International Standards
and Recommended Practices

Annex 11
to the Convention on
International Civil Aviation

Air Traffic Services

Air Traffic Control Service
Flight Information Service
Alerting Service

This edition incorporates all amendments adopted by the Council prior to 13 March 2001 and supersedes, on 1 November 2001, all previous editions of Annex 11.

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

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AMENDMENTS

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

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1-40	Incorporated in this edition		

CORRIGENDA			
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FOREWORD

Historical background

In October 1945, the Rules of the Air and Air Traffic Control (RAC) Division at its first session made recommendations for Standards, Practices and Procedures for Air Traffic Control. These were reviewed by the then Air Navigation Committee and approved by the Council on 25 February 1946. They were published as "Recommendations for Standards, Practices and Procedures — *Air Traffic Control*" in the second part of Doc 2010, published in February 1946.

The RAC Division, at its second session in December 1946 – January 1947, reviewed Doc 2010 and proposed Standards and Recommended Practices for Air Traffic Control. It did not appear possible, however, to finalize those Standards prior to basic principles being established by the RAC Division for the organization of the relevant services.

These were established by the RAC Division at its third session in April–May 1948 and a draft Annex was thereafter submitted to States. This was adopted by the Council on 18 May 1950, pursuant to Article 37 of the Convention on International Civil Aviation (Chicago, 1944), and designated as Annex 11 to the Convention with the title "International Standards and Recommended Practices — *Air Traffic Services*". It became effective on 1 October 1950. This new title — *Air Traffic Services* — was preferred to the title *Air Traffic Control*, in order to make it clear that air traffic control service was a part of the services covered by Annex 11, together with flight information service and alerting service.

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

Applicability

The Standards and Recommended Practices in this document, together with the Standards in Annex 2, govern the application of the "Procedures for Air Navigation Services — *Air Traffic Management*" and the "Regional Supplementary Procedures — *Rules of the Air and Air Traffic Services*", in which latter document will be found subsidiary procedures of regional application.

Annex 11 pertains to the establishment of airspace, units and services necessary to promote a safe, orderly and expeditious flow of air traffic. A clear distinction is made between air traffic control service, flight information service and alerting service. Its purpose, together with Annex 2, is to ensure that flying on international air routes is carried out under uniform conditions designed to improve the safety and efficiency of air operation.

The Standards and Recommended Practices in Annex 11 apply in those parts of the airspace under the jurisdiction of a Contracting State wherein air traffic services are provided and also wherever a Contracting State accepts the responsibility of providing air traffic services over the high seas or in airspace of undetermined sovereignty. A Contracting State accepting such responsibility may apply the Standards and Recommended Practices in a manner consistent with that adopted for airspace under its jurisdiction.

Action by Contracting States

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

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. Information relating to the establishment and withdrawal of, and changes to, facilities, services and procedures affecting aircraft operations provided according to the Standards specified in this Annex should be notified and take effect in accordance with Annex 15.

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

Status of Annex components

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

1. — *Material comprising the Annex proper:*

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

Standard. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

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

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

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

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

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

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

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

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

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

Selection of language

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

Editorial practices

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

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

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

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

Table A. Amendments to Annex 11

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
1st Edition	Rules of the Air and Air Traffic Control (RAC) Division, Third Session (1948)	International Standards and Recommended Practices — *Air Traffic Services*.	18 May 1950 1 October 1950 1 June 1951
1 to 6 (2nd Edition)	Rules of the Air and Air Traffic Control (RAC) Division, Fourth Session (1950)	Aerodrome traffic; transfer of control; contents of clearance; distress phase; requirements for communications; upper flight information regions and upper control areas; vertical separation.	27 November 1951 1 April 1952 1 September 1952
7	Air Navigation Commission	Deletion of guidance material on the dissemination of information on ATS facilities.	22 February 1956 — —
8 (3rd Edition)	Second Air Navigation Conference (1955)	Definitions; establishment of authority; designations of airspace; separation of aircraft; requirements for communications; requirements for meteorological information; determination and establishment of controlled airspaces; diagrams of communications.	11 May 1956 15 September 1956 1 December 1956
9 (4th Edition)	Rules of the Air, Air Traffic Services and Search and Rescue (RAC/SAR) Divisions (1958)	Definitions; objectives of air traffic services; designations of airspace and controlled aerodromes; specifications for airspace; air traffic control service; alerting service; requirements for communications; determination and establishment of controlled airspaces, naming of reporting points; automation of air traffic control.	8 December 1959 1 May 1960 1 August 1960
10	Panel for Coordinating Procedures Respecting the Supply of Information for Air Operations (1959)	SIGMET information; delegation and application of flight information service; requirements for meteorological information.	2 December 1960 1 April 1961 1 July 1961
11	Air Navigation Commission	Deletion of guidance material illustrating the depiction on charts of air traffic services information.	26 June 1961 — —
12	Air Navigation Commission	Guidance material relating to the selection of designators for routes within controlled airspace.	15 December 1961 — —
13	Air Navigation Commission	Notification of rescue coordination centres during uncertainty, alert and distress phases.	13 April 1962 1 August 1962 1 November 1962
14	Air Navigation Commission	Requirements for other aircraft in the vicinity of an aircraft in a state of emergency to be informed of the nature of emergency.	19 June 1964 1 November 1964 1 February 1965

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
15 (5th Edition)	Rules of the Air, Air Traffic Services/ Operations (RAC/OPS) Divisional Meeting (1963); Air Navigation Commission	Application of vertical separation for flights above FL 290; provision of air traffic control service to VFR flights; delineation of airspace; vertical limits of flight information regions; ATS routes and reporting point designators; coordination with operators; methods of separation; requirements for communications; guidance material on the determination and establishment of controlled airspace.	17 March 1965 29 March 1966 25 August 1966
16	Air Traffic Control Automation Panel (ATCAP), Fifth Meeting (1966)	Transfer of responsibility for control; control of air traffic flow.	7 June 1967 5 October 1967 8 February 1968
17	Fifth Air Navigation Conference (1967)	Air traffic services reporting office and its communication requirements; clearances and separation; scope of the flight information service; communications for control of vehicles at aerodromes; ATS requirements for meteorological information; information on aerodrome conditions and operational status of navigation aids.	23 January 1969 23 May 1969 18 September 1969
18 (6th Edition)	Sixth Air Navigation Conference (1969); Air Navigation Commission	Definitions; terminology for designating controlled airspace; vertical limits of ATS airspaces; minimum flight altitudes; establishment and application of separation minima; clearances and separation; standard departure and arrival routes; establishment and identification of reporting points and reporting lines; provision of flight information service to IFR flights over water areas; establishment of air-ground communications for ATS purposes.	25 May 1970 25 September 1970 4 February 1971
19	Air Navigation Commission	Authority over aircraft over the high seas; SIGMET information.	15 November 1972 15 March 1973 16 August 1973
20	Seventh Air Navigation Conference (1972)	Definitions; area navigation (RNAV); designators for ATS routes and reporting points.	23 March 1973 30 July 1973 23 May 1974
21	Council action in pursuance of Assembly Resolutions A17-10 and A18-10	Practices to be followed by ATS units in the event that an aircraft is subjected to unlawful interference.	7 December 1973 7 April 1974 23 May 1974
22	Technical Panel on Supersonic Transport Operations (SSTP), Fourth Meeting (1973); Air Navigation Commission	Clearance for transonic acceleration and deceleration of supersonic flights; cooperation between military authorities and air traffic services and requirements for communications.	4 February 1975 4 June 1975 9 October 1975
23	Air Navigation Commission	Use of SSR code 7500 in the event of unlawful interference; requirements for communications between ATS units and meteorological offices.	12 December 1975 12 April 1976 12 August 1976
24	Air Navigation Commission	Definitions; time-keeping accuracy.	7 April 1976 7 August 1976 30 December 1976
25 (7th Edition)	Ninth Air Navigation Conference (1976)	Definitions; VOR change-over points; identification of ATS routes; establishment and identification of significant points; flight information service; ATS requirements for information.	7 December 1977 7 April 1978 10 August 1978

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
26	Air Navigation Commission	Designation of standard departure and arrival routes.	3 December 1979 3 April 1980 27 November 1980
27	Air Navigation Commission	Coordination of activities constituting a potential hazard to flights of civil aircraft; unmanned free balloons.	4 March 1981 4 July 1981 26 November 1981
28	Air Navigation Commission	Requirements for communications between ATS units and military units.	1 April 1981 1 August 1981 26 November 1981
29	Operational Flight Information Service (OFIS) Panel, Second Meeting (1980); Review of the General Concept of Separation Panel (RGCSP), Fourth Meeting (1980); Air Navigation Commission	Provision of integrated AIS, ATS, MET and other pertinent operational information to aircraft in flight; composite separation; automatic recording of radar data; traffic information broadcasts by aircraft.	2 April 1982 2 August 1982 25 November 1982
30	ATS Data Acquisition, Processing and Transfer (ADAPT) Panel, Third Meeting (1981); AGA Divisional Meeting (1981); Air Navigation Commission	ATS requirements for communications; marking of surface wind indicators; surface movement guidance and control systems; units of measurement; definitions.	16 March 1983 29 July 1983 24 November 1983
31	Council; Air Navigation Commission	Civil-military coordination; in-flight contingencies involving strayed or unidentified aircraft and/or interception of civil aircraft; requirements for communications; traffic information broadcasts by aircraft.	12 March 1986 27 July 1986 20 November 1986
32 (8th Edition)	Review of the General Concept of Separation Panel (RGCSP), Fifth Meeting (1985); Air Navigation Commission	Definitions; Coordinated Universal Time (UTC); volcanic ash warnings; establishment of ATS routes defined by VOR; deletion of Attachments A, B, C, D, F and G.	18 March 1987 27 July 1987 19 November 1987
33 (9th Edition)	Secretariat; Visual Flight Rules Operations Panel, Third Meeting (1986); Air Navigation Commission; amendments consequential to the adoption of amendments to Annex 6	Operation of aircraft in mixed VFR/IFR; ATS requirements for NOTAM action; surface movement guidance and control; and ATS responsibilities regarding acts of unlawful interference.	12 March 1990 30 July 1990 14 November 1991
34	Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel, Fourth Meeting (SICASP/4) (1989)	Definitions; provision of air traffic services irrespective of airborne collision avoidance system (ACAS) operation.	26 February 1993 26 July 1993 11 November 1993

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
35 (10th Edition)	Review of the General Concept of Separation Panel (RGCSP), Sixth Meeting (1988), Seventh Meeting (1990), Eighth Meeting (1993); Automatic Dependent Surveillance Panel (ADSP), Second Meeting (1992); Air Navigation Commission	Definitions; reduced vertical separation minimum of 300 m (1000 ft) vertical separation minimum above FL 290; integration of helicopter traffic with conventional aeroplane traffic; establishment of ATS routes defined by VOR and establishment of ATS routes for use by RNAV-equipped aircraft; required navigation performance; automatic dependent surveillance; provisions relating to the World Geodetic System — 1984 (WGS-84) geodetic datum; transmission of information to aircraft on radioactive material and toxic chemical “clouds”.	18 March 1994 25 July 1994 10 November 1994
36	Fourth Meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP/4); Thirteenth and Fourteenth Meetings of the All Weather Operations Panel (AWOP/13 and 14); Tenth Meeting of the Obstacle Clearance Panel (OCP/10)	Pressure-altitude reporting transponders; microwave landing system; en-route obstacle clearance criteria.	8 March 1996 15 July 1996 7 November 1996
37 (11th Edition)	Air Navigation Commission; Amendment 70 to Annex 3	Aeronautical databases; AIRMET information; wind shear.	20 March 1997 21 July 1997 6 November 1997
38 (12th Edition)	Automatic Dependent Surveillance Panel, Fourth Meeting (1996); Review of the General Concept of Separation Panel, Ninth Meeting (1996); Amendment 71 to Annex 3; Air Navigation Commission	Definitions; automatic dependent surveillance systems and procedures; data interchange between automated ATS systems; ATS applications for air-ground data links; separation between aircraft; RNP and RNAV for en-route operations; requirements for the uplink of OPMET information to aircraft in flight; volcanic ash advisories; Human Factors.	19 March 1998 20 July 1998 5 November 1998
39	Air Navigation Commission	ATS airspace classifications; visual meteorological conditions; and minimum safe altitude warning.	10 March 1999 19 July 1999 4 November 1999
40 (13th Edition)	Air Navigation Commission; Fifth Meeting of the Automatic Dependent Surveillance Panel (ADSP/5); Thirty-ninth Meeting of the European Air Navigation Planning Group (EANPG); Twelfth Meeting of the Obstacle Clearance Panel (OCP/12); Amendments 25, 20 and 7 to Annex 6, Parts I, II and III, respectively; Secretariat	Definitions; ATS safety management; ADS to indicate state of aircraft emergency; flexible use of airspace; minimum flight altitudes; terrain clearance during radar vectoring; downstream clearance delivery service; transfer of responsibility for control; read-back of clearances; air traffic flow management; automatic terminal information service; VOLMET and D-VOLMET; equipment in ATS units and criteria for indicators(s) for RVR values; editorial amendments.	12 March 2001 16 July 2001 1 November 2001

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

Note 1.— Throughout the text of this document the term "service" is used as an abstract noun to designate functions, or service rendered; the term "unit" is used to designate a collective body performing a service.

Note 2.— The designation (RR) in these definitions indicates a definition which has been extracted from the Radio Regulations of the International Telecommunication Union (ITU) (see Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies (*Doc 9718)).*

When the following terms are used in the Standards and Recommended Practices for Air Traffic Services, they have the following meanings:

Accepting unit. Air traffic control unit next to take control of an aircraft.

Accident. An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

a) a person is fatally or seriously injured as a result of:

— being in the aircraft, or

— direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or

— direct exposure to jet blast,

except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft sustains damage or structural failure which:

— adversely affects the structural strength, performance or flight characteristics of the aircraft, and

— would normally require major repair or replacement of the affected component,

except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or

c) the aircraft is missing or is completely inaccessible.

Note 1.— For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO.

Note 2.— An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

Accuracy. A degree of conformance between the estimated or measured value and the true value.

Note.— For measured positional data the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.

Advisory airspace. An airspace of defined dimensions, or designated route, within which air traffic advisory service is available.

Advisory route. A designated route along which air traffic advisory service is available.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome control service. Air traffic control service for aerodrome traffic.

Aerodrome control tower. A unit established to provide air traffic control service to aerodrome traffic.

Aerodrome traffic. All traffic on the manoeuvring area of an aerodrome and all aircraft flying in the vicinity of an aerodrome.

Note.— An aircraft is in the vicinity of an aerodrome when it is in, entering or leaving an aerodrome traffic circuit.

Aeronautical fixed service (AFS). A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical mobile service (RR S1.32). A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies.

Aeronautical station (RR S1.81). A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea.

Aeronautical telecommunication station. A station in the aeronautical telecommunication service.

Airborne collision avoidance system (ACAS). An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.

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

Air-ground communication. Two-way communication between aircraft and stations or locations on the surface of the earth.

AIRMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of low-level aircraft operations and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof.

Air-taxiing. Movement of a helicopter/VTOL above the surface of an aerodrome, normally in ground effect and at a ground speed normally less than 37 km/h (20 kt).

Note.— The actual height may vary, and some helicopters may require air-taxiing above 8 m (25 ft) AGL to reduce ground effect turbulence or provide clearance for cargo slingloads.

Air traffic. All aircraft in flight or operating on the manoeuvring area of an aerodrome.

Air traffic advisory service. A service provided within advisory airspace to ensure separation, in so far as practical, between aircraft which are operating on IFR flight plans.

Air traffic control clearance. Authorization for an aircraft to proceed under conditions specified by an air traffic control unit.

Note 1.— For convenience, the term "air traffic control clearance" is frequently abbreviated to "clearance" when used in appropriate contexts.

Note 2.— The abbreviated term "clearance" may be prefixed by the words "taxi", "take-off", "departure", "en route", "approach" or "landing" to indicate the particular portion of flight to which the air traffic control clearance relates.

Air traffic control service. A service provided for the purpose of:

a) preventing collisions:

   1) between aircraft, and

   2) on the manoeuvring area between aircraft and obstructions; and

b) expediting and maintaining an orderly flow of air traffic.

Air traffic control unit. A generic term meaning variously, area control centre, approach control unit or aerodrome control tower.

Air traffic flow management (ATFM). A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

Air traffic service. A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Air traffic services airspaces. Airspaces of defined dimensions, alphabetically designated, within which specific types of flights may operate and for which air traffic services and rules of operation are specified.

Note.— ATS airspaces are classified as Class A to G as shown in Appendix 4.

Air traffic services reporting office. A unit established for the purpose of receiving reports concerning air traffic services and flight plans submitted before departure.

Note.— An air traffic services reporting office may be established as a separate unit or combined with an existing unit, such as another air traffic services unit, or a unit of the aeronautical information service.

Air traffic services unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Airway. A control area or portion thereof established in the form of a corridor.

ALERFA. The code word used to designate an alert phase.

Alerting service. A service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

Alert phase. A situation wherein apprehension exists as to the safety of an aircraft and its occupants.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en route.

ETOPS en-route alternate. A suitable and appropriate alternate aerodrome at which an aeroplane would be able to land after experiencing an engine shut-down or other abnormal or emergency condition while en route in an ETOPS operation.

Destination alternate. An alternate aerodrome to which an aircraft may proceed should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level.

Approach control service. Air traffic control service for arriving or departing controlled flights.

Approach control unit. A unit established to provide air traffic control service to controlled flights arriving at, or departing from, one or more aerodromes.

Appropriate ATS authority. The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned.

Apron. A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Apron management service. A service provided to regulate the activities and the movement of aircraft and vehicles on an apron.

Area control centre. A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction.

Area control service. Air traffic control service for controlled flights in control areas.

Area navigation (RNAV). A method of navigation which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

Area navigation route. An ATS route established for the use of aircraft capable of employing area navigation.

ATS route. A specified route designed for channelling the flow of traffic as necessary for the provision of air traffic services.

Note 1.— The term "ATS route" is used to mean variously, airway, advisory route, controlled or uncontrolled route, arrival or departure route, etc.

Note 2.— An ATS route is defined by route specifications which include an ATS route designator, the track to or from significant points (waypoints), distance between significant points, reporting requirements and, as determined by the appropriate ATS authority, the lowest safe altitude.

Automatic dependent surveillance (ADS). A surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position and additional data as appropriate.

Automatic terminal information service (ATIS). The automatic provision of current, routine information to arriving and departing aircraft throughout 24 hours or a specified portion thereof:

Data link-automatic terminal information service (D-ATIS). The provision of ATIS via data link.

Voice-automatic terminal information service (Voice-ATIS). The provision of ATIS by means of continuous and repetitive voice broadcasts.

Base turn. A turn executed by the aircraft during the initial approach between the end of the outbound track and the beginning of the intermediate or final approach track. The tracks are not reciprocal.

Note.— Base turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual procedure.

Change-over point. The point at which an aircraft navigating on an ATS route segment defined by reference to very high frequency omnidirectional radio ranges is expected to transfer its primary navigational reference from the facility behind the aircraft to the next facility ahead of the aircraft.

Note.— Change-over points are established to provide the optimum balance in respect of signal strength and quality between facilities at all levels to be used and to ensure a common source of azimuth guidance for all aircraft operating along the same portion of a route segment.

Clearance limit. The point to which an aircraft is granted an air traffic control clearance.

Conference communications. Communication facilities whereby direct speech conversation may be conducted between three or more locations simultaneously.

Control area. A controlled airspace extending upwards from a specified limit above the earth.

Controlled aerodrome. An aerodrome at which air traffic control service is provided to aerodrome traffic.

Note.— The term "controlled aerodrome" indicates that air traffic control service is provided to aerodrome traffic but does not necessarily imply that a control zone exists.

Controlled airspace. An airspace of defined dimensions within which air traffic control service is provided in accordance with the airspace classification.

Note.— Controlled airspace is a generic term which covers ATS airspace Classes A, B, C, D and E as described in 2.6.

Controlled flight. Any flight which is subject to an air traffic control clearance.

Controller-pilot data link communications (CPDLC). A means of communication between controller and pilot, using data link for ATC communications.

Control zone. A controlled airspace extending upwards from the surface of the earth to a specified upper limit.

Cruising level. A level maintained during a significant portion of a flight.

Cyclic redundancy check (CRC). A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.

Data link communications. A form of communication intended for the exchange of messages via a data link.

Data quality. A degree or level of confidence that the data provided meets the requirements of the data user in terms of accuracy, resolution and integrity.

Declared capacity. A measure of the ability of the ATC system or any of its subsystems or operating positions to provide service to aircraft during normal activities. It is expressed as the number of aircraft entering a specified portion of airspace in a given period of time, taking due account of weather, ATC unit configuration, staff and equipment available, and any other factors that may affect the workload of the controller responsible for the airspace.

DETRESFA. The code word used to designate a distress phase.

Distress phase. A situation wherein there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.

Downstream clearance. A clearance issued to an aircraft by an air traffic control unit that is not the current controlling authority of that aircraft.

Emergency phase. A generic term meaning, as the case may be, uncertainty phase, alert phase or distress phase.

Final approach. That part of an instrument approach procedure which commences at the specified final approach fix or point, or where such a fix or point is not specified,

a) at the end of the last procedure turn, base turn or inbound turn of a racetrack procedure, if specified; or

b) at the point of interception of the last track specified in the approach procedure; and

ends at a point in the vicinity of an aerodrome from which:

1) a landing can be made; or

2) a missed approach procedure is initiated.

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

Flight information centre. A unit established to provide flight information service and alerting service.

Flight information region. An airspace of defined dimensions within which flight information service and alerting service are provided.

Flight information service. A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1.— A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to a QFE altimeter setting, will indicate height above the QFE reference datum;

c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Note 2.— The terms "height" and "altitude", used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

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

Note.— Specifications for flight plans are contained in Annex 2. When the expression "flight plan form" is used it denotes the model flight plan form at Appendix 2 to the PANS-ATM.

Forecast. A statement of expected meteorological conditions for a specified time or period, and for a specified area or portion of airspace.

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

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

IFR. The symbol used to designate the instrument flight rules.

IFR flight. A flight conducted in accordance with the instrument flight rules.

IMC. The symbol used to designate instrument meteorological conditions.

INCERFA. The code word used to designate an uncertainty phase.

Incident. An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in the Accident/Incident Reporting Manual *(Doc 9156).*

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions.

Note.— The specified minima for visual meteorological conditions are contained in Annex 2.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

International NOTAM office. An office designated by a State for the exchange of NOTAM internationally.

Level. A generic term relating to the vertical position of an aircraft in flight and meaning variously, height, altitude or flight level.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

Meteorological office. An office designated to provide meteorological service for international air navigation.

Movement area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

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

Printed communications. Communications which automatically provide a permanent printed record at each terminal of a circuit of all messages which pass over such circuit.

Radiotelephony. A form of radiocommunication primarily intended for the exchange of information in the form of speech.

Reporting point. A specified geographical location in relation to which the position of an aircraft can be reported.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace.

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Rescue coordination centre. A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

RNP type. A containment value expressed as a distance in nautical miles from the intended position within which flights would be for at least 95 per cent of the total flying time.

Example.— RNP 4 represents a navigation accuracy of plus or minus 7.4 km (4 NM) on a 95 per cent containment basis.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

SIGMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations.

Significant point. A specified geographical location used in defining an ATS route or the flight path of an aircraft and for other navigation and ATS purposes.

Special VFR flight. A VFR flight cleared by air traffic control to operate within a control zone in meteorological conditions below VMC.

Station declination. An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.

Taxiing. Movement of an aircraft on the surface of an aerodrome under its own power, excluding take-off and landing.

Terminal control area. A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes.

Track. The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (true, magnetic or grid).

Traffic avoidance advice. Advice provided by an air traffic services unit specifying manoeuvres to assist a pilot to avoid a collision.

Traffic information. Information issued by an air traffic services unit to alert a pilot to other known or observed air traffic which may be in proximity to the position or intended route of flight and to help the pilot avoid a collision.

Transfer of control point. A defined point located along the flight path of an aircraft, at which the responsibility for providing air traffic control service to the aircraft is transferred from one control unit or control position to the next.

Transferring unit. Air traffic control unit in the process of transferring the responsibility for providing air traffic control service to an aircraft to the next air traffic control unit along the route of flight.

Uncertainty phase. A situation wherein uncertainty exists as to the safety of an aircraft and its occupants.

VFR. The symbol used to designate the visual flight rules.

VFR flight. A flight conducted in accordance with the visual flight rules.

Visual meteorological conditions (VMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima.

Note.— The specified minima are contained in Annex 2.

VMC. The symbol used to designate visual meteorological conditions.

Waypoint. A specified geographical location used to define an area navigation route or the flight path of an aircraft employing area navigation. Waypoints are identified as either:

Fly-by waypoint. A waypoint which requires turn anticipation to allow tangential interception of the next segment of a route or procedure, or

Flyover waypoint. A waypoint at which a turn is initiated in order to join the next segment of a route or procedure.

CHAPTER 2. GENERAL

2.1 Establishment of authority

2.1.1 Contracting States shall determine, in accordance with the provisions of this Annex and for the territories over which they have jurisdiction, those portions of the airspace and those aerodromes where air traffic services will be provided. They shall thereafter arrange for such services to be established and provided in accordance with the provisions of this Annex, except that, by mutual agreement, a State may delegate to another State the responsibility for establishing and providing air traffic services in flight information regions, control areas or control zones extending over the territories of the former.

Note.— If one State delegates to another State the responsibility for the provision of air traffic services over its territory, it does so without derogation of its national sovereignty. Similarly, the providing State's responsibility is limited to technical and operational considerations and does not extend beyond those pertaining to the safety and expedition of aircraft using the concerned airspace. Furthermore, the providing State in providing air traffic services within the territory of the delegating State will do so in accordance with the requirements of the latter which is expected to establish such facilities and services for the use of the providing State as are jointly agreed to be necessary. It is further expected that the delegating State would not withdraw or modify such facilities and services without prior consultation with the providing State. Both the delegating and providing States may terminate the agreement between them at any time.

2.1.2 Those portions of the airspace over the high seas or in airspace of undetermined sovereignty where air traffic services will be provided shall be determined on the basis of regional air navigation agreements. A Contracting State having accepted the responsibility to provide air traffic services in such portions of airspace shall thereafter arrange for the services to be established and provided in accordance with the provisions of this Annex.

Note 1.— The phrase "regional air navigation agreements" refers to the agreements approved by the Council of ICAO normally on the advice of Regional Air Navigation Meetings.

Note 2.— The Council, when approving the Foreword to this Annex, indicated that a Contracting State accepting the responsibility for providing air traffic services over the high seas or in airspace of undetermined sovereignty may apply the Standards and Recommended Practices in a manner consistent with that adopted for airspace under its jurisdiction.

2.1.3 When it has been determined that air traffic services will be provided, the States concerned shall designate the authority responsible for providing such services.

Note 1.— The authority responsible for establishing and providing the services may be a State or a suitable Agency.

Note 2.— Situations which arise in respect of the establishment and provision of air traffic services to either part or whole of an international flight are as follows:

Situation 1: *A route, or portion of a route, contained within airspace under the sovereignty of a State establishing and providing its own air traffic services.*

Situation 2: *A route, or portion of a route, contained within airspace under the sovereignty of a State which has, by mutual agreement, delegated to another State, responsibility for the establishment and provision of air traffic services.*

Situation 3: *A portion of a route contained within airspace over the high seas or in airspace of undetermined sovereignty for which a State has accepted the responsibility for the establishment and provision of air traffic services.*

For the purpose of this Annex, the State which designates the authority responsible for establishing and providing the air traffic services is:

in Situation 1: *the State having sovereignty over the relevant portion of the airspace;*

in Situation 2: *the State to whom responsibility for the establishment and provision of air traffic services has been delegated;*

in Situation 3: *the State which has accepted the responsibility for the establishment and provision of air traffic services.*

2.1.4 Where air traffic services are established, information shall be published as necessary to permit the utilization of such services.

2.2 Objectives of the air traffic services

The objectives of the air traffic services shall be to:

a) prevent collisions between aircraft;

b) prevent collisions between aircraft on the manoeuvring area and obstructions on that area;

c) expedite and maintain an orderly flow of air traffic;

d) provide advice and information useful for the safe and efficient conduct of flights;

e) notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

2.3 Divisions of the air traffic services

The air traffic services shall comprise three services identified as follows.

2.3.1 The *air traffic control service*, to accomplish objectives a), b) and c) of 2.2, this service being divided in three parts as follows:

a) *Area control service:* the provision of air traffic control service for controlled flights, except for those parts of such flights described in 2.3.1 b) and c), in order to accomplish objectives a) and c) of 2.2;

b) *Approach control service:* the provision of air traffic control service for those parts of controlled flights associated with arrival or departure, in order to accomplish objectives a) and c) of 2.2;

c) *Aerodrome control service:* the provision of air traffic control service for aerodrome traffic, except for those parts of flights described in 2.3.1 b), in order to accomplish objectives a), b) and c) of 2.2.

2.3.2 The *flight information service*, to accomplish objective d) of 2.2.

2.3.3 The *alerting service*, to accomplish objective e) of 2.2.

2.4 Determination of the need for air traffic services

2.4.1 The need for the provision of air traffic services shall be determined by consideration of the following:

a) the types of air traffic involved;

b) the density of air traffic;

c) the meteorological conditions;

d) such other factors as may be relevant.

Note.— Due to the number of elements involved, it has not been possible to develop specific data to determine the need for air traffic services in a given area or at a given location. For example:

a) a mixture of different types of air traffic with aircraft of varying speeds (conventional jet, etc.) might necessitate the provision of air traffic services, whereas a relatively greater density of traffic where only one type of operation is involved would not;

b) meteorological conditions might have considerable effect in areas where there is a constant flow of air traffic (e.g. scheduled traffic), whereas similar or worse meteorological conditions might be relatively unimportant in an area where air traffic would be discontinued in such conditions (e.g. local VFR flights);

c) open stretches of water, mountainous, uninhabited or desert areas might necessitate the provision of air traffic services even though the frequency of operations is extremely low.

2.4.2 The carriage of airborne collision avoidance systems (ACAS) by aircraft in a given area shall not be a factor in determining the need for air traffic services in that area.

2.5 Designation of the portions of the airspace and controlled aerodromes where air traffic services will be provided

2.5.1 When it has been determined that air traffic services will be provided in particular portions of the airspace or at particular aerodromes, then those portions of the airspace or those aerodromes shall be designated in relation to the air traffic services that are to be provided.

2.5.2 The designation of the particular portions of the airspace or the particular aerodromes shall be as follows:

2.5.2.1 *Flight information regions.* Those portions of the airspace where it is determined that flight information service and alerting service will be provided shall be designated as flight information regions.

2.5.2.2 *Control areas and control zones*

2.5.2.2.1 Those portions of the airspace where it is determined that air traffic control service will be provided to IFR flights shall be designated as control areas or control zones.

Note.— The distinction between control areas and control zones is made in 2.9.

2.5.2.2.1.1 Those portions of controlled airspace wherein it is determined that air traffic control service will also be provided to VFR flights shall be designated as Classes B, C, or D airspace.

2.5.2.2.2 Where designated within a flight information region, control areas and control zones shall form part of that flight information region.

2.5.2.3 *Controlled aerodromes.* Those aerodromes where it is determined that air traffic control service will be provided to aerodrome traffic shall be designated as controlled aerodromes.

2.6 Classification of airspaces

2.6.1 ATS airspaces shall be classified and designated in accordance with the following:

Class A. IFR flights only are permitted, all flights are provided with air traffic control service and are separated from each other.

Class B. IFR and VFR flights are permitted, all flights are provided with air traffic control service and are separated from each other.

Class C. IFR and VFR flights are permitted, all flights are provided with air traffic control service and IFR flights are separated from other IFR flights and from VFR flights. VFR flights are separated from IFR flights and receive traffic information in respect of other VFR flights.

Class D. IFR and VFR flights are permitted and all flights are provided with air traffic control service, IFR flights are separated from other IFR flights and receive traffic information in respect of VFR flights, VFR flights receive traffic information in respect of all other flights.

Class E. IFR and VFR flights are permitted, IFR flights are provided with air traffic control service and are separated from other IFR flights. All flights receive traffic information as far as is practical. Class E shall not be used for control zones.

Class F. IFR and VFR flights are permitted, all participating IFR flights receive an air traffic advisory service and all flights receive flight information service if requested.

Note.— Where air traffic advisory service is implemented, this is considered normally as a temporary measure only until such time as it can be replaced by air traffic control. (See also PANS-ATM, Chapter 9.)

Class G. IFR and VFR flights are permitted and receive flight information service if requested.

2.6.2 States shall select those airspace classes appropriate to their needs.

2.6.3 The requirements for flights within each class of airspace shall be as shown in the table in Appendix 4.

Note.— Where the ATS airspaces adjoin vertically, i.e. one above the other, flights at a common level would comply with requirements of, and be given services applicable to, the less restrictive class of airspace. In applying these criteria, Class B airspace is therefore considered less restrictive than Class A airspace; Class C airspace less restrictive than Class B airspace, etc.

2.7 Required navigation performance (RNP) for en-route operations

2.7.1 RNP types shall be prescribed by States. When applicable, the RNP type(s) for designated areas, tracks orATS routes shall be prescribed on the basis of regional air navigation agreements.

2.7.2 **Recommendation.—** *For the en-route phase of flight, RNP types RNP 1, RNP 4, RNP 10, RNP 12.6 and RNP 20 should be implemented as soon as practicable.*

2.7.3 The prescribed RNP type shall be appropriate to the level of communications, navigation and air traffic services provided in the airspace concerned.

Note.— Applicable RNP types and associated procedures are published in the Manual on Required Navigation Performance (RNP) *(Doc 9613).*

2.8 Establishment and designation of the units providing air traffic services

The air traffic services shall be provided by units established and designated as follows:

2.8.1 Flight information centres shall be established to provide flight information service and alerting service within flight information regions, unless the responsibility of providing such services within a flight information region is assigned to an air traffic control unit having adequate facilities for the discharge of such responsibility.

Note.— This does not preclude delegating to other units the function of providing certain elements of the flight information service.

2.8.2 Air traffic control units shall be established to provide air traffic control service, flight information service and alerting service within control areas, control zones and at controlled aerodromes.

Note.— The services to be provided by various air traffic control units are indicated in 3.2.

2.9 Specifications for flight information regions, control areas and control zones

2.9.1 **Recommendation.—** *The delineation of airspace, wherein air traffic services are to be provided, should be related to the nature of the route structure and the need for efficient service rather than to national boundaries.*

Note 1.— Agreements to permit the delineation of airspace lying across national boundaries are advisable when such action will facilitate the provision of air traffic services (see 2.1.1). Agreements which permit delineation of airspace boundaries by straight lines will, for example, be most convenient where data processing techniques are used by air traffic services units.

Note 2.— Where delineation of airspace is made by reference to national boundaries there is a need for suitably sited transfer points to be mutually agreed upon.

2.9.2 Flight information regions

2.9.2.1 Flight information regions shall be delineated to cover the whole of the air route structure to be served by such regions.

2.9.2.2 A flight information region shall include all airspace within its lateral limits, except as limited by an upper flight information region.

2.9.2.3 Where a flight information region is limited by an upper flight information region, the lower limit specified for the upper flight information region shall constitute the upper vertical limit of the flight information region and shall coincide with a VFR cruising level of the tables in Appendix 3 to Annex 2.

Note.— In cases where an upper flight information region is established the procedures applicable therein need not be identical with those applicable in the underlying flight information region.

2.9.3 Control areas

2.9.3.1 Control areas including, *inter alia*, airways and terminal control areas shall be delineated so as to encompass sufficient airspace to contain the flight paths of those IFR flights or portions thereof to which it is desired to provide the applicable parts of the air traffic control service, taking into account the capabilities of the navigation aids normally used in that area.

Note.— In a control area other than one formed by a system of airways, a system of routes may be established to facilitate the provision of air traffic control.

2.9.3.2 A lower limit of a control area shall be established at a height above the ground or water of not less than 200 m (700 ft).

Note.— This does not imply that the lower limit has to be established uniformly in a given control area (see Figure A-5 of the Air Traffic Services Planning Manual *(Doc 9426), Part I, Section 2, Chapter 3).*

2.9.3.2.1 **Recommendation.—** *The lower limit of a control area should, when practicable and desirable in order to allow freedom of action for VFR flights below the control area, be established at a greater height than the minimum specified in 2.9.3.2.*

2.9.3.2.2 **Recommendation.—** *When the lower limit of a control area is above 900 m (3 000 ft) MSL it should coincide with a VFR cruising level of the tables in Appendix 3 to Annex 2.*

Note.— This implies that the selected VFR cruising level be such that expected local atmospheric pressure variations do not result in a lowering of this limit to a height of less than 200 m (700 ft) above ground or water.

2.9.3.3 An upper limit of a control area shall be established when either:

a) air traffic control service will not be provided above such upper limit; or

b) the control area is situated below an upper control area, in which case the upper limit shall coincide with the lower limit of the upper control area.

When established, such upper limit shall coincide with a VFR cruising level of the tables in Appendix 3 to Annex 2.

2.9.4 Flight information regions or control areas in the upper airspace

Recommendation.— *Where it is desirable to limit the number of flight information regions or control areas through which high flying aircraft would otherwise have to operate, a flight information region or control area, as appropriate, should be delineated to include the upper airspace within the lateral limits of a number of lower flight information regions or control areas.*

2.9.5 Control zones

2.9.5.1 The lateral limits of control zones shall encompass at least those portions of the airspace, which are not within control areas, containing the paths of IFR flights arriving at and departing from aerodromes to be used under instrument meteorological conditions.

Note.— Aircraft holding in the vicinity of aerodromes are considered as arriving aircraft.

2.9.5.2 The lateral limits of a control zone shall extend to at least 9.3 km (5 NM) from the centre of the aerodrome or aerodromes concerned in the directions from which approaches may be made.

Note.— A control zone may include two or more aerodromes situated close together.

2.9.5.3 If a control zone is located within the lateral limits of a control area, it shall extend upwards from the surface of the earth to at least the lower limit of the control area.

Note.— An upper limit higher than the lower limit of the overlying control area may be established when desired.

2.9.5.4 **Recommendation.—** *If a control zone is located outside of the lateral limits of a control area, an upper limit should be established.*

2.9.5.5 **Recommendation.—** *If it is desired to establish the upper limit of a control zone at a level higher than the lower limit of the control area established above it, or if the control zone is located outside of the lateral limits of a control area, its upper limit should be established at a level which can easily be identified by pilots. When this limit is above 900 m (3 000 ft) MSL it should coincide with a VFR cruising level of the tables in Appendix 3 to Annex 2.*

Note.— This implies that, if used, the selected VFR cruising level be such that expected local atmospheric pressure variations do not result in a lowering of this limit to a height of less than 200 m (700 ft) above ground or water.

2.10 Identification of air traffic services units and airspaces

2.10.1 **Recommendation.—** *An area control centre or flight information centre should be identified by the name of a nearby town or city or geographic feature.*

2.10.2 **Recommendation.—** *An aerodrome control tower or approach control unit should be identified by the name of the aerodrome at which it is located.*

2.10.3 **Recommendation.—** *A control zone, control area or flight information region should be identified by the name of the unit having jurisdiction over such airspace.*

2.11 Establishment and identification of ATS routes

2.11.1 When ATS routes are established, a protected airspace along each ATS route and a safe spacing between adjacent ATS routes shall be provided.

2.11.2 **Recommendation**.— *When warranted by density, complexity or nature of the traffic, special routes should be established for use by low-level traffic, including helicopters operating to and from helidecks on the high seas. When determining the lateral spacing between such routes, account should be taken of the navigational means available and the navigation equipment carried on board helicopters.*

2.11.3 ATS routes shall be identified by designators.

2.11.4 Designators for ATS routes other than standard departure and arrival routes shall be selected in accordance with the principles set forth in Appendix 1.

2.11.5 Standard departure and arrival routes and associated procedures shall be identified in accordance with the principles set forth in Appendix 3.

Note 1.— Guidance material relating to the establishment of ATS routes is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

Note 2.— Guidance material relating to the establishment of ATS routes defined by VOR is contained in Attachment A.

Note 3.— The spacing between parallel tracks or between parallel ATS route centre lines for which an RNP type is required will be dependent upon the relevant RNP type specified. Guidance material relating to the establishment of ATS routes for use by RNAV-equipped aircraft and to the spacing between routes based on RNP type is contained in Attachment B.

2.12 Establishment of change-over points

2.12.1 **Recommendation.—** *Change-over points should be established on ATS route segments defined by reference to very high frequency omnidirectional radio ranges where this will assist accurate navigation along the route segments. The establishment of change-over points should be limited to route segments of 110 km (60 NM) or more, except where the complexity of ATS routes, the density of navigation aids or other technical and operational reasons warrant the establishment of change-over points on shorter route segments.*

2.12.2 **Recommendation.—** *Unless otherwise established in relation to the performance of the navigation aids or frequency protection criteria, the change-over point on a route segment should be the mid-point between the facilities in the case of a straight route segment or the intersection of radials in the case of a route segment which changes direction between the facilities.*

Note.— Guidance on the establishment of change-over points is contained in Attachment A.

2.13 Establishment and identification of significant points

2.13.1 Significant points shall be established for the purpose of defining an ATS route and/or in relation to the requirements of air traffic services for information regarding the progress of aircraft in flight.

2.13.2 Significant points shall be identified by designators.

2.13.3 Significant points shall be established and identified in accordance with the principles set forth in Appendix 2.

2.14 Establishment and identification of standard routes for taxiing aircraft

2.14.1 **Recommendation.—** *Where necessary, standard routes for taxiing aircraft should be established on an aerodrome between runways, aprons and maintenance areas. Such routes should be direct, simple and where practicable, designed to avoid traffic conflicts.*

2.14.2 **Recommendation.—** *Standard routes for taxiing aircraft should be identified by designators distinctively different from those of the runways and ATS routes.*

2.15 Coordination between the operator and air traffic services

2.15.1 Air traffic services units, in carrying out their objectives, shall have due regard for the requirements of the operators consequent on their obligations as specified in Annex 6, and, if so required by the operators, shall make available to them or their designated representatives such information as may be available to enable them or their designated representatives to carry out their responsibilities.

2.15.2 When so requested by an operator, messages (including position reports) received by air traffic services units and relating to the operation of the aircraft for which operational control service is provided by that operator shall, so far as practicable, be made available immediately to the operator or a designated representative in accordance with locally agreed procedures.

2.16 Coordination between military authorities and air traffic services

2.16.1 Air traffic services authorities shall establish and maintain close cooperation with military authorities responsible for activities that may affect flights of civil aircraft.

2.16.2 Coordination of activities potentially hazardous to civil aircraft shall be effected in accordance with 2.17.

2.16.3 Arrangements shall be made to permit information relevant to the safe and expeditious conduct of flights of civil aircraft to be promptly exchanged between air traffic services units and appropriate military units.

2.16.3.1 Air traffic services units shall, either routinely or on request, in accordance with locally agreed procedures, provide appropriate military units with pertinent flight plan and other data concerning flights of civil aircraft. In order to eliminate or reduce the need for interceptions, air traffic services authorities shall designate any areas or routes where the requirements of Annex 2 concerning flight plans, two-way communications and position reporting apply to all flights to ensure that all pertinent data is available in appropriate air traffic services units specifically for the purpose of facilitating identification of civil aircraft.

2.16.3.2 Special procedures shall be established in order to ensure that:

a) air traffic services units are notified if a military unit observes that an aircraft which is, or might be, a civil aircraft is approaching, or has entered, any area in which interception might become necessary;

b) all possible efforts are made to confirm the identity of the aircraft and to provide it with the navigational guidance necessary to avoid the need for interception.

2.17 Coordination of activities potentially hazardous to civil aircraft

2.17.1 The arrangements for activities potentially hazardous to civil aircraft, whether over the territory of a State or over the high seas, shall be coordinated with the appropriate air traffic services authorities. The coordination shall be effected early enough to permit timely promulgation of information regarding the activities in accordance with the provisions of Annex 15.

2.17.1.1 **Recommendation.—** *If the appropriate ATS authority is not that of the State where the organization planning the activities is located, initial coordination should be effected through the ATS authority responsible for the airspace over the State where the organization is located.*

2.17.2 The objective of the coordination shall be to achieve the best arrangements which will avoid hazards to civil aircraft and minimize interference with the normal operations of such aircraft.

2.17.2.1 **Recommendation.—** *In determining these arrangements the following should be applied:*

a) the locations or areas, times and durations for the activities should be selected to avoid closure or realignment of established ATS routes, blocking of the most economic flight levels, or delays of scheduled aircraft operations, unless no other options exist;

b) the size of the airspace designated for the conduct of the activities should be kept as small as possible;

c) direct communication between the appropriate ATS authority or air traffic services unit and the organization or unit conducting the activities should be provided for use in the event that civil aircraft emergencies or other unforeseen circumstances require discontinuation of the activities.

2.17.3 The appropriate ATS authorities shall be responsible for initiating the promulgation of information regarding the activities.

2.17.4 **Recommendation.—** *If activities potentially hazardous to civil aircraft take place on a regular or continuing basis, special committees should be established as required to ensure that the requirements of all parties concerned are adequately coordinated.*

2.17.5 **Recommendation.—** *In order to provide added airspace capacity and to improve efficiency and flexibility of aircraft operations, States should establish procedures providing for a flexible use of airspace reserved for military or other special activities. The procedures should permit all airspace users to have safe access to such reserved airspace.*

2.18 Aeronautical data

2.18.1 Determination and reporting of air traffic services-related aeronautical data shall be in accordance with the accuracy and integrity requirements set forth in Tables 1 to 5 contained in Appendix 5 while taking into account the established quality system procedures. Accuracy requirements for aeronautical data are based upon a 95 per cent confidence level, and in that respect three types of positional data shall be identified: surveyed points (e.g. navigation aids positions), calculated points (mathematical calculations from the known surveyed points of points in space, fixes) and declared points (e.g. flight information region boundary points).

Note.— Specifications governing the quality system are given in Annex 15, Chapter 3.

2.18.2 Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classification and data integrity level shall apply:

a) critical data, integrity level 1×10^{-8}: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;

b) essential data, integrity level 1×10^{-5}: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and

c) routine data, integrity level 1×10^{-3}: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

2.18.3 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the cyclic redundancy check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 2.18.2, a 32- or 24-bit CRC algorithm shall apply respectively.

2.18.4 **Recommendation.—** *To achieve protection of the integrity level of routine aeronautical data as classified in 2.18.2, a 16-bit CRC algorithm should apply.*

Note.— Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674). Supporting material in respect of the provisions of Appendix 5 related to accuracy and integrity of aeronautical data is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77 —* Industry Requirements for Aeronautical Information.

2.18.5 Geographical coordinates indicating latitude and longitude shall be determined and reported to the aeronautical information services authority in terms of the World Geodetic System — 1984 (WGS-84) geodetic reference datum, identifying those geographical coordinates which have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the requirements in Appendix 5, Table 1.

2.18.6 The order of accuracy of the field work and determinations and calculations derived therefrom shall be such that the resulting operational navigation data for the phases of flight will be within the maximum deviations, with respect to an appropriate reference frame, as indicated in the tables contained in Appendix 5.

Note 1.— An appropriate reference frame is that which enables WGS-84 to be realized on a given position and with respect to which all coordinate data are related.

Note 2.— Specifications governing the publication of aeronautical data are given in Annex 4, Chapter 2 and Annex 15, Chapter 3.

Note 3.— For those fixes and points that are serving a dual purpose, e.g. holding point and missed approach point, the higher accuracy applies.

2.19 Coordination between meteorological and air traffic services authorities

2.19.1 To ensure that aircraft receive the most up-to-date meteorological information for aircraft operations, arrangements shall be made, where necessary, between meteorological and air traffic services authorities for air traffic services personnel:

a) in addition to using indicating instruments, to report, if observed by air traffic services personnel or communicated by aircraft, such other meteorological elements as may be agreed upon;

b) to report as soon as possible to the associated meteorological office meteorological phenomena of operational significance, if observed by air traffic services personnel or communicated by aircraft, which have not been included in the aerodrome meteorological report;

c) to report as soon as possible to the associated meteorological office pertinent information concerning pre-eruption volcanic activity, volcanic eruptions and information concerning volcanic ash cloud. In addition, area control centres and flight information centres shall report the information to the associated meteorological watch office and volcanic ash advisory centres (VAACs).

Note 1.— VAACs are designated by regional air navigation agreements in accordance with Annex 3, 3.6.1.

Note 2.— See 4.2.3 regarding transmission of special air-reports.

2.19.2 Close coordination shall be maintained between area control centres, flight information centres and associated meteorological watch offices to ensure that information on volcanic ash included in NOTAM and SIGMET messages is consistent.

2.20 Coordination between aeronautical information services and air traffic services authorities

2.20.1 To ensure that aeronautical information services units obtain information to enable them to provide up-to-date pre-flight information and to meet the need for in-flight information, arrangements shall be made between aeronautical information services and air traffic services authorities responsible for air traffic services to report to the responsible aeronautical information services unit, with a minimum of delay:

a) information on aerodrome conditions;

b) the operational status of associated facilities, services and navigation aids within their area of responsibility;

c) the occurrence of volcanic activity observed by air traffic services personnel or reported by aircraft; and

d) any other information considered to be of operational significance.

2.20.2 Before introducing changes to the air navigation system, due account shall be taken by the services responsible for such changes of the time needed by the aeronautical information service for the preparation, production and issuance of relevant material for promulgation. To ensure timely provision of the information to the aeronautical information service, close coordination between those services concerned is therefore required.

2.20.3 Of particular importance are changes to aeronautical information that affect charts and/or computer-based navigation systems which qualify to be notified by the Aeronautical Information Regulation and Control (AIRAC) system, as specified in Annex 15, Chapter 6 and Appendix 4. The predetermined, internationally agreed AIRAC effective dates in addition to 14 days postage time shall be observed by the responsible air traffic services when submitting the raw information/data to aeronautical information services.

2.20.4 The air traffic services responsible for the provision of raw aeronautical information/data to the aeronautical information services shall do so while taking into account accuracy and integrity requirements for aeronautical data as specified in Appendix 5 to this Annex.

Note 1.— Specifications for the issue of a NOTAM, SNOWTAM and ASHTAM are contained in Annex 15, Chapter 5.

Note 2.— Reports of volcanic activity comprise the information detailed in Annex 3, Chapter 4.

Note 3.— AIRAC information is distributed by the aeronautical information service at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.

Note 4.— The schedule of the predetermined, internationally agreed AIRAC common effective dates at intervals of 28 days, including 6 November 1997, and guidance for the AIRAC use are contained in the Aeronautical Information Services Manual *(Doc 8126, Chapter 3, 3.1 and Chapter 4, 4.4).*

2.21 Minimum flight altitudes

Minimum flight altitudes shall be determined and promulgated by each Contracting State for each ATS route and control area

over its territory. The minimum flight altitudes determined shall provide a minimum clearance above the controlling obstacle located within the areas concerned.

Note.— The requirements for publication by States of minimum flight altitudes and of the criteria used to determine them are contained in Annex 15, Appendix I. Detailed obstacle clearance criteria are contained in PANS-OPS (Doc 8168), Volume I, Part VI and Volume II, Part III and Part VI.

2.22 Service to aircraft in the event of an emergency

2.22.1 An aircraft known or believed to be in a state of emergency, including being subjected to unlawful interference, shall be given maximum consideration, assistance and priority over other aircraft as may be necessitated by the circumstances.

Note.— To indicate that it is in a state of emergency, an aircraft equipped with an appropriate data link capability and/or an SSR transponder might operate the equipment as follows:

a) on Mode A, Code 7700; or

b) on Mode A, Code 7500, to indicate specifically that it is being subjected to unlawful interference; or

c) activate the appropriate emergency and/or urgency capability of ADS; or

d) transmit the appropriate emergency message via CPDLC.

2.22.1.1 **Recommendation.—** *In communications between ATS units and aircraft in the event of an emergency, Human Factors principles should be observed.*

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

2.22.2 When an occurrence of unlawful interference with an aircraft takes place or is suspected, ATS units shall attend promptly to requests by the aircraft. Information pertinent to the safe conduct of the flight shall continue to be transmitted and necessary action shall be taken to expedite the conduct of all phases of the flight, especially the safe landing of the aircraft.

2.23 In-flight contingencies

2.23.1 Strayed or unidentified aircraft

Note 1.— The terms "strayed aircraft" and "unidentified aircraft" in this paragraph have the following meanings:

Strayed aircraft. *An aircraft which has deviated significantly from its intended track or which reports that it is lost.*

Unidentified aircraft. *An aircraft which has been observed or reported to be operating in a given area but whose identity has not been established.*

Note 2.— An aircraft may be considered, at the same time, as a "strayed aircraft" by one unit and as an "unidentified aircraft" by another unit.

2.23.1.1 As soon as an air traffic services unit becomes aware of a strayed aircraft it shall take all necessary steps as outlined in 2.23.1.1.1 and 2.23.1.1.2 to assist the aircraft and to safeguard its flight.

Note.— Navigational assistance by an air traffic services unit is particularly important if the unit becomes aware of an aircraft straying, or about to stray, into an area where there is a risk of interception or other hazard to its safety.

2.23.1.1.1 If the aircraft's position is not known, the air traffic services unit shall:

a) attempt to establish two-way communication with the aircraft, unless such communication already exists;

b) use all available means to determine its position;

c) inform other ATS units into whose area the aircraft may have strayed or may stray, taking into account all the factors which may have affected the navigation of the aircraft in the circumstances;

d) inform, in accordance with locally agreed procedures, appropriate military units and provide them with pertinent flight plan and other data concerning strayed aircraft;

e) request from the units referred to in c) and d) and from other aircraft in flight every assistance in establishing communication with the aircraft and determining its position.

Note.— The requirements in d) and e) apply also to ATS units informed in accordance with c).

2.23.1.1.2 When the aircraft's position is established, the air traffic services unit shall:

a) advise the aircraft of its position and corrective action to be taken; and

b) provide, as necessary, other ATS units and appropriate military units with relevant information concerning the strayed aircraft and any advice given to that aircraft.

2.23.1.2 As soon as an air traffic services unit becomes aware of an unidentified aircraft in its area, it shall endeavour

to establish the identity of the aircraft whenever this is necessary for the provision of air traffic services or required by the appropriate military authorities in accordance with locally agreed procedures. To this end, the air traffic services unit shall take such of the following steps as are appropriate in the circumstances:

a) attempt to establish two-way communication with the aircraft;

b) inquire of other air traffic services units within the flight information region about the flight and request their assistance in establishing two-way communication with the aircraft;

c) inquire of air traffic services units serving the adjacent flight information regions about the flight and request their assistance in establishing two-way communication with the aircraft;

d) attempt to obtain information from other aircraft in the area.

2.23.1.2.1 The air traffic services unit shall, as necessary, inform the appropriate military unit as soon as the identity of the aircraft has been established.

2.23.2 Interception of civil aircraft

2.23.2.1 As soon as an air traffic services unit learns that an aircraft is being intercepted in its area of responsibility, it shall take such of the following steps as are appropriate in the circumstances:

a) attempt to establish two-way communication with the intercepted aircraft via any means available, including the emergency radio frequency 121.5 MHz, unless such communication already exists;

b) inform the pilot of the intercepted aircraft of the interception;

c) establish contact with the intercept control unit maintaining two-way communication with the intercepting aircraft and provide it with available information concerning the aircraft;

d) relay messages between the intercepting aircraft or the intercept control unit and the intercepted aircraft, as necessary;

e) in close coordination with the intercept control unit take all necessary steps to ensure the safety of the intercepted aircraft;

f) inform ATS units serving adjacent flight information regions if it appears that the aircraft has strayed from such adjacent flight information regions.

2.23.2.2 As soon as an air traffic services unit learns that an aircraft is being intercepted outside its area of responsibility, it shall take such of the following steps as are appropriate in the circumstances:

a) inform the ATS unit serving the airspace in which the interception is taking place, providing this unit with available information that will assist in identifying the aircraft and requesting it to take action in accordance with 2.23.2.1;

b) relay messages between the intercepted aircraft and the appropriate ATS unit, the intercept control unit or the intercepting aircraft.

2.24 Time in air traffic services

2.24.1 Air traffic services units shall use Coordinated Universal Time (UTC) and shall express the time in hours and minutes and, when required, seconds of the 24-hour day beginning at midnight.

2.24.2 Air traffic services units shall be equipped with clocks indicating the time in hours, minutes and seconds, clearly visible from each operating position in the unit concerned.

2.24.3 Air traffic services unit clocks and other time-recording devices shall be checked as necessary to ensure correct time to within plus or minus 30 seconds of UTC. Wherever data link communications are utilized by an air traffic services unit, clocks and other time-recording devices shall be checked as necessary to ensure correct time to within 1 second of UTC.

2.24.4 The correct time shall be obtained from a standard time station or, if not possible, from another unit which has obtained the correct time from such station.

2.24.5 Aerodrome control towers shall, prior to an aircraft taxiing for take-off, provide the pilot with the correct time, unless arrangements have been made for the pilot to obtain it from other sources. Air traffic services units shall, in addition, provide aircraft with the correct time on request. Time checks shall be given to the nearest half minute.

2.25 Establishment of requirements for carriage and operation of pressure-altitude reporting transponders

States shall establish requirements for carriage and operation of pressure-altitude reporting transponders within defined portions of airspace.

Note.— This provision is intended to improve the effectiveness of air traffic services as well as airborne collision avoidance systems.

2.26 ATS safety management

2.26.1 States shall implement systematic and appropriate ATS safety management programmes to ensure that safety is maintained in the provision of ATS within airspaces and at aerodromes.

2.26.2 As of 27 November 2003, the acceptable level of safety and safety objectives applicable to the provision of ATS within airspaces and at aerodromes shall be established by the State or States concerned. When applicable, safety levels and safety objectives shall be established on the basis of regional air navigation agreements.

Note.— The acceptable level of safety may be specified in qualitative or quantitative terms. The following are examples of measures which could be used to express the acceptable level of safety:

a) a maximum probability of an undesirable event, such as collision, loss of separation or runway incursion;

b) a maximum number of accidents per flight hour;

c) a maximum number of incidents per aircraft movement;

d) a maximum number of valid short-term conflict alerts (STCA) per aircraft movement.

2.26.3 **Recommendation.—** *The acceptable level of safety and safety objectives applicable to the provision of ATS within airspaces and at aerodromes should be established by the State or States concerned. When applicable, safety levels and safety objectives should be established on the basis of regional air navigation agreements.*

2.26.4 An ATS safety management programme shall, *inter alia*:

a) identify actual and potential hazards and determine the need for remedial action;

b) ensure that remedial action necessary to maintain an acceptable level of safety is implemented; and

c) provide for continuous monitoring and regular assessment of the safety level achieved.

2.26.5 Any significant safety-related change to the ATC system, including the implementation of a reduced separation minimum or a new procedure, shall only be effected after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted. When appropriate, the responsible authority shall ensure that adequate provision is made for post-implementation monitoring to verify that the defined level of safety continues to be met.

Note 1.— When, due to the nature of the change, the acceptable level of safety cannot be expressed in quantitative terms, the safety assessment may rely on operational judgement.

Note 2.— Attention is drawn to guidance material contained in the Air Traffic Services Planning Manual *(Doc 9426), the* Manual on Airspace Planning Methodology for the Determination of Separation Minima *(Doc 9689), the* Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum between FL 290 and FL 410 Inclusive (*Doc 9574*) *and the* Manual on Required Navigation Performance *(Doc 9613).*

CHAPTER 3. AIR TRAFFIC CONTROL SERVICE

3.1 Application

Air traffic control service shall be provided:

a) to all IFR flights in airspace Classes A, B, C, D and E;

b) to all VFR flights in airspace Classes B, C and D;

c) to all special VFR flights;

d) to all aerodrome traffic at controlled aerodromes.

3.2 Provision of air traffic control service

The parts of air traffic control service described in 2.3.1 shall be provided by the various units as follows:

a) *Area control service:*

1) by an area control centre; or

2) by the unit providing approach control service in a control zone or in a control area of limited extent which is designated primarily for the provision of approach control service and where no area control centre is established.

b) *Approach control service:*

1) by an aerodrome control tower or area control centre when it is necessary or desirable to combine under the responsibility of one unit the functions of the approach control service with those of the aerodrome control service or the area control service;

2) by an approach control unit when it is necessary or desirable to establish a separate unit.

c) *Aerodrome control service:* by an aerodrome control tower.

Note.— The task of providing specified services on the apron, e.g. apron management service, may be assigned to an aerodrome control tower or to a separate unit.

3.3 Operation of air traffic control service

3.3.1 In order to provide air traffic control service, an air traffic control unit shall:

a) be provided with information on the intended movement of each aircraft, or variations therefrom, and with current information on the actual progress of each aircraft;

b) determine from the information received, the relative positions of known aircraft to each other;

c) issue clearances and information for the purpose of preventing collision between aircraft under its control and of expediting and maintaining an orderly flow of traffic;

d) coordinate clearances as necessary with other units:

1) whenever an aircraft might otherwise conflict with traffic operated under the control of such other units;

2) before transferring control of an aircraft to such other units.

3.3.2 Information on aircraft movements, together with a record of air traffic control clearances issued to such aircraft, shall be so displayed as to permit ready analysis in order to maintain an efficient flow of air traffic with adequate separation between aircraft.

3.3.3 Clearances issued by air traffic control units shall provide separation:

a) between all flights in airspace Classes A and B;

b) between IFR flights in airspace Classes C, D and E;

c) between IFR flights and VFR flights in airspace Class C;

d) between IFR flights and special VFR flights;

e) between special VFR flights when so prescribed by the appropriate ATS authority,

except that, when requested by an aircraft and if so prescribed by the appropriate ATS authority for the cases listed under b) above in airspace Classes D and E, a flight may be cleared without separation being so provided in respect of a specific portion of the flight conducted in visual meteorological conditions.

3.3.4 Separation by an air traffic control unit shall be obtained by at least one of the following:

a) vertical separation, obtained by assigning different levels selected from:

1) the tables of cruising levels in Appendix 3 of Annex 2, or

2) a modified table of cruising levels, when so prescribed in accordance with Appendix 3 of Annex 2 for flight above FL 410,

except that the correlation of levels to track as prescribed therein shall not apply whenever otherwise indicated in appropriate aeronautical information publications or air traffic control clearances;

Note.— Guidance material relating to vertical separation is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive *(Doc 9574).*

b) horizontal separation, obtained by providing:

1) longitudinal separation, by maintaining an interval between aircraft operating along the same, converging or reciprocal tracks, expressed in time or distance; or

2) lateral separation, by maintaining aircraft on different routes or in different geographical areas;

c) composite separation, consisting of a combination of vertical separation and one of the other forms of separation contained in b) above, using minima for each which may be lower than, but not less than half of, those used for each of the combined elements when applied individually. Composite separation shall only be applied on the basis of regional air navigation agreements.

Note.— Guidance material relating to the implementation of composite lateral/vertical separation is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

3.4 Separation minima

3.4.1 The selection of separation minima for application within a given portion of airspace shall be as follows:

a) the separation minima shall be selected from those prescribed by the provisions of the PANS-ATM and the *Regional Supplementary Procedures* as applicable under the prevailing circumstances except that, where types of aids are used or circumstances prevail which are not covered by current ICAO provisions, other separation minima shall be established as necessary by:

1) the appropriate ATS authority, following consultation with operators, for routes or portions of routes contained within the sovereign airspace of a State;

2) regional air navigation agreements for routes or portions of routes contained within airspace over the high seas or over areas of undetermined sovereignty.

Note.— Details of current separation minima prescribed by ICAO are contained in the PANS-ATM (Doc 4444) and Part 1 of the Regional Supplementary Procedures *(Doc 7030).*

b) the selection of separation minima shall be made in consultation between the appropriate ATS authorities responsible for the provision of air traffic services in neighbouring airspace when:

1) traffic will pass from one into the other of the neighbouring airspaces;

2) routes are closer to the common boundary of the neighbouring airspaces than the separation minima applicable in the circumstances.

Note.— The purpose of this provision is to ensure, in the first case, compatibility on both sides of the line of transfer of traffic, and, in the other case, adequate separation between aircraft operating on both sides of the common boundary.

3.4.2 Details of the selected separation minima and of their areas of application shall be notified:

a) to the ATS units concerned; and

b) to pilots and operators through aeronautical information publications, where separation is based on the use by aircraft of specified navigation aids or specified navigation techniques.

3.5 Responsibility for control

3.5.1 Responsibility for control of individual flights

A controlled flight shall be under the control of only one air traffic control unit at any given time.

3.5.2 Responsibility for control within a given block of airspace

Responsibility for the control of all aircraft operating within a given block of airspace shall be vested in a single air traffic control unit. However, control of an aircraft or groups of aircraft may be delegated to other air traffic control units provided that coordination between all air traffic control units concerned is assured.

3.6 Transfer of responsibility for control

3.6.1 Place or time of transfer

The responsibility for the control of an aircraft shall be transferred from one air traffic control unit to another as follows:

3.6.1.1 *Between two units providing area control service.* The responsibility for the control of an aircraft shall be transferred from a unit providing area control service in a control area to the unit providing area control service in an adjacent control area at the time of crossing the common control area boundary as estimated by the area control centre having control of the aircraft or at such other point or time as has been agreed between the two units.

3.6.1.2 *Between a unit providing area control service and a unit providing approach control service.* The responsibility for the control of an aircraft shall be transferred from a unit providing area control service to a unit providing approach control service, and vice versa, at a point or time agreed between the two units.

3.6.1.3 *Between a unit providing approach control service and an aerodrome control tower*

3.6.1.3.1 *Arriving aircraft.* The responsibility for the control of an arriving aircraft shall be transferred from the unit providing approach control service to the aerodrome control tower, when the aircraft:

a) is in the vicinity of the aerodrome, and:

1) it is considered that approach and landing will be completed in visual reference to the ground, or

2) it has reached uninterrupted visual meteorological conditions, or

b) is at a prescribed point or level, as specified in letters of agreement or ATS unit instructions; or

c) has landed.

Note.— Even though there is an approach control unit, control of certain flights may be transferred directly from an area control centre to an aerodrome control tower and vice versa, by prior arrangement between the units concerned for the relevant part of approach control service to be provided by the area control centre or the aerodrome control tower, as applicable.

3.6.1.3.2 *Departing aircraft.* The responsibility for control of a departing aircraft shall be transferred from the aerodrome control tower to the unit providing approach control service:

a) *when visual meteorological conditions prevail in the vicinity of the aerodrome:*

1) prior to the time the aircraft leaves the vicinity of the aerodrome, or

2) prior to the aircraft entering instrument meteorological conditions, or

3) at a prescribed point or level,

as specified in letters of agreement or ATS unit instructions;

b) *when instrument meteorological conditions prevail at the aerodrome:*

1) immediately after the aircraft is airborne, or

2) at a prescribed point or level,

as specified in letters of agreement or ATS unit instructions.

Note.— See Note following 3.6.1.3.1.

3.6.1.4 *Between control sectors/positions within the same air traffic control unit*

The responsibility for control of an aircraft shall be transferred from one control sector/position to another control sector/position within the same air traffic control unit at a point, level or time, as specified in ATS unit instructions.

3.6.2 Coordination of transfer

3.6.2.1 Responsibility for control of an aircraft shall not be transferred from one air traffic control unit to another without the consent of the accepting control unit, which shall be obtained in accordance with 3.6.2.2, 3.6.2.2.1, 3.6.2.2.2 and 3.6.2.3.

3.6.2.2 The transferring control unit shall communicate to the accepting control unit the appropriate parts of the current flight plan and any control information pertinent to the transfer requested.

3.6.2.2.1 Where transfer of control is to be effected using radar data, the control information pertinent to the transfer shall include information regarding the position and, if required, the track and speed of the aircraft, as observed by radar immediately prior to the transfer.

3.6.2.2.2 Where transfer of control is to be effected using ADS data, the control information pertinent to the transfer shall include the four-dimensional position and other information as necessary.

3.6.2.3 The accepting control unit shall:

a) indicate its ability to accept control of the aircraft on the terms specified by the transferring control unit, unless by prior agreement between the two units concerned, the absence of any such indication is understood to signify acceptance of the terms specified, or indicate any necessary changes thereto; and

b) specify any other information or clearance for a subsequent portion of the flight, which it requires the aircraft to have at the time of transfer.

3.6.2.4 The accepting control unit shall notify the transferring control unit when it has established two-way voice and/or data link communications with and assumed control of the aircraft concerned, unless otherwise specified by agreement between the two control units concerned.

3.6.2.5 Applicable coordination procedures, including transfer of control points, shall be specified in letters of agreement and ATS unit instructions as appropriate.

3.7 Air traffic control clearances

Air traffic control clearances shall be based solely on the requirements for providing air traffic control service.

3.7.1 Contents of clearances

3.7.1.1 An air traffic control clearance shall indicate:

a) aircraft identification as shown in the flight plan;

b) clearance limit;

c) route of flight;

d) level(s) of flight for the entire route or part thereof and changes of levels if required;

Note.— If the clearance for the levels covers only part of the route, it is important for the air traffic control unit to specify a point to which the part of the clearance regarding levels applies whenever necessary to ensure compliance with 3.6.5.2.2 a) of Annex 2.

e) any necessary instructions or information on other matters such as approach or departure manoeuvres, communications and the time of expiry of the clearance.

Note.— The time of expiry of the clearance indicates the time after which the clearance will be automatically cancelled if the flight has not been commenced.

3.7.1.2 **Recommendation.—** *Standard departure and arrival routes and associated procedures should be established when necessary to facilitate:*

a) the safe, orderly and expeditious flow of air traffic;

b) the description of the route and procedure in air traffic control clearances.

Note.— Material relating to the establishment of standard departure and arrival routes and associated procedures is contained in the Air Traffic Services Planning Manual *(Doc 9426). The design criteria are contained in PANS-OPS, Volume II (Doc 8168).*

3.7.2 Clearances for transonic flight

3.7.2.1 The air traffic control clearance relating to the transonic acceleration phase of a supersonic flight shall extend at least to the end of that phase.

3.7.2.2 **Recommendation.—** *The air traffic control clearance relating to the deceleration and descent of an aircraft from supersonic cruise to subsonic flight should provide for uninterrupted descent, at least during the transonic phase.*

3.7.3 Read-back of clearances and safety-related information

3.7.3.1 The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall always be read back:

a) ATC route clearances;

b) clearances and instructions to enter, land on, take off on, hold short of, cross and backtrack on any runway; and

c) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained inATIS broadcasts, transition levels.

3.7.3.1.1 Other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.

3.7.3.1.2 The controller shall listen to the read-back to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the read-back.

3.7.3.2 Unless specified by the appropriate ATS authority, voice read-back of CPDLC messages shall not be required.

Note.— The procedures and provisions relating to the exchange and acknowledgement of CPDLC messages are contained in Annex 10, Volume II and PANS-ATM, Chapter 14.

3.7.4 Coordination of clearances

An air traffic control clearance shall be coordinated between air traffic control units to cover the entire route of an aircraft or a specified portion thereof as follows.

3.7.4.1 An aircraft shall be cleared for the entire route to the aerodrome of first intended landing:

a) when it has been possible, prior to departure, to coordinate the clearance between all the units under whose control the aircraft will come; or

b) when there is reasonable assurance that prior coordination will be effected between those units under whose control the aircraft will subsequently come.

Note.— Where a clearance is issued covering the initial part of the flight solely as a means of expediting departing traffic, the succeeding en-route clearance will be as specified above even though the aerodrome of first intended landing is under the jurisdiction of an area control centre other than the one issuing the en-route clearance.

3.7.4.2 When coordination as in 3.7.4.1 has not been achieved or is not anticipated, the aircraft shall be cleared only to that point where coordination is reasonably assured; prior to reaching such point, or at such point, the aircraft shall receive further clearance, holding instructions being issued as appropriate.

3.7.4.2.1 When prescribed by the appropriate ATS authority, aircraft shall contact a downstream air traffic control unit, for the purpose of receiving a downstream clearance prior to the transfer of control point.

3.7.4.2.1.1 Aircraft shall maintain the necessary two-way communication with the current air traffic control unit whilst obtaining a downstream clearance.

3.7.4.2.1.2 A clearance issued as a downstream clearance shall be clearly identifiable as such to the pilot.

3.7.4.2.1.3 Unless coordinated, downstream clearances shall not affect the aircraft's original flight profile in any airspace, other than that of the air traffic control unit responsible for the delivery of the downstream clearance.

Note.— Requirements relating to the application of downstream clearance delivery service are specified in Annex 10, Volume II. Guidance material is contained in the Manual of Air Traffic Services Data Link Applications *(Doc 9694).*

3.7.4.2.1.4 **Recommendation.—** *Where practicable, and where data link communications are used to facilitate downstream clearance delivery, two-way voice communications between the pilot and the air traffic control unit providing the downstream clearance should be available.*

3.7.4.3 When an aircraft intends to depart from an aerodrome within a control area to enter another control area within a period of thirty minutes, or such other specific period of time as has been agreed between the area control centres concerned, coordination with the subsequent area control centre shall be effected prior to issuance of the departure clearance.

3.7.4.4 When an aircraft intends to leave a control area for flight outside controlled airspace, and will subsequently re-enter the same or another control area, a clearance from point of departure to the aerodrome of first intended landing may be issued. Such clearance or revisions thereto shall apply only to those portions of the flight conducted within controlled airspace.

3.7.5 Air traffic flow management

3.7.5.1 Air traffic flow management (ATFM) shall be implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.

Note.— The capacity of the air traffic control services concerned will normally be declared by the appropriate ATS authority.

3.7.5.2 **Recommendation**.— *ATFM should be implemented on the basis of regional air navigation agreements or, if appropriate, through multilateral agreements. Such agreements should make provision for common procedures and common methods of capacity determination.*

3.7.5.3 When it becomes apparent to an ATC unit that traffic additional to that already accepted cannot be accommodated within a given period of time at a particular location or in a particular area, or can only be accommodated at a given rate, that unit shall so advise the ATFM unit, when such is established, as well as, when appropriate, ATS units concerned. Flight crews of aircraft destined to the location or area in question and operators concerned shall also be advised of the delays expected or the restrictions that will be applied.

Note.— Operators concerned will normally be advised, in advance where possible, of restrictions imposed by the air traffic flow management unit when such is established.

3.8 Control of persons and vehicles at aerodromes

3.8.1 The movement of persons or vehicles including towed aircraft on the manoeuvring area of an aerodrome shall be controlled by the aerodrome control tower as necessary to avoid hazard to them or to aircraft landing, taxiing or taking off.

3.8.2 In conditions where low visibility procedures are in operation:

a) persons and vehicles operating on the manoeuvring area of an aerodrome shall be restricted to the essential minimum, and particular regard shall be given to the requirements to protect the ILS/MLS sensitive area(s) when Category II or Category III precision instrument operations are in progress;

b) subject to the provisions in 3.8.3, the minimum separation between vehicles and taxiing aircraft shall be as prescribed by the appropriate ATS authority taking into account the aids available;

c) when mixed ILS and MLS Category II or Category III precision instrument operations are taking place to the same runway continuously, the more restrictive ILS or MLS critical and sensitive areas shall be protected.

Note.— The period of application of low visibility procedures is determined in accordance with ATS unit instructions. Guidance on low visibility operations on an aerodrome is contained in the Manual of Surface Movement Guidance and Control Systems (SMGCS) *(Doc 9476).*

3.8.3 Emergency vehicles proceeding to the assistance of an aircraft in distress shall be afforded priority over all other surface movement traffic.

3.8.4 Subject to the provisions in 3.8.3, vehicles on the manoeuvring area shall be required to comply with the following rules:

a) vehicles and vehicles towing aircraft shall give way to aircraft which are landing, taking off or taxiing;

b) vehicles shall give way to other vehicles towing aircraft;

c) vehicles shall give way to other vehicles in accordance with ATS unit instructions;

d) notwithstanding the provisions of a), b) and c), vehicles and vehicles towing aircraft shall comply with instructions issued by the aerodrome control tower.

3.9 Provision of radar

Recommendation.— *Radar systems should provide for the display of safety-related alerts and warnings, including conflict alert, conflict prediction, minimum safe altitude warning and unintentionally duplicated SSR codes.*

3.10 Use of surface movement radar (SMR)

Note.— Surface movement radar (SMR) has proven to be useful in assisting with the monitoring of aircraft and vehicles on the manoeuvring area. See Annex 14, Volume I, Chapter 8 for the requirements concerning the provision of SMR and the Air Traffic Services Planning Manual *(Doc 9426) for guidance on the use of SMR.*

CHAPTER 4. FLIGHT INFORMATION SERVICE

4.1 Application

4.1.1 Flight information service shall be provided to all aircraft which are likely to be affected by the information and which are:

a) provided with air traffic control service; or

b) otherwise known to the relevant air traffic services units.

Note.— Flight information service does not relieve the pilot-in-command of an aircraft of any responsibilities and the pilot-in-command has to make the final decision regarding any suggested alteration of flight plan.

4.1.2 Where air traffic services units provide both flight information service and air traffic control service, the provision of air traffic control service shall have precedence over the provision of flight information service whenever the provision of air traffic control service so requires.

Note.— It is recognized that in certain circumstances aircraft on final approach, landing, take-off and climb may require to receive without delay essential information other than that pertaining to the provision of air traffic control service.

4.2 Scope of flight information service

4.2.1 Flight information service shall include the provision of pertinent:

a) SIGMET and AIRMET information;

b) information concerning pre-eruption volcanic activity, volcanic eruptions and volcanic ash clouds;

c) information concerning the release into the atmosphere of radioactive materials or toxic chemicals;

d) information on changes in the serviceability of navigation aids;

e) information on changes in condition of aerodromes and associated facilities, including information on the state of the aerodrome movement areas when they are affected by snow, ice or significant depth of water;

f) information on unmanned free balloons;

and of any other information likely to affect safety.

4.2.2 Flight information service provided to flights shall include, in addition to that outlined in 4.2.1, the provision of information concerning:

a) weather conditions reported or forecast at departure, destination and alternate aerodromes;

b) collision hazards, to aircraft operating in airspace Classes C, D, E, F and G;

c) for flight over water areas, in so far as practicable and when requested by a pilot, any available information such as radio call sign, position, true track, speed, etc., of surface vessels in the area.

Note 1.— The information in b), including only known aircraft the presence of which might constitute a collision hazard to the aircraft informed, will sometimes be incomplete and air traffic services cannot assume responsibility for its issuance at all times or for its accuracy.

Note 2.— When there is a need to supplement collision hazard information provided in compliance with b), or in case of temporary disruption of flight information service, traffic information broadcasts by aircraft may be applied in designated airspaces. Guidance on traffic information broadcasts by aircraft and related operating procedures is contained in Attachment C.

4.2.3 **Recommendation.—** *ATS units should transmit, as soon as practicable, special air-reports to other aircraft concerned, to the associated meteorological office, and to other ATS units concerned. Transmissions to aircraft should be continued for a period to be determined by agreement between the meteorological and air traffic services authorities concerned.*

4.2.4 Flight information service provided to VFR flights shall include, in addition to that outlined in 4.2.1, the provision of available information concerning traffic and weather conditions along the route of flight that are likely to make operation under the visual flight rules impracticable.

4.3 Operational flight information service broadcasts

4.3.1 Application

4.3.1.1 The meteorological information and operational information concerning navigation aids and aerodromes

included in the flight information service shall, whenever available, be provided in an operationally integrated form.

4.3.1.2 **Recommendation.—** *Where integrated operational flight information messages are to be transmitted to aircraft, they should be transmitted with the content and, where specified, in the sequence indicated, for the various phases of flight.*

4.3.1.3 **Recommendation.—** *Operational flight information service broadcasts, when provided, should consist of messages containing integrated information regarding selected operational and meteorological elements appropriate to the various phases of flight. These broadcasts should be of three major types, i.e. HF, VHF and ATIS.*

4.3.2 HF operational flight information service (OFIS) broadcasts

4.3.2.1 **Recommendation.—** *HF operational flight information service (OFIS) broadcasts should be provided when it has been determined by regional air navigation agreements that a requirement exists.*

4.3.2.2 **Recommendation.—** *Whenever such broadcasts are provided:*

a) the information should be in accordance with 4.3.2.5, as applicable, subject to regional air navigation agreements;

b) the aerodromes for which reports and forecasts are to be included should be as determined by regional air navigation agreements;

c) the time-sequencing of stations participating in the broadcast should be as determined by regional air navigation agreements;

d) the HF OFIS broadcast message should take into consideration human performance. The broadcast message should not exceed the length of time allocated for it by regional air navigation agreements, care being taken that the readability is not impaired by the speed of the transmission;

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

e) each aerodrome message should be identified by the name of the aerodrome to which the information applies;

f) when information has not been received in time for a broadcast, the latest available information should be included together with the time of that observation;

g) the full broadcast message should be repeated if this is feasible within the remainder of the time allotted to the broadcasting station;

h) the broadcast information should be updated immediately a significant change occurs; and

i) the HF OFIS message should be prepared and disseminated by the most appropriate unit(s) as designated by each State.

4.3.2.3 **Recommendation.—** *Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications, HF OFIS broadcasts concerning aerodromes designated for use by international air services should be available in the English language.*

4.3.2.4 **Recommendation.—** *Where HF OFIS broadcasts are available in more than one language, a discrete channel should be used for each language.*

4.3.2.5 **Recommendation.—** *HF operational flight information service broadcast messages should contain the following information in the sequence indicated or as determined by regional air navigation agreements:*

a) En-route weather information

Information on significant en-route weather phenomena should be in the form of available SIGMET as prescribed in Annex 3.

b) Aerodrome information including:

1) name of aerodrome;

2) time of observation;

3) essential operational information;

4) surface wind direction and speed; if appropriate, maximum wind speed;

**5) visibility and, when applicable, runway visual range (RVR);*

**6) present weather;*

**7) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available; and*

8) aerodrome forecast.

* These elements are replaced by the term "CAVOK", whenever the conditions as specified in the PANS-ATM (Doc 4444), Chapte r11 prevail.

4.3.3 VHF operational flight information service (OFIS) broadcasts

4.3.3.1 **Recommendation.—** *VHF operational flight information service broadcasts should be provided as determined by regional air navigation agreements.*

4.3.3.2 **Recommendation.—** *Whenever such broadcasts are provided:*

a) the aerodromes for which reports and forecasts are to be included should be as determined by regional air navigation agreements;

b) each aerodrome message should be identified by the name of the aerodrome to which the information applies;

c) when information has not been received in time for a broadcast, the latest available information should be included together with the time of that observation;

d) the broadcasts should be continuous and repetitive;

e) The VHF OFIS broadcast message should take into consideration human performance. The broadcast message should, whenever practicable, not exceed five minutes, care being taken that the readability is not impaired by the speed of the transmission;

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

f) the broadcast message should be updated on a scheduled basis as determined by regional air navigation agreements. In addition it should be expeditiously updated immediately a significant change occurs; and

g) the VHF OFIS message should be prepared and disseminated by the most appropriate unit(s) as designated by each State.

4.3.3.3 **Recommendation.—** *Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications, VHF OFIS broadcasts concerning aerodromes designated for use by international air services should be available in the English language.*

4.3.3.4 **Recommendation.—** *Where VHF OFIS broadcasts are available in more than one language, a discrete channel should be used for each language.*

4.3.3.5 **Recommendation.—** *VHF operational flight information service broadcast messages should contain the following information in the sequence indicated:*

a) name of aerodrome;

b) time of observation;

c) landing runway;

d) significant runway surface conditions and, if appropriate, braking action;

e) changes in the operational state of the navigation aids, if appropriate;

f) holding delay, if appropriate;

g) surface wind direction and speed; if appropriate, maximum wind speed;

**h) visibility and, when applicable, runway visual range (RVR);*

**i) present weather;*

**j) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility, when available;*

†k) air temperature;

†l) dew point temperature;

†m) QNH altimeter setting;

n) supplementary information on recent weather of operational significance and, where necessary, wind shear;

o) trend forecast, when available; and

p) notice of current SIGMET messages.

4.3.4 Voice-automatic terminal information service (Voice-ATIS) broadcasts

4.3.4.1 Voice-automatic terminal information service (Voice-ATIS) broadcasts shall be provided at aerodromes where there is a requirement to reduce the communication load on the ATS VHF air-ground communication channels. When provided, they shall comprise:

* These elements are replaced by the term "CAVOK", whenever the conditions as specified in the PANS-ATM (Doc 4444), Chapte r11 prevail.

† As determined on the basis of regional air navigation agreements.

a) one broadcast serving arriving aircraft; or

b) one broadcast serving departing aircraft; or

c) one broadcast serving both arriving and departing aircraft; or

d) two broadcasts serving arriving and departing aircraft respectively at those aerodromes where the length of a broadcast serving both arriving and departing aircraft would be excessively long.

4.3.4.2 A discrete VHF frequency shall, whenever practicable, be used for Voice-ATIS broadcasts. If a discrete frequency is not available, the transmission may be made on the voice channel(s) of the most appropriate terminal navigation aid(s), preferably a VOR, provided the range and readability are adequate and the identification of the navigation aid is sequenced with the broadcast so that the latter is not obliterated.

4.3.4.3 Voice-ATIS broadcasts shall not be transmitted on the voice channel of an ILS.

4.3.4.4 Whenever Voice-ATIS is provided, the broadcast shall be continuous and repetitive.

4.3.4.5 The information contained in the current broadcast shall immediately be made known to the ATS unit(s) concerned with the provision to aircraft of information relating to approach, landing and take-off, whenever the message has not been prepared by that (those) unit(s).

Note.— The requirements for the provision of ATIS that applies to both Voice-ATIS and D-ATIS are contained in 4.3.6 below.

4.3.4.6 **Recommendation.—** *Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications, Voice-ATIS broadcasts provided at aerodromes designated for use by international air services should be available in the English language.*

4.3.4.7 **Recommendation.—** *Where Voice-ATIS broadcasts are available in more than one language, a discrete channel should be used for each language.*

4.3.4.8 **Recommendation.—** *The Voice-ATIS broadcast message should, whenever practicable, not exceed 30 seconds, care being taken that the readability of the ATIS message is not impaired by the speed of the transmission or by the identification signal of a navigation aid used for transmission of ATIS. The ATIS broadcast message should take into consideration human performance.*

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

4.3.5 Data link-automatic terminal information service (D-ATIS)

4.3.5.1 Where a D-ATIS supplements the existing availability of Voice-ATIS, the information shall be identical in both content and format to the applicable Voice-ATIS broadcast.

4.3.5.1.1 Where real-time meteorological information is included but the data remains within the parameters of the significant change criteria, the content, for the purpose of maintaining the same designator, shall be considered identical.

Note.— Significant change criteria are specified in Annex 3, 4.3.4.

4.3.5.2 Where a D-ATIS supplements the existing availability of Voice-ATIS and the ATIS requires updating, Voice-ATIS and D-ATIS shall be updated simultaneously.

Note.— Guidance material relating to D-ATIS is contained in the Manual of Air Traffic Services Data Link Applications *(Doc 9694). The technical requirements for the D-ATIS application are contained in Annex 10, Volume III, Part I, Chapter 3.*

4.3.6 Automatic terminal information service (voice and/or data link)

4.3.6.1 Whenever Voice-ATIS and/or D-ATIS is provided:

a) the information communicated shall relate to a single aerodrome;

b) the information communicated shall be updated immediately a significant change occurs;

c) the preparation and dissemination of the ATIS message shall be the responsibility of the air traffic services;

d) individual ATIS messages shall be identified by a designator in the form of a letter of the ICAO spelling alphabet. Designators assigned to consecutive ATIS messages shall be in alphabetical order;

e) aircraft shall acknowledge receipt of the information upon establishing communication with the ATS unit providing approach control service or the aerodrome control tower, as appropriate;

f) the appropriate ATS unit shall, when replying to the message in e) above or, in the case of arriving aircraft, at such other time as may be prescribed by the appropriate ATS authority, provide the aircraft with the current altimeter setting; and

g) the meteorological information shall be extracted from the local meteorological routine or special report.

Note.— In accordance with Annex 3, Sections 4.5 and 4.7, the surface wind direction and speed and runway visual range (RVR) are to be averaged over 2 minutes and 1 minute, respectively; and the wind information is to refer to conditions along the runway for departing aircraft and to conditions at the touchdown zone for arriving aircraft. A template for the local meteorological report, including the corresponding ranges and resolutions of each element, are in Appendix 2 to Annex 3. Additional criteria for the local meteorological report are contained in Chapter 4 of, and in Attachment C to, Annex 3.

4.3.6.2 When rapidly changing meteorological conditions make it inadvisable to include a weather report in the ATIS, the ATIS messages shall indicate that the relevant weather information will be given on initial contact with the appropriate ATS unit.

4.3.6.3 Information contained in a current ATIS, the receipt of which has been acknowledged by the aircraft concerned, need not be included in a directed transmission to the aircraft, with the exception of the altimeter setting, which shall be provided in accordance with 4.3.6.1 f).

4.3.6.4 If an aircraft acknowledges receipt of an ATIS that is no longer current, any element of information that needs updating shall be transmitted to the aircraft without delay.

4.3.6.5 **Recommendation.—** *Contents of ATIS should be kept as brief as possible. Information additional to that specified in 4.3.7 to 4.3.9, for example information already available in aeronautical information publications (AIPs) and NOTAM, should only be included when justified in exceptional circumstances.*

4.3.7 ATIS for arriving and departing aircraft

ATIS messages containing both arrival and departure information shall contain the following elements of information in the order listed:

a) name of aerodrome;

b) arrival and/or departure indicator;

c) contract type, if communication is via D-ATIS;

d) designator;

e) time of observation, if appropriate;

f) type of approach(es) to be expected;

g) the runway(s) in use; status of arresting system constituting a potential hazard, if any;

h) significant runway surface conditions and, if appropriate, braking action;

i) holding delay, if appropriate;

j) transition level, if applicable;

k) other essential operational information;

l) surface wind direction and speed, including significant variations and, if surface wind sensors related specifically to the sections of runway(s) in use are available and the information is required by operators, the indication of the runway and the section of the runway to which the information refers;

*m) visibility and, when applicable, RVR;

*n) present weather;

*o) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available;

p) air temperature;

†q) dew point temperature;

r) altimeter setting(s);

s) any available information on significant meteorological phenomena in the approach and climb-out areas including wind shear, and information on recent weather of operational significance;

t) trend forecast, when available; and

u) specific ATIS instructions.

4.3.8 ATIS for arriving aircraft

ATIS messages containing arrival information only shall contain the following elements of information in the order listed:

a) name of aerodrome;

b) arrival indicator;

c) contract type, if communication is via D-ATIS;

d) designator;

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* These elements are replaced by the term "CAVOK", whenever the conditions as specified in the PANS-ATM (Doc 4444), Chapter 11 prevail.

† As determined on the basis of regional air navigation agreements.

e) time of observation, if appropriate;

f) type of approach(es) to be expected;

g) main landing runway(s); status of arresting system constituting a potential hazard, if any;

h) significant runway surface conditions and, if appropriate, braking action;

i) holding delay, if appropriate;

j) transition level, if applicable;

k) other essential operational information;

l) surface wind direction and speed, including significant variations and, if surface wind sensors related specifically to the sections of runway(s) in use are available and the information is required by operators, the indication of the runway and the section of the runway to which the information refers;

*m) visibility and, when applicable, RVR;

*n) present weather;

*o) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available;

p) air temperature;

†q) dew point temperature;

r) altimeter setting(s);

s) any available information on significant meteorological phenomena in the approach area including wind shear, and information on recent weather of operational significance;

t) trend forecast, when available; and

u) specific ATIS instructions.

4.3.9 ATIS for departing aircraft

ATIS messages containing departure information only shall contain the following elements of information in the order listed:

a) name of aerodrome;

b) departure indicator;

c) contract type, if communication is via D-ATIS;

d) designator;

e) time of observation, if appropriate;

f) runway(s) to be used for take-off; status of arresting system constituting a potential hazard, if any;

g) significant surface conditions of runway(s) to be used for take-off and, if appropriate, braking action;

h) departure delay, if appropriate;

i) transition level, if applicable;

j) other essential operational information;

k) surface wind direction and speed, including significant variations and, if surface wind sensors related specifically to the sections of runway(s) in use are available and the information is required by operators, the indication of the runway and the section of the runway to which the information refers;

*l) visibility and, when applicable, RVR;

*m) present weather;

*n) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available;

o) air temperature;

†p) dew point temperature;

q) altimeter setting(s);

r) any available information on significant meteorological phenomena in the climb-out area including wind shear;

s) trend forecast, when available; and

t) specific ATIS instructions.

4.3.10 Use of the OFIS messages in directed request/reply transmissions

When requested by the pilot, the applicable OFIS message(s) shall be transmitted by the appropriate ATS unit.

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* These elements are replaced by the term "CAVOK", whenever the conditions as specified in the PANS-ATM (Doc 4444), Chapter 11 prevail.

† As determined on the basis of regional air navigation agreements.

4.4 VOLMET broadcasts and D-VOLMET service

4.4.1 **Recommendation**.— *HF and/or VHF VOLMET broadcasts and/or D-VOLMET service should be provided when it has been determined by regional air navigation agreements that a requirement exists.*

Note.— Annex 3, 11.5 and 11.6 provide details of VOLMET broadcasts and D-VOLMET service.

4.4.2 **Recommendation**.— *VOLMET broadcasts should use standard radiotelephony phraseologies.*

Note.— Guidance on standard radiotelephony phraseologies to be used in VOLMET broadcasts is given in the Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services *(Doc 9377), Appendix 1.*

CHAPTER 5. ALERTING SERVICE

5.1 Application

5.1.1 Alerting service shall be provided:

a) for all aircraft provided with air traffic control service;

b) in so far as practicable, to all other aircraft having filed a flight plan or otherwise known to the air traffic services; and

c) to any aircraft known or believed to be the subject of unlawful interference.

5.1.2 Flight information centres or area control centres shall serve as the central point for collecting all information relevant to a state of emergency of an aircraft operating within the flight information region or control area concerned and for forwarding such information to the appropriate rescue coordination centre.

5.1.3 In the event of a state of emergency arising to an aircraft while it is under the control of an aerodrome control tower or approach control unit, such unit shall notify immediately the flight information centre or area control centre responsible which shall in turn notify the rescue coordination centre, except that notification of the area control centre, flight information centre, or rescue coordination centre shall not be required when the nature of the emergency is such that the notification would be superfluous.

5.1.3.1 Nevertheless, whenever the urgency of the situation so requires, the aerodrome control tower or approach control unit responsible shall first alert and take other necessary steps to set in motion all appropriate local rescue and emergency organizations which can give the immediate assistance required.

5.2 Notification of rescue coordination centres

5.2.1 Without prejudice to any other circumstances that may render such notification advisable, air traffic services units shall, except as prescribed in 5.5.1, notify rescue coordination centres immediately an aircraft is considered to be in a state of emergency in accordance with the following:

a) *Uncertainty phase* when:

1) no communication has been received from an aircraft within a period of thirty minutes after the time a communication should have been received, or from the time an unsuccessful attempt to establish communication with such aircraft was first made, whichever is the earlier, or when

2) an aircraft fails to arrive within thirty minutes of the estimated time of arrival last notified to or estimated by air traffic services units, whichever is the later,

except when no doubt exists as to the safety of the aircraft and its occupants.

b) *Alert phase* when:

1) following the uncertainty phase, subsequent attempts to establish communication with the aircraft or inquiries to other relevant sources have failed to reveal any news of the aircraft, or when

2) an aircraft has been cleared to land and fails to land within five minutes of the estimated time of landing and communication has not been re-established with the aircraft, or when

3) information has been received which indicates that the operating efficiency of the aircraft has been impaired, but not to the extent that a forced landing is likely,

except when evidence exists that would allay apprehension as to the safety of the aircraft and its occupants, or when

4) an aircraft is known or believed to be the subject of unlawful interference.

c) *Distress phase* when:

1) following the alert phase, further unsuccessful attempts to establish communication with the aircraft and more widespread unsuccessful inquiries point to the probability that the aircraft is in distress, or when

2) the fuel on board is considered to be exhausted, or to be insufficient to enable the aircraft to reach safety, or when

3) information is received which indicates that the operating efficiency of the aircraft has been impaired to the extent that a forced landing is likely, or when

4) information is received or it is reasonably certain that the aircraft is about to make or has made a forced landing,

except when there is reasonable certainty that the aircraft and its occupants are not threatened by grave and imminent danger and do not require immediate assistance.

5.2.2 The notification shall contain such of the following information as is available in the order listed:

a) INCERFA, ALERFA or DETRESFA, as appropriate to the phase of the emergency;

b) agency and person calling;

c) nature of the emergency;

d) significant information from the flight plan;

e) unit which made last contact, time and means used;

f) last position report and how determined;

g) colour and distinctive marks of aircraft;

h) any action taken by reporting office;

i) other pertinent remarks.

5.2.2.1 **Recommendation.—** *Such part of the information specified in 5.2.2, which is not available at the time notification is made to a rescue coordination centre, should be sought by an air traffic services unit prior to the declaration of a distress phase, if there is reasonable certainty that this phase will eventuate.*

5.2.3 Further to the notification in 5.2.1, the rescue coordination centre shall, without delay, be furnished with:

a) any useful additional information, especially on the development of the state of emergency through subsequent phases; or

b) information that the emergency situation no longer exists.

Note.— The cancellation of action initiated by the rescue coordination centre is the responsibility of that centre.

5.3 Use of communication facilities

Air traffic services units shall, as necessary, use all available communication facilities to endeavour to establish and maintain communication with an aircraft in a state of emergency, and to request news of the aircraft.

5.4 Plotting aircraft in a state of emergency

When a state of emergency is considered to exist, the flight of the aircraft involved shall be plotted on a chart in order to determine the probable future position of the aircraft and its maximum range of action from its last known position. The flights of other aircraft known to be operating in the vicinity of the aircraft involved shall also be plotted in order to determine their probable future positions and maximum endurance.

5.5 Information to the operator

5.5.1 When an area control or a flight information centre decides that an aircraft is in the uncertainty or the alert phase, it shall, when practicable, advise the operator prior to notifying the rescue coordination centre.

Note.— If an aircraft is in the distress phase, the rescue coordination centre has to be notified immediately in accordance with 5.2.1.

5.5.2 All information notified to the rescue coordination centre by an area control or flight information centre shall, whenever practicable, also be communicated, without delay, to the operator.

5.6 Information to aircraft operating in the vicinity of an aircraft in a state of emergency

5.6.1 When it has been established by an air traffic services unit that an aircraft is in a state of emergency, other aircraft known to be in the vicinity of the aircraft involved shall, except as provided in 5.6.2, be informed of the nature of the emergency as soon as practicable.

5.6.2 When an air traffic services unit knows or believes that an aircraft is being subjected to unlawful interference, no reference shall be made in ATS air-ground communications to the nature of the emergency unless it has first been referred to in communications from the aircraft involved and it is certain that such reference will not aggravate the situation.

CHAPTER 6. AIR TRAFFIC SERVICES REQUIREMENTS FOR COMMUNICATIONS

6.1 Aeronautical mobile service (air-ground communications)

6.1.1 General

6.1.1.1 Radiotelephony and/or data link shall be used in air-ground communications for air traffic services purposes.

Note.— Requirements for ATS units to be provided with and to maintain guard on the emergency channel 121.5 MHz are specified in Annex 10, Volumes II and V.

6.1.1.2 When direct pilot-controller two-way radiotelephony or data link communications are used for the provision of air traffic control service, recording facilities shall be provided on all such air-ground communication channels.

6.1.2 For flight information service

6.1.2.1 Air-ground communication facilities shall enable two-way communications to take place between a unit providing flight information service and appropriately equipped aircraft flying anywhere within the flight information region.

6.1.2.2 **Recommendation.—** *Whenever practicable, air-ground communication facilities for flight information service should permit direct, rapid, continuous and static-free two-way communications.*

6.1.3 For area control service

6.1.3.1 Air-ground communication facilities shall enable two-way communications to take place between a unit providing area control service and appropriately equipped aircraft flying anywhere within the control area(s).

6.1.3.2 **Recommendation.—** *Whenever practicable, air-ground communication facilities for area control service should permit direct, rapid, continuous and static-free two-way communications.*

6.1.3.3 **Recommendation.—** *Where air-ground voice communication channels are used for area control service and are worked by air-ground communicators, suitable arrangements should be made to permit direct pilot-controller voice communications, as and when required.*

6.1.4 For approach control service

6.1.4.1 Air-ground communication facilities shall enable direct, rapid, continuous and static-free two-way communications to take place between the unit providing approach control service and appropriately equipped aircraft under its control.

6.1.4.2 Where the unit providing approach control service functions as a separate unit, air-ground communications shall be conducted over communication channels provided for its exclusive use.

6.1.5 For aerodrome control service

6.1.5.1 Air-ground communication facilities shall enable direct, rapid, continuous and static-free two-way communications to take place between an aerodrome control tower and appropriately equipped aircraft operating at any distance within 45 km (25 NM) of the aerodrome concerned.

6.1.5.2 **Recommendation.—** *Where conditions warrant, separate communication channels should be provided for the control of traffic operating on the manoeuvring area.*

6.2 Aeronautical fixed service (ground-ground communications)

6.2.1 General

6.2.1.1 Direct-speech and/or data link communications shall be used in ground-ground communications for air traffic services purposes.

Note.— Indication by time of the speed with which the communication should be established is provided as a guide to communication services, particularly to determine the types of communication channels required, e.g. that "instantaneous" is intended to refer to communications which effectively provide for immediate access between controllers; "fifteen seconds" to accept switchboard operation and "five minutes" to mean methods involving retransmission.

6.2.2 Communications within a flight information region

6.2.2.1 *Communications between air traffic services units*

6.2.2.1.1 A flight information centre shall have facilities for communications with the following units providing a service within its area of responsibility:

a) the area control centre, unless collocated;

b) approach control units;

c) aerodrome control towers.

6.2.2.1.2 An area control centre, in addition to being connected to the flight information centre as prescribed in 6.2.2.1.1, shall have facilities for communications with the following units providing a service within its area of responsibility:

a) approach control units;

b) aerodrome control towers;

c) air traffic services reporting offices, when separately established.

6.2.2.1.3 An approach control unit, in addition to being connected to the flight information centre and the area control centre as prescribed in 6.2.2.1.1 and 6.2.2.1.2, shall have facilities for communications with the associated aerodrome control tower(s) and, when separately established, the associated air traffic services reporting office(s).

6.2.2.1.4 An aerodrome control tower, in addition to being connected to the flight information centre, the area control centre and the approach control unit as prescribed in 6.2.2.1.1, 6.2.2.1.2 and 6.2.2.1.3, shall have facilities for communications with the associated air traffic services reporting office, when separately established.

6.2.2.2 *Communications between air traffic services units and other units*

6.2.2.2.1 A flight information centre and an area control centre shall have facilities for communications with the following units providing a service within their respective area of responsibility:

a) appropriate military units;

b) the meteorological office serving the centre;

c) the aeronautical telecommunications station serving the centre;

d) appropriate operator's offices;

e) the rescue coordination centre or, in the absence of such centre, any other appropriate emergency service;

f) the international NOTAM office serving the centre.

6.2.2.2.2 An approach control unit and an aerodrome control tower shall have facilities for communications with the following units providing a service within their respective area of responsibility:

a) appropriate military units;

b) rescue and emergency services (including ambulance, fire, etc.);

c) the meteorological office serving the unit concerned;

d) the aeronautical telecommunications station serving the unit concerned;

e) the unit providing apron management service, when separately established.

6.2.2.2.3 The communication facilities required under 6.2.2.2.1 a) and 6.2.2.2.2 a) shall include provisions for rapid and reliable communications between the air traffic services unit concerned and the military unit(s) responsible for control of interception operations within the area of responsibility of the air traffic services unit.

6.2.2.3 *Description of communication facilities*

6.2.2.3.1 The communication facilities required under 6.2.2.1, 6.2.2.2.1 a) and 6.2.2.2.2 a), b) and c) shall include provisions for:

a) communications by direct speech alone, or in combination with data link communications, whereby for the purpose of transfer of radar control the communications can be established instantaneously and for other purposes the communications can normally be established within fifteen seconds; and

b) printed communications, when a written record is required; the message transit time for such communications being no longer than five minutes.

6.2.2.3.2 **Recommendation.—** *In all cases not covered by 6.2.2.3.1, the communication facilities should include provisions for:*

a) communications by direct speech alone, or in combination with data link communications, whereby the communications can normally be established within fifteen seconds; and

b) printed communications, when a written record is required; the message transit time for such communications being no longer than five minutes.

6.2.2.3.3 **Recommendation.—** *In all cases where automatic transfer of data to and/or from air traffic services computers is required, suitable facilities for automatic recording should be provided.*

6.2.2.3.4 **Recommendation.—** *The communication facilities required in accordance with 6.2.2.1 and 6.2.2.2 should be supplemented, as and where necessary, by facilities for other forms of visual or audio communications, for example, closed circuit television or separate information processing systems.*

6.2.2.3.5 The communication facilities required under 6.2.2.2.2 a), b) and c) shall include provisions for communications by direct speech arranged for conference communications.

6.2.2.3.6 **Recommendation.—** *The communication facilities required under 6.2.2.2.2 d) should include provisions for communications by direct speech arranged for conference communications, whereby the communications can normally be established within fifteen seconds.*

6.2.2.3.7 All facilities for direct-speech or data link communications between air traffic services units and between air traffic services units and appropriate military units shall be provided with automatic recording.

6.2.2.3.8 **Recommendation.—** *All facilities for direct-speech or data link communications required under 6.2.2.2.1 and 6.2.2.2.2 and not otherwise covered by 6.2.2.3.7 should be provided with automatic recording.*

6.2.3 Communications between flight information regions

6.2.3.1 Flight information centres and area control centres shall have facilities for communications with all adjacent flight information centres and area control centres.

6.2.3.1.1 These communication facilities shall in all cases include provisions for messages in a form suitable for retention as a permanent record, and delivery in accordance with transit times specified by regional air navigation agreements.

6.2.3.1.2 Unless otherwise prescribed on the basis of regional air navigation agreements, facilities for communications between area control centres serving contiguous control areas shall, in addition, include provisions for direct-speech and, where applicable, data link communications, with automatic recording, whereby for the purpose of transfer of control using radar or ADS data, the communications can be established instantaneously and for other purposes the communications can normally be established within fifteen seconds.

6.2.3.1.3 When so required by agreement between the States concerned in order to eliminate or reduce the need for interceptions in the event of deviations from assigned track, facilities for communications between adjacent flight information centres or area control centres other than those mentioned in 6.2.3.1.2 shall include provisions for direct speech alone, or in combination with data link communications. The communication facilities shall be provided with automatic recording.

6.2.3.1.4 **Recommendation.—** *The communication facilities in 6.2.3.1.3 should permit communications to be established normally within fifteen seconds.*

6.2.3.2 **Recommendation.—** *Adjacent ATS units should be connected in all cases where special circumstances exist.*

Note.— Special circumstances may be due to traffic density, types of aircraft operations and/or the manner in which the airspace is organized and may exist even if the control areas and/or control zones are not contiguous or have not (yet) been established.

6.2.3.3 **Recommendation.—** *Wherever local conditions are such that it is necessary to clear aircraft into an adjacent control area prior to departure, an approach control unit and/or aerodrome control tower should be connected with the area control centre serving the adjacent area.*

6.2.3.4 **Recommendation.—** *The communication facilities in 6.2.3.2 and 6.2.3.3 should include provisions for communications by direct speech alone, or in combination with data link communications, with automatic recording, whereby for the purpose of transfer of control using radar or ADS data, the communications can be established instantaneously and for other purposes the communications can normally be established within fifteen seconds.*

6.2.3.5 **Recommendation.—** *In all cases where automatic exchange of data between air traffic services computers is required, suitable facilities for automatic recording should be provided.*

6.2.4 Procedures for direct-speech communications

Recommendation.— *Appropriate procedures for direct-speech communications should be developed to permit immediate connections to be made for very urgent calls concerning the safety of aircraft, and the interruption, if necessary, of less urgent calls in progress at the time.*

6.3 Surface movement control service

6.3.1 Communications for the control of vehicles other than aircraft on manoeuvring areas at controlled aerodromes

6.3.1.1 Two-way radiotelephony communication facilities shall be provided for aerodrome control service for the control of vehicles on the manoeuvring area, except where communication by a system of visual signals is deemed to be adequate.

6.3.1.2 **Recommendation.—** *Where conditions warrant, separate communication channels should be provided for the control of vehicles on the manoeuvring area. Automatic recording facilities should be provided on all such channels.*

6.4 Aeronautical radio navigation service

6.4.1 Automatic recording of surveillance data

6.4.1.1 **Recommendation.—** *Surveillance data from primary and secondary radar equipment or obtained through ADS, used as an aid to air traffic services, should be automatically recorded for use in accident and incident investigations, search and rescue, air traffic control and surveillance systems evaluation and training.*

6.4.1.2 **Recommendation.—** *Automatic recordings should be retained for a period of at least fourteen days. When the recordings are pertinent to accident and incident investigations, they should be retained for longer periods until it is evident that they will no longer be required.*

CHAPTER 7. AIR TRAFFIC SERVICES REQUIREMENTS FOR INFORMATION

7.1 Meteorological information

7.1.1 General

7.1.1.1 Air traffic services units shall be supplied with up-to-date information on existing and forecast meteorological conditions as necessary for the performance of their respective functions. The information shall be supplied in such a form as to require a minimum of interpretation on the part of air traffic services personnel and with a frequency which satisfies the requirements of the air traffic services units concerned.

7.1.1.2 **Recommendation.—** *Meteorological offices should be so situated as to facilitate personal consultation between meteorological personnel and personnel of units providing air traffic services. Where collocation is not practicable, the required consultation should be achieved by other means.*

7.1.1.3 **Recommendation.—** *Air traffic services units should be supplied with available detailed information on the location, vertical extent, direction and rate of movement of meteorological phenomena in the vicinity of the aerodrome, and particularly in the climb-out and approach areas, which could be hazardous to aircraft operations.*

Note.— The meteorological phenomena are listed in Annex 3, Chapter 4, 4.12.1.

7.1.1.4 **Recommendation.—** *When computer-processed upper air data are made available to air traffic services units in digital form for use by air traffic services computers, the contents, format and transmission arrangements should be as agreed between the Meteorological Authority and the appropriate ATS Authority.*

7.1.2 Flight information centres and area control centres

7.1.2.1 Flight information centres and area control centres shall be supplied with SIGMET and AIRMET information, special air-reports, current meteorological reports and forecasts, particular emphasis being given to the occurrence or expected occurrence of weather deterioration as soon as this can be determined. These reports and forecasts shall cover the flight information region or control area and such other areas as may be determined on the basis of regional air navigation agreements.

Note.— For the purpose of this provision, certain changes in weather are construed as weather deterioration, although they are not ordinarily considered as such. An increase in temperature may, for example, adversely affect the operation of certain types of aircraft.

7.1.2.2 Flight information centres and area control centres shall be provided, at suitable intervals, with current pressure data for setting altimeters, for locations specified by the flight information centre or area control centre concerned.

7.1.3 Units providing approach control service

7.1.3.1 Units providing approach control service shall be supplied with current meteorological reports and forecasts for the airspace and the aerodromes with which they are concerned. Special reports and amendments to forecasts shall be communicated to the units providing approach control service as soon as they are necessary in accordance with established criteria, without waiting for the next routine report or forecast. Where multiple anemometers are used, the indicators to which they are related shall be clearly marked to identify the runway and section of the runway monitored by each anemometer.

Note.— See Note following 7.1.2.1.

7.1.3.2 Units providing approach control service shall be provided with current pressure data for setting altimeters, for locations specified by the unit providing approach control service.

7.1.3.3 Units providing approach control service for final approach, landing and take-off shall be equipped with surface wind indicator(s). The indicator(s) shall be related to the same location(s) of observation and be fed from the same anemometer(s) as the corresponding indicator(s) in the aerodrome control tower and in the meteorological station, where such a station exists.

7.1.3.4 Units providing approach control service for final approach, landing and take-off at aerodromes where runway visual range values are assessed by instrumental means shall be equipped with indicator(s) permitting read-out of the current runway visual range value(s). The indicator(s) shall be related to the same location(s) of observation and be fed from the same runway visual range measuring device(s) as the corresponding indicator(s) in the aerodrome control tower and in the meteorological station, where such a station exists.

7.1.3.5 **Recommendation**.— *Units providing approach control service for final approach, landing and take-off should be supplied with information on wind shear which could adversely affect aircraft on the approach or take-off paths or during circling approach.*

Note.— Provisions concerning the issuance of wind shear warnings and ATS requirements for meteorological information are given in Annex 3, Chapters 7 and 10, respectively.

7.1.4 Aerodrome control towers

7.1.4.1 Aerodrome control towers shall be supplied with current meteorological reports and forecasts for the aerodrome with which they are concerned. Special reports and amendments to forecasts shall be communicated to the aerodrome control towers as soon as they are necessary in accordance with established criteria, without waiting for the next routine report or forecast.

Note.— See Note following 7.1.2.1.

7.1.4.2 Aerodrome control towers shall be provided with current pressure data for setting altimeters for the aerodrome concerned.

7.1.4.3 Aerodrome control towers shall be equipped with surface wind indicator(s). The indicator(s) shall be related to the same location(s) of observation and be fed from the same anemometer(s) as the corresponding indicator(s) in the meteorological station, where such a station exists. Where multiple anemometers are used, the indicators to which they are related shall be clearly marked to identify the runway and section of the runway monitored by each anemometer.

7.1.4.4 Aerodrome control towers at aerodromes where runway visual range values are measured by instrumental means shall be equipped with indicator(s) permitting read-out of the current runway visual range value(s). The indicator(s) shall be related to the same location(s) of observation and be fed from the same runway visual range measuring device(s) as the corresponding indicator(s) in the meteorological station, where such a station exists.

7.1.4.5 **Recommendation.—** *Aerodrome control towers should be supplied with information on wind shear which could adversely affect aircraft on the approach or take-off paths or during circling approach and aircraft on the runway during the landing roll or take-off run.*

7.1.4.6 **Recommendation.—** *Aerodrome control towers and/or other appropriate units should be supplied with information concerning meteorological conditions which could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services.*

Note.— The meteorological conditions are listed in Annex 3, Chapter 7, 7.5.2.

7.1.5 Communication stations

Where necessary for flight information purposes, current meteorological reports and forecasts shall be supplied to communication stations. A copy of such information shall be forwarded to the flight information centre or the area control centre.

7.2 Information on aerodrome conditions and the operational status of associated facilities

Aerodrome control towers and units providing approach control service shall be kept currently informed of the operationally significant conditions of the movement area, including the existence of temporary hazards, and the operational status of any associated facilities at the aerodrome(s) with which they are concerned.

7.3 Information on the operational status of navigation aids

7.3.1 ATS units shall be kept currently informed of the operational status of non-visual navigation aids, and those visual aids essential for take-off, departure, approach and landing procedures within their area of responsibility and those visual and non-visual aids essential for surface movement.

7.3.2 **Recommendation.—** *Information on the operational status, and any changes thereto, of visual and non-visual aids as referred to in 7.3.1 should be received by the appropriate ATS unit(s) on a timely basis consistent with the use of the aid(s) involved.*

Note.— Guidance material regarding the provision of information to ATS units in respect to visual and non-visual navigation aids is contained in the Air Traffic Services Planning Manual *(Doc 9426). Specifications for monitoring visual aids are contained in Annex 14, Volume I, and related guidance material is in the* Aerodrome Design Manual *(Doc 9157), Part 5. Specifications for monitoring non-visual aids are contained in Annex 10, Volume I.*

7.4 Information on unmanned free balloons

Operators of unmanned free balloons shall keep the appropriate air traffic services units informed of details of flights of unmanned free balloons in accordance with the provisions contained in Annex 2.

7.5 Information concerning volcanic activity

7.5.1 ATS units shall be informed, in accordance with local agreement, of pre-eruption volcanic activity, volcanic eruptions and volcanic ash cloud which could affect airspace used by flights within their area of responsibility.

7.5.2 Area control centres and flight information centres shall be provided with volcanic ash advisory information issued by the associated VAAC.

Note.— VAACs are designated by regional air navigation agreements in accordance with Annex 3, 3.6.1.

7.6 Information concerning radioactive materials and toxic chemical "clouds"

ATS units shall be informed, in accordance with local agreement, of the release into the atmosphere of radioactive materials or toxic chemicals which could affect airspace used by flights within their area of responsibility.

APPENDIX 1. PRINCIPLES GOVERNING THE IDENTIFICATION OF RNP TYPES AND THE IDENTIFICATION OF ATS ROUTES OTHER THAN STANDARD DEPARTURE AND ARRIVAL ROUTES

(Chapter 2, Sections 2.7 and 2.11 refer)

Note.— See Appendix 3 concerning the identification of standard departure and arrival routes and associated procedures. Guidance material on the establishment of these routes and procedures is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

1. Designators for ATS routes and RNP types

1.1 The purpose of a system of route designators and required navigation performance (RNP) type(s) applicable to specified ATS route segment(s), route(s) or area is to allow both pilots and ATS, taking into account automation requirements:

a) to make unambiguous reference to any ATS route without the need to resort to the use of geographical coordinates or other means in order to describe it;

b) to relate an ATS route to a specific vertical structure of the airspace, as applicable;

c) to indicate a required level of navigation performance accuracy, when operating along an ATS route or within a specified area; and

d) to indicate that a route is used primarily or exclusively by certain types of aircraft.

Note 1.— Prior to the global introduction of RNP, all references in this appendix to RNP also apply to area navigation (RNAV) routes, where navigation performance accuracy requirements have been specified.

Note 2.— Specifications governing the publication of RNP types are given in Annex 4, Chapter 7, and Annex 15, Appendix 1.

Note 3.— In relation to this appendix and for flight planning purposes, a prescribed RNP type is not considered an integral part of the ATS route designator.

1.2 In order to meet this purpose, the designation system shall:

a) permit the identification of any ATS route in a simple and unique manner;

b) avoid redundancy;

c) be usable by both ground and airborne automation systems;

d) permit utmost brevity in operational use; and

e) provide sufficient possibility of extension to cater for any future requirements without the need for fundamental changes.

1.3 Controlled, advisory and uncontrolled ATS routes, with the exception of standard arrival and departure routes, shall therefore be identified as specified hereafter.

2. Composition of designator

2.1 The ATS route designator shall consist of a basic designator supplemented, if necessary, by:

a) one prefix as prescribed in 2.3; and

b) one additional letter as prescribed in 2.4.

2.1.1 The number of characters required to compose the designator shall not exceed six characters.

2.1.2 The number of characters required to compose the designator should, whenever possible, be kept to a maximum of five characters.

2.2 The basic designator shall consist of one letter of the alphabet followed by a number from 1 to 999.

2.2.1 Selection of the letter shall be made from those listed hereunder:

a) A, B, G, R for routes which form part of the regional networks of ATS routes and are not area navigation routes;

b) L, M, N, P for area navigation routes which form part of the regional networks of ATS routes;

c) H, J, V, W for routes which do not form part of the regional networks of ATS routes and are not area navigation routes;

d) Q, T, Y, Z for area navigation routes which do not form part of the regional networks of ATS routes.

2.3 Where applicable, one supplementary letter shall be added as a prefix to the basic designator in accordance with the following:

a) K to indicate a low-level route established for use primarily by helicopters;

b) U to indicate that the route or portion thereof is established in the upper airspace;

c) S to indicate a route established exclusively for use by supersonic aircraft during acceleration, deceleration and while in supersonic flight.

2.4 When prescribed by the appropriate ATS authority or on the basis of regional air navigation agreements, a supplementary letter may be added after the basic designator of the ATS route in question in order to indicate the type of service provided or the turn performance required on the route in question in accordance with the following:

a) for RNP 1 routes at and above FL 200, the letter Y to indicate that all turns on the route between 30 and 90 degrees shall be made within the allowable RNP tolerance of a tangential arc between the straight leg segments defined with a radius of 22.5 NM (e.g. A123Y[1]);

b) for RNP 1 routes at and below FL 190, the letter Z to indicate that all turns on the route between 30 and 90 degrees shall be made within the allowable RNP tolerance of a tangential arc between the straight leg segments defined with a radius of 15 NM (e.g. G246Z[1]);

c) the letter F to indicate that on the route or portion thereof advisory service only is provided;

d) the letter G to indicate that on the route or portion thereof flight information service only is provided.

Note 1.— Due to limitations in the display equipment on board aircraft, the supplementary letters "F", "G", "Y" or "Z" may not be displayed to the pilot.

Note 2.— Implementation of a route or a portion thereof as controlled route, advisory route or flight information route is indicated in aeronautical charts and aeronautical information publications in accordance with the provisions in Annexes 4 and 15.

Note 3.— The conditions under which States may specify the controlled turn performance referred to in 2.4 a) and b) are discussed in the Manual on Required Navigation Performance (RNP) *(Doc 9613).*

3. Assignment of basic designators

3.1 Basic ATS route designators shall be assigned in accordance with the following principles.

3.1.1 The same basic designator shall be assigned to a main trunk route throughout its entire length, irrespective of terminal control areas, States or regions traversed.

Note.— This is of particular importance where automated ATS data processing and computerized airborne navigation equipment is used.

3.1.2 Where two or more trunk routes have a common segment, the segment in question shall be assigned each of the designators of the routes concerned, except where this would present difficulties in the provision of air traffic service, in which case, by common agreement, one designator only shall be assigned.

3.1.3 A basic designator assigned to one route shall not be assigned to any other route.

3.1.4 States' requirements for designators shall be notified to the Regional Offices of ICAO for coordination.

4. Use of designators in communications

4.1 In printed communications, the designator shall be expressed at all times by not less than two and not more than six characters.

4.2 In voice communications, the basic letter of a designator shall be spoken in accordance with the ICAO spelling alphabet.

4.3 Where the prefixes K, U or S specified in 2.3 are used, they shall, in voice communications, be spoken as follows:

K — KOPTER
U — UPPER
S — SUPERSONIC

The word "kopter" shall be pronounced as in the word "helicopter" and the words "upper" and "supersonic" as in the English language.

4.4 Where the letters "F", "G", "Y" or "Z" specified in 2.4 above are used, the flight crew should not be required to use them in voice communications.

APPENDIX 2. PRINCIPLES GOVERNING THE ESTABLISHMENT AND IDENTIFICATION OF SIGNIFICANT POINTS

(Chapter 2, Section 2.13 refers)

1. Establishment of significant points

1.1 Significant points should, whenever possible, be established with reference to ground-based radio navigation aids, preferably VHF or higher frequency aids.

1.2 Where such ground-based radio navigation aids do not exist, significant points shall be established at locations which can be determined by self-contained airborne navigation aids, or, where navigation by visual reference to the ground is to be effected, by visual observation. Specific points may be designated as ''transfer of control'' points by agreement between adjacent air traffic control units or control positions concerned.

2. Designators for significant points marked by the site of a radio navigation aid

2.1 Plain language name for significant points marked by the site of a radio navigation aid

2.1.1 Whenever practicable, significant points shall be named with reference to an identifiable and preferably prominent geographical location.

2.1.2 In selecting a name for the significant point, care shall be taken to ensure that the following conditions are met:

a) the name shall not create difficulties in pronunciation for pilots or ATS personnel when speaking in the language used in ATS communications. Where the name of a geographical location in the national language selected for designating a significant point gives rise to difficulties in pronunciation, an abbreviated or contracted version of this name, which retains as much of its geographical significance as possible, shall be selected;

   Example: FUERSTENFELDBRUCK = FURSTY

b) the name shall be easily recognizable in voice communications and shall be free of ambiguity with those of other significant points in the same general area. In addition, the name shall not create confusion with respect to other communications exchanged between air traffic services and pilots;

c) the name should, if possible, consist of at least six letters and form two syllables and preferably not more than three;

d) the selected name shall be the same for both the significant point and the radio navigation aid marking it.

2.2 Composition of coded designators for significant points marked by the site of a radio navigation aid

2.2.1 The coded designator shall be the same as the radio identification of the radio navigation aid. It shall be so composed, if possible, as to facilitate association with the name of the point in plain language.

2.2.2 Coded designators shall not be duplicated within 1 100 km (600 NM) of the location of the radio navigation aid concerned, except as noted hereunder.

Note.— When two radio navigation aids operating in different bands of the frequency spectrum are situated at the same location, their radio identifications are normally the same.

2.3 States' requirements for coded designators shall be notified to the Regional Offices of ICAO for coordination.

3. Designators for significant points not marked by the site of a radio navigation aid

3.1 Where a significant point is required at a position not marked by the site of a radio navigation aid, the significant point shall be designated by a unique five-letter pronounceable "name-code". This name-code designator then serves as the name as well as the coded designator of the significant point.

3.2 This name-code designator shall be selected so as to avoid any difficulties in pronunciation by pilots or ATS

personnel when speaking in the language used in ATS communications.

Examples: ADOLA, KODAP

3.3 The name-code designator shall be easily recognizable in voice communications and shall be free of ambiguity with those used for other significant points in the same general area.

3.4 The name-code designator assigned to a significant point shall not be assigned to any other significant point.

3.5 States' requirements for name-code designators shall be notified to the Regional Offices of ICAO for coordination.

3.6 In areas where no system of fixed routes is established or where the routes followed by aircraft vary depending on operational considerations, significant points shall be determined and reported in terms of World Geodetic System — 1984 (WGS-84) geographical coordinates, except that permanently established significant points serving as exit and/or entry points into such areas shall be designated in accordance with the applicable provisions in 2 or 3.

4. Use of designators in communications

4.1 Normally the name selected in accordance with 2 or 3 shall be used to refer to the significant point in voice communications. If the plain language name for a significant point marked by the site of a radio navigation aid selected in accordance with 2.1 is not used, it shall be replaced by the coded designator which, in voice communications, shall be spoken in accordance with the ICAO spelling alphabet.

4.2 In printed and coded communications, only the coded designator or the selected name-code shall be used to refer to a significant point.

5. Significant points used for reporting purposes

5.1 In order to permit ATS to obtain information regarding the progress of aircraft in flight, selected significant points may need to be designated as reporting points.

5.2 In establishing such points, consideration shall be given to the following factors:

a) the type of air traffic services provided;

b) the amount of traffic normally encountered;

c) the accuracy with which aircraft are capable of adhering to the current flight plan;

d) the speed of the aircraft;

e) the separation minima applied;

f) the complexity of the airspace structure;

g) the control method(s) employed;

h) the start or end of significant phases of a flight (climb, descent, change of direction, etc.);

i) transfer of control procedures;

j) safety and search and rescue aspects;

k) the cockpit and air-ground communication workload.

5.3 Reporting points shall be established either as "compulsory" or as "on-request".

5.4 In establishing "compulsory" reporting points the following principles shall apply:

a) compulsory reporting points shall be limited to the minimum necessary for the routine provision of information to air traffic services units on the progress of aircraft in flight, bearing in mind the need to keep cockpit and controller workload and air-ground communications load to a minimum;

b) the availability of a radio navigation aid at a location should not necessarily determine its designation as a compulsory reporting point;

c) compulsory reporting points should not necessarily be established at flight information region or control area boundaries.

5.5 "On-request" reporting points may be established in relation to the requirements of air traffic services for additional position reports when traffic conditions so demand.

5.6 The designation of compulsory and on-request reporting points shall be reviewed regularly with a view to keeping the requirements for routine position reporting to the minimum necessary to ensure efficient air traffic services.

5.7 Routine reporting over compulsory reporting points should not systematically be made mandatory for all flights in all circumstances. In applying this principle, particular attention shall be given to the following:

a) high-speed, high-flying aircraft should not be required to make routine position reports over all reporting points established as compulsory for low-speed, low-flying aircraft;

b) aircraft transiting through a terminal control area should not be required to make routine position reports as frequently as arriving and departing aircraft.

5.8 In areas where the above principles regarding the establishment of reporting points would not be practicable, a reporting system with reference to meridians of longitude or parallels of latitude expressed in whole degrees may be established.

APPENDIX 3. PRINCIPLES GOVERNING THE IDENTIFICATION OF STANDARD DEPARTURE AND ARRIVAL ROUTES AND ASSOCIATED PROCEDURES

(See Chapter 2, 2.11.3)

Note.— Material relating to the establishment of standard departure and arrival routes and associated procedures is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

1. Designators for standard departure and arrival routes and associated procedures

Note.— In the following text the term "route" is used in the meaning of "route and associated procedures".

1.1 The system of designators shall:

a) permit the identification of each route in a simple and unambiguous manner;

b) make a clear distinction between:

— departure routes and arrival routes;

— departure or arrival routes and other ATS routes;

— routes requiring navigation by reference to ground-based radio aids or self-contained airborne aids, and routes requiring navigation by visual reference to the ground;

c) be compatible with ATS and aircraft data processing and display requirements;

d) be of utmost brevity in its operational application;

e) avoid redundancy;

f) provide sufficient possibility for extension to cater for any future requirements without the need for fundamental changes.

1.2 Each route shall be identified by a plain language designator and a corresponding coded designator.

1.3 The designators shall, in voice communications, be easily recognizable as relating to a standard departure or arrival route and shall not create any difficulties in pronunciation for pilots and ATS personnel.

2. Composition of designators

2.1 Plain language designator

2.1.1 The plain language designator of a standard departure or arrival route shall consist of:

a) a basic indicator; followed by

b) a validity indicator; followed by

c) a route indicator, where required; followed by

d) the word "departure" or "arrival"; followed by

e) the word "visual", if the route has been established for use by aircraft operating in accordance with the visual flight rules (VFR).

2.1.2 The basic indicator shall be the name or name-code of the significant point where a standard departure route terminates or a standard arrival route begins.

2.1.3 The validity indicator shall be a number from 1 to 9.

2.1.4 The route indicator shall be one letter of the alphabet. The letters "I" and "O" shall not be used.

2.2 Coded designator

The coded designator of a standard departure or arrival route, instrument or visual, shall consist of:

a) the coded designator or name-code of the significant point described in 2.1.1 a); followed by

b) the validity indicator in 2.1.1 b); followed by

c) the route indicator in 2.1.1 c), where required.

Note.— Limitations in the display equipment on board aircraft may require shortening of the basic indicator, if that indicator is a five-letter name-code, e.g. KODAP. The manner in which such an indicator is shortened is left to the discretion of operators.

3. Assignment of designators

3.1 Each route shall be assigned a separate designator.

3.2 To distinguish between two or more routes which relate to the same significant point (and therefore are assigned the same basic indicator), a separate route indicator as described in 2.1.4 shall be assigned to each route.

4. Assignment of validity indicators

4.1 A validity indicator shall be assigned to each route to identify the route which is currently in effect.

4.2 The first validity indicator to be assigned shall be the number "1".

4.3 Whenever a route is amended, a new validity indicator, consisting of the next higher number, shall be assigned. The number "9" shall be followed by the number "1".

5. Examples of plain language and coded designators

5.1 *Example 1*: Standard departure route — instrument:

a) Plain language designator: BRECON ONE DEPARTURE

b) Coded designator: BCN 1

5.1.1 *Meaning*: The designator identifies a standard instrument departure route which terminates at the significant point BRECON (basic indicator). BRECON is a radio navigation facility with the identification BCN (basic indicator of the coded designator). The validity indicator ONE (1 in the coded designator) signifies either that the original version of the route is still in effect or that a change has been made from the previous version NINE (9) to the now effective version ONE (1) (see 4.3). The absence of a route indicator (see 2.1.4 and 3.2) signifies that only one route, in this case a departure route, has been established with reference to BRECON.

5.2 *Example 2*: Standard arrival route — instrument:

a) Plain language designator: KODAP TWO ALPHA ARRIVAL

b) Coded designator: KODAP 2 A

5.2.1 *Meaning*: This designator identifies a standard instrument arrival route which begins at the significant point KODAP (basic indicator). KODAP is a significant point not marked by the site of a radio navigation facility and therefore assigned a five-letter name-code in accordance with Appendix 2. The validity indicator TWO (2) signifies that a change has been made from the previous version ONE (1) to the now effective version TWO (2). The route indicator ALPHA (A) identifies one of several routes established with reference to KODAP and is a specific character assigned to this route.

5.3 *Example 3*: Standard departure route — visual:

a) Plain language designator: ADOLA FIVE BRAVO DEPARTURE VISUAL

b) Coded designator: ADOLA 5 B

5.3.1 *Meaning*: This designator identifies a standard departure route for controlled VFR flights which terminates at ADOLA, a significant point not marked by the site of a radio navigation facility. The validity indicator FIVE (5) signifies that a change has been made from the previous version FOUR (4) to the now effective version FIVE (5). The route indicator BRAVO (B) identifies one of several routes established with reference to ADOLA.

6. Composition of designators for MLS/RNAV approach procedures

6.1 Plain language designator

6.1.1 The plain language designator of an MLS/RNAV approach procedure shall consist of:

a) "MLS"; followed by

b) a basic indicator; followed by

c) a validity indicator; followed by

d) a route indicator; followed by

e) the word "approach"; followed by

f) the designator of the runway for which the procedure is designed.

6.1.2 The basic indicator shall be the name or name-code of the significant point where the approach procedure begins.

6.1.3 The validity indicator shall be a number from 1 to 9.

6.1.4 The route indicator shall be one letter of the alphabet. The letters "I" and "O" shall not be used.

6.1.5 The designator of the runway shall be in accordance with Annex 14, Volume I, 5.2.2.

6.2 Coded designator

6.2.1 The coded designator of an MLS/RNAV approach procedure shall consist of:

a) "MLS"; followed by

b) the coded designator or name-code of the significant point described in 6.1.1 b); followed by

c) the validity indicator in 6.1.1 c); followed by

d) the route indicator in 6.1.1 d); followed by

e) the runway designator in 6.1.1 f).

6.3 Assignment of designators

6.3.1 The assignment of designators for MLS/RNAV approach procedures shall be in accordance with paragraph 3. Procedures having identical tracks but different flight profiles shall be assigned separate route indicators.

6.3.2 The route indicator letter for MLS/RNAV approach procedures shall be assigned uniquely to all approaches at an airport until all the letters have been used. Only then shall the route indicator letter be repeated. The use of the same route indicator for two routes using the same MLS ground facility shall not be permitted.

6.3.3 The assignment of validity indicator for approach procedures shall be in accordance with paragraph 4.

6.4 Example of plain language and coded designators

6.4.1 *Example:*

a) Plain language designator:	MLS HAPPY ONE ALPHA APPROACH RUNWAY ONE EIGHT LEFT
b) Coded designator:	MLS HAPPY 1 A 18L

6.4.2 *Meaning:* The designator identifies an MLS/RNAV approach procedure which begins at the significant point HAPPY (basic indicator). HAPPY is a significant point not marked by the site of a radio navigation facility and therefore assigned a five-letter name-code in accordance with Appendix 2. The validity indicator ONE (1) signifies that either the original version of the route is still in effect or a change has been made from the previous version NINE (9) to the now effective version ONE (1). The route indicator ALPHA (A) identifies one of several routes established with reference to HAPPY and is a specific character assigned to this route.

7. Use of designators in communications

7.1 In voice communications, only the plain language designator shall be used.

Note.— For the purpose of identification of routes, the words "departure", "arrival" and "visual" described in 2.1.1 d) and 2.1.1 e) are considered to be an integral element of the plain language designator.

7.2 In printed or coded communications, only the coded designator shall be used.

8. Display of routes and procedures to air traffic control

8.1 A detailed description of each currently effective standard departure and/or arrival route/approach procedure, including the plain language designator and the coded designator, shall be displayed at the working positions at which the routes/procedures are assigned to aircraft as part of an ATC clearance, or are otherwise of relevance in the provision of air traffic control services.

8.2 Whenever possible, a graphic portrayal of the routes/procedures shall also be displayed.

APPENDIX 4. ATS AIRSPACE CLASSES — SERVICES PROVIDED AND FLIGHT REQUIREMENTS

(Chapter 2, 2.6 refers)

Class	*Type of flight*	*Separation provided*	*Service provided*	*Speed limitation**	*Radio communication requirement*	*Subject to an ATC clearance*
A	IFR only	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
B	IFR	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
	VFR	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
C	IFR	IFR from IFR IFR from VFR	Air traffic control service	Not applicable	Continuous two-way	Yes
	VFR	VFR from IFR	1) Air traffic control service for separation from IFR; 2) VFR/VFR traffic information (and traffic avoidance advice on request)	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	Yes
D	IFR	IFR from IFR	Air traffic control service, traffic information about VFR flights (and traffic avoidance advice on request)	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	Yes
	VFR	Nil	IFR/VFR and VFR/VFR traffic information (and traffic avoidance advice on request)	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	Yes
E	IFR	IFR from IFR	Air traffic control service and, as far as practical, traffic information about VFR flights	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	Yes
	VFR	Nil	Traffic information as far as practical	250 kt IAS below 3 050 m (10 000 ft) AMSL	No	No
F	IFR	IFR from IFR as far as practical	Air traffic advisory service; flight information service	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	No
	VFR	Nil	Flight information service	250 kt IAS below 3 050 m (10 000 ft) AMSL	No	No
G	IFR	Nil	Flight information service	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	No
	VFR	Nil	Flight information service	250 kt IAS below 3 050 m (10 000 ft) AMSL	No	No

* When the height of the transition altitude is lower than 3 050 m (10 000 ft) AMSL, FL 100 should be used in lieu of 10 000 ft.

APPENDIX 5. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table 1. Latitude and longitude

Latitude and longitude	Accuracy Data type	Integrity Classification
Flight information region boundary points	2 km (1 NM) declared	1×10^{-3} routine
P, R, D areas boundary points (outside CTA/CTZ boundaries)	2 km (1 NM) declared	1×10^{-3} routine
P, R, D areas boundary points (inside CTA/CTZ boundary)	100 m calculated	1×10^{-5} essential
CTA/CTZ boundary points	100 m calculated	1×10^{-5} essential
En-route navaids and fixes, holding, STAR/SID points	100 m surveyed/calculated	1×10^{-5} essential
Obstacles en route	100 m surveyed	1×10^{-3} routine
Final approach fixes/points and other essential fixes/points comprising instrument approach procedure	3 m surveyed/calculated	1×10^{-5} essential

Table 2. Elevation/altitude/height

Elevation/altitude/height	Accuracy Data type	Integrity Classification
Threshold crossing height, precision approaches	0.5 m or 1 ft calculated	1×10^{-8} critical
Obstacle clearance altitude/height (OCA/H)	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Obstacles en route, elevations	3 m (10 ft) surveyed	1×10^{-3} routine
Distance measuring equipment (DME), elevation	30 m (100 ft) surveyed	1×10^{-5} essential
Instrument approach procedures altitude	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Minimum altitudes	50 m or 100 ft calculated	1×10^{-3} routine

Table 3. Declination and magnetic variation

Declination/variation	Accuracy Data type	Integrity Classification
VHF NAVAID station declination used for technical line-up.	1 degree surveyed	1×10^{-5} essential
NDB NAVAID magnetic variation.	1 degree surveyed	1×10^{-3} routine

Table 4. Bearing

Bearing	Accuracy Data type	Integrity Classification
Airway segments	1/10 degree calculated	1×10^{-3} routine
En-route and terminal fix formations	1/10 degree calculated	1×10^{-3} routine
Terminal arrival/departure route segments	1/10 degree calculated	1×10^{-3} routine
Instrument approach procedure fix formations.	1/100 degree calculated	1×10^{-5} essential

Table 5. Length/distance/dimension

Length/distance/dimension	Accuracy Data type	Integrity Classification
Airway segments length	1/10 km or 1/10 NM calculated	1×10^{-3} routine
En-route fix formations distance.	1/10 km or 1/10 NM calculated	1×10^{-3} routine
Terminal arrival/departure route segments length	1/100 km or 1/100 NM calculated	1×10^{-5} essential
Terminal and instrument approach procedure fix formations distance	1/100 km or 1/100 NM calculated	1×10^{-5} essential

ATTACHMENT A. MATERIAL RELATING TO A METHOD OF ESTABLISHING ATS ROUTES DEFINED BY VOR

(Paragraph 2.7.1 and Section 2.11 refer)

1. Introduction

1.1 The guidance material in this Attachment results from comprehensive studies, carried out in Europe in 1972 and the United States in 1978, which were in general agreement.

Note.— Details of the European studies are contained in Circular 120 — Methodology for the Derivation of Separation Minima Applied to the Spacing between Parallel Tracks in ATS Route Structures.

1.2 In applying the guidance material in 3 and 4, it should be recognized that the data on which it is based are generally representative of navigation using VOR meeting the full requirements of Doc 8071 — *Manual on Testing of Radio Navigation Aids*, Volume I. Any additional factors, such as those due to particular operational requirements, frequency of aircraft passings or information available regarding the actual track-keeping performance of aircraft within a given portion of airspace should be taken into account.

1.3 Attention is also invited to the basic assumptions in 4.2 and to the fact that the values given in 4.1 represent a conservative approach. Before applying these values, account should therefore be taken of any practical experience gained in the airspace under consideration, as well as the possibility of achieving improvements in the overall navigation performance of aircraft.

1.4 States are encouraged to keep ICAO fully informed of the results of the application of this guidance material.

2. Determination of VOR system performance values

The large variability of the values which are likely to be associated with each of the factors that make up the total VOR system, and the limitation of presently available methods to measure all these effects individually with the required precision, have led to the conclusion that an assessment of the total system error provides a more realistic method for determining the VOR system performance. The material contained in 3 and 4 should be applied only after study of Circular 120 especially with respect to the environmental conditions.

Note.— Guidance material on overall VOR system accuracy is also contained in Annex 10, Volume I, Attachment C.

3. Determination of protected airspace along VOR-defined routes

Note 1.— The material of this section has not been derived by means of the collision-risk/target level of safety method.

Note 2.— The word "containment" as used in this section is intended to indicate that the protected airspace provided will contain the traffic for 95 per cent of the total flying time (i.e. accumulated over all aircraft) for which the traffic operates along the route in question. Where, for example 95 per cent containment is provided, it is implicit that for 5 per cent of the total flying time traffic will be outside *the protected airspace. It is not possible to quantify the maximum distance which such traffic is likely to deviate beyond the protected airspace.*

3.1 For VOR-defined routes where radar is not used to assist aircraft in remaining within the protected airspace, the following guidance is provided. However, when the lateral deviations of aircraft are being controlled with the aid of radar monitoring, the size of the protected airspace required may be reduced, as indicated by practical experience gained in the airspace under consideration.

3.2 As a minimum, protection against activity in airspace adjacent to the routes should provide 95 per cent containment.

3.3 The work described in Circular 120 indicates that a VOR system performance based on the probability of 95 per cent containment would require the following protected airspace around the centre line of the route to allow for possible deviations:

— VOR routes with 93 km (50 NM) or less between VORs: ±7.4 km (4 NM);

— VOR routes with up to 278 km (150 NM) between VORs: ±7.4 km (4 NM) up to 46 km (25 NM) from the VOR then expanding protected airspace up to ±11.1 km (6 NM) at 139 km (75 NM) from the VOR.

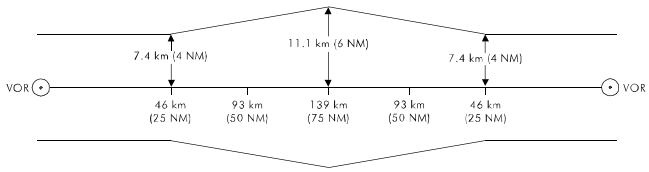

Figure A-1

3.4 If the appropriate ATS authority considers that a better protection is required, e.g. because of the proximity of prohibited, restricted or danger areas, climb or descent paths of military aircraft, etc., it may decide that a higher level of containment should be provided. For delineating the protected airspace the following values should then be used:

— for segments with 93 km (50 NM) or less between VORs, use the values in line A of the table below;

— for segments with more than 93 km (50 NM) and less than 278 km (150 NM) between the VORs use the values given in line A of the table up to 46 km (25 NM), then expand linearly to the value given in line B at 139 km (75 NM) from the VOR.

	Percentage containment					
	95	*96*	*97*	*98*	*99*	*99.5*
A (km)	±7.4	±7.4	±8.3	±9.3	±10.2	±11.1
(NM)	±4.0	±4.0	±4.5	±5.0	±5.5	±6.0
B (km)	±11.1	±11.1	±12.0	±12.0	±13.0	±15.7
(NM)	±6.0	±6.0	±6.5	±6.5	±7.0	±8.5

For example, the protected area for a route of 222 km (120 NM) between VORs and for which 99.5 per cent containment is required should have the following shape:

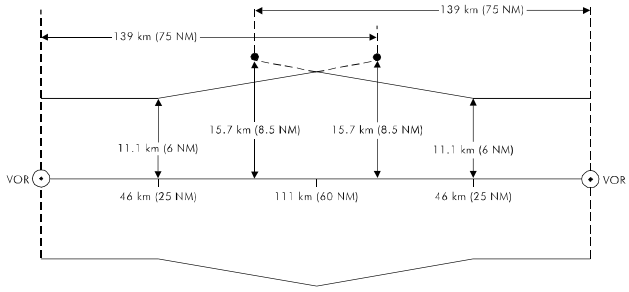

Figure A-2

3.5 If two segments of a VOR-defined ATS route intersect at an angle of more than 25 degrees, additional protected airspace should be provided on the outside of the turn and also on the inside of the turn as necessary. This additional space is to act as a buffer for increased lateral displacement of aircraft, observed in practice, during changes of direction exceeding 25 degrees. The amount of airspace added varies with the angle of intersection. The greater the angle, the greater the additional airspace to be used. Guidance is provided for protected airspace required at turns of no more than 90 degrees. For the exceptional circumstances which require an ATS route with a turn of more than 90 degrees, States should ensure that adequate protected airspace is provided on both the inside and outside of such turns.

3.6 The following examples have been synthesized from the practices of two States which use templates to facilitate the diagramming of airspace for planning purposes. Design of the turning area templates took into account factors such as aircraft speed, bank angle in turns, probable wind velocity, position errors, pilot delays and an intercept angle of at least 30 degrees to achieve the new track, and provides at least 95 per cent containment.

3.7 A template was used to establish the additional airspace required on the outside of turns to contain aircraft executing turns of 30, 45, 60, 75 and 90 degrees. The simplified figures below represent the outer limits of this airspace with the fairing curves removed to allow easy construction. In each case, the additional airspace is shown for aircraft flying in the direction of the large arrow. Where routes are used in both directions, the same additional airspace should be provided on the other outside boundary.

3.8 Figure A-3 illustrates the application of two segments intersecting at a VOR, at an angle of 60 degrees.

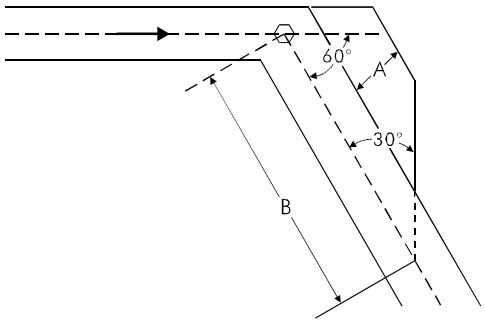

Figure A-3

3.9 Figure A-4 illustrates the application for two segments meeting at a VOR intersection at an angle of 60 degrees beyond the point where boundary splay is required in order to comply with 3.3 and Figure A-1.

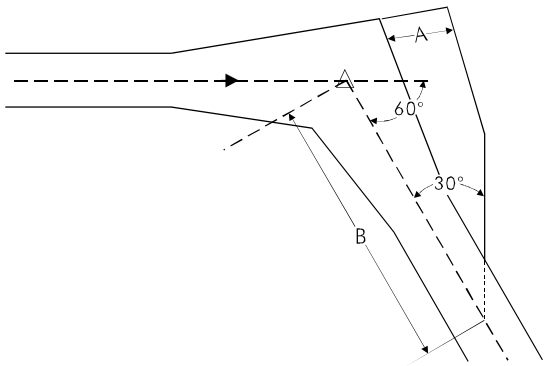

Figure A-4

3.10 The following table outlines the distances to be used in sample cases when providing additional protected airspace for route segments at and below FL 450, intersecting at a VOR or meeting at a VOR intersection not more than 139 km (75 NM) from each VOR.

Note.— Refer to Figures A-3 and A-4.

Angle of intersection	*30°*	*45°*	*60°*	*75°*	*90°*
VOR					
*Distance "A" (km)	5	9	13	17	21
(NM)	3	5	7	9	11
*Distance "B" (km)	46	62	73	86	92
(NM)	25	34	40	46	50
Intersection					
*Distance "A" (km)	7	11	17	23	29
(NM)	4	6	9	13	16
*Distance "B" (km)	66	76	88	103	111
(NM)	36	41	48	56	60

*Distances are rounded up to the next whole kilometre/nautical mile.

Note.— For behaviour of aircraft at turns, see Circular 120, 4.4.

3.11 Figure A-5 illustrates a method to construct the required additional protected airspace on the inside of turns for turns of 90 degrees or less:

Locate a point on the airway centre line, equal to the radius of turn plus the along-track tolerance prior to the nominal turning point.

From this point, drop a perpendicular line to intersect the edge of the airway on the inside of the turn.

From this point on the inner edge of the airway, construct a line to intersect the airway centre line beyond the turn at an angle of half of the angle of turn.

The resulting triangle on the inside of the turn depicts the additional airspace which should be protected for the change of direction. For any turn of 90 degrees or less, the extra space on the inside will serve for aircraft approaching the turn from either direction.

Note 1.— Criteria for the calculation of the along-track tolerance are contained in PANS-OPS (Doc 8168), Volume II, Part III, Appendix to Chapter 31.

Note 2.— Guidance on the calculation of radius of turn is provided in Section 7.

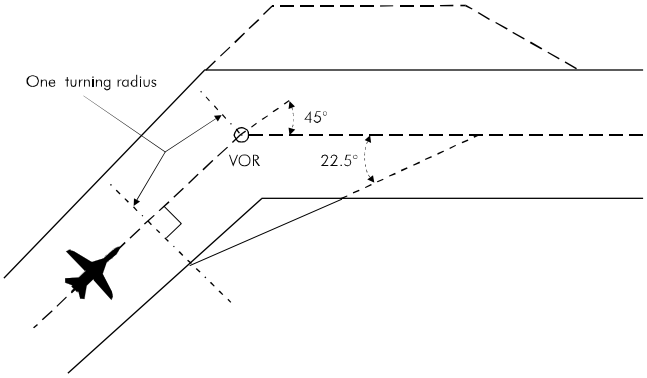

Figure A-5

3.12 For turns at VOR intersections, the principles of construction for extra airspace on the inside of a turn as described in 3.11 can be applied. Depending on the distance of the intersection from one or both VORs, one or both airways may have a splay at the intersection. Depending upon the situation, the extra airspace may be inside, partially inside, or outside of the 95 per cent containment. If the route is used in both directions, the construction should be completed separately for each direction.

3.13 Measured data for routes longer than 278 km (150 NM) between VORs are not yet available. To determine protected airspace beyond 139 km (75 NM) from the VOR, the use of an angular value of the order of 5 degrees as representing the probable system performance would appear satisfactory. The following figure illustrates this application.

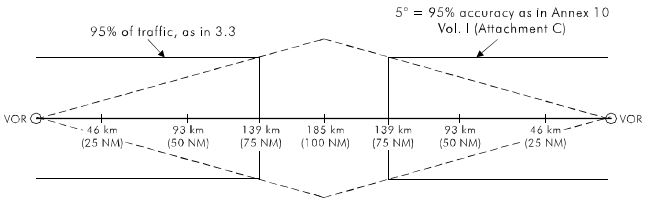

Figure A-6

4. Spacing of parallel routes defined by VORs

Note.— The material of this section has been derived from measured data using the collision-risk/target level of safety method.

4.1 The collision risk calculation, performed with the data of the European study mentioned in 1.1 indicates that, in the type of environment investigated, the distance between route centre lines (S in Figure A-7) for distances between VORs of 278 km (150 NM) or less should normally be a minimum of:

a) 33.3 km (18 NM) for parallel routes where the aircraft on the routes fly in opposite direction; and

b) 30.6 km (16.5 NM) for parallel routes where the aircraft on the two routes fly in the same direction.

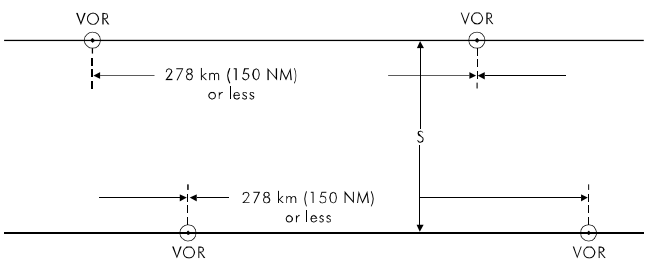

Figure A-7

Note.— Two route segments are considered parallel when:

— *they have about the same orientation, i.e. the angular difference does not exceed 10 degrees;*

— *they are not intersecting, i.e. another form of separation must exist at a defined distance from the intersection;*

— *traffic on each route is independent of traffic on the other route, i.e. it does not lead to restrictions on the other route.*

4.2 This spacing of parallel routes assumes:

a) aircraft may either during climb or descent or during level flight be at the same flight levels on the two routes;

b) traffic densities of 25 000 to 50 000 flights per busy two-month period;

c) VOR transmissions which are regularly flight checked in accordance with Doc 8071 — *Manual on Testing of Radio Navigation Aids*, Volume I, and have been found to be satisfactory in accordance with the procedures in that document for navigational purposes on the defined routes; and

d) no real-time radar monitoring or control of the lateral deviations is exercised.

4.3 Preliminary work indicates that, in the circumstances described in a) to c) below, it may be possible to reduce the minimum distance between routes. However, the figures given have not been precisely calculated and in each case a detailed study of the particular circumstances is essential:

a) if the aircraft on adjacent routes are not assigned the same flight levels, the distance between the routes may be reduced; the magnitude of the reduction will depend on the vertical separation between aircraft on the adjacent tracks and on the percentage of climbing and descending traffic, but is not likely to be more than 5.6 km (3 NM);

b) if the traffic characteristics differ significantly from those contained in Circular 120, the minima contained in 4.1 may require adjustment. For example, for traffic densities of about 10 000 flights per busy two-month period a reduction of 900 to 1 850 m (0.5 to 1.0 NM) may be possible;

c) the relative locations of the VORs defining the two tracks and the distance between the VORs will have an effect on the spacing, but this has not been quantified.

4.4 Application of radar monitoring and control of the lateral deviations of the aircraft may have a large effect on the minimum allowable distance between routes. Studies on the effect of radar monitoring indicate that:

— further work is necessary before a fully satisfactory mathematical model can be developed;

— any reduction of separation is closely related to:

  — traffic (volume, characteristics);
  — radar coverage and processing, availability of an automatic alarm;
  — monitoring continuity;
  — sector workload; and
  — radiotelephony quality.

According to these studies and taking into account the experience some States have accumulated over many years with parallel route systems under continuous radar control, it can be expected that a reduction to the order of 15 to 18.5 km (8 to 10 NM), but most probably not less than 13 km (7 NM), may be possible as long as radar monitoring workload is not increased substantially by that reduction. Actual operations of such systems using reduced lateral spacing have shown that:

— it is very important to define and publish change-over points (see also 6);

— large turns should be avoided when possible; and

— where large turns cannot be avoided, required turn profiles should be defined for turns larger than 20 degrees.

Even where the probability of total radar failure is very small, procedures to cover that case should be considered.

5. Spacing of adjacent VOR-defined routes that are not parallel

Note 1.— The material of this section is intended to provide guidance for situations where non-intersecting VOR-defined routes are adjacent and have an angular difference exceeding 10 degrees.

Note 2.— The material of this section has not been derived by means of the collision-risk/target level of safety method.

5.1 For adjacent non-intersecting VOR-defined routes that are not parallel, the collision-risk/target level of safety method is not, at its present state of development, fully appropriate. For this reason use should be made of the material in 3.

5.2 The protected airspace between such routes should not be less than that which will provide, without overlap, the 99.5 per cent containment values given in the table in 3.4 (see example in Figure A-8).

5.3 Where there is an angular difference of more than 25 degrees between route segments, additional protected airspace, as indicated in 3.5 to 3.10, should be provided.

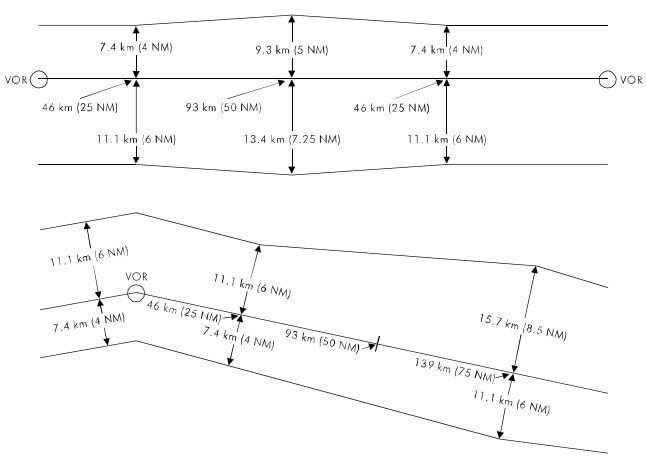

Figure A-8

6. Change-over points for VORs

6.1 When considering the establishment of points for changeover from one VOR to another for primary navigational guidance on VOR-defined ATS routes, States should bear in mind that:

a) the establishment of change-over points should be made on the basis of performance of the VOR stations concerned, including an evaluation of the interference protection criteria. The process should be verified by flight checking (see Doc 8071, Volume I, Part II);

b) where frequency protection is critical, flight inspection should be undertaken at the highest altitudes to which the facility is protected.

6.2 Nothing in 6.1 should be interpreted as placing a restriction on the service ranges of VOR installations meeting the specifications in Annex 10, Volume I, 3.3.

7. Calculation of radius of turn

7.1 The method used to calculate turn radii and the turn radii indicated below are applicable to aircraft performing a constant radius turn. The material has been derived from the turn performance criteria developed for RNP 1 ATS routes and can be used in the construction of the required additional protected airspace on the inside of turns also for ATS routes other than those defined by VOR.

7.2 Turn performance is dependent on two parameters — ground speed and bank angle. Due to the effect of the wind component changing with the change of heading, the ground speed and hence bank angle will change during a constant radius turn. However, for turns not greater than approximately 90 degrees and for the speed values considered below, the following formula can be used to calculate the achievable constant radius of turn, where the ground speed is the sum of the true airspeed and the wind speed:

$$\text{Radius of turn} = \frac{(\text{Ground speed})^2}{\text{Constant 'G'} * \text{TAN(bank angle)}}$$

7.3 The greater the ground speed, the greater will be the required bank angle. To ensure that the turn radius is representative for all foreseeable conditions, it is necessary to consider extreme parameters. A true airspeed of 1 020 km/h (550 kt) is considered probably the greatest to be encountered in the upper levels. Combined with maximum anticipated wind speeds in the medium and upper flight levels of 370 km/h (200 kt) [99.5 per cent values based on meteorological data], a maximum ground speed of 1 400 km/h (750 kt) should be considered. Maximum bank angle is very much a function of individual aircraft. Aircraft with high wing loadings flying at or near their maximum flight level are highly intolerant of extreme angles. Most transport aircraft are certified to fly no

slower than 1.3 times their stall speed for any given configuration. Because the stall speed rises with TAN(bank angle), many operators try not to cruise below 1.4 times the stall speed to protect against gusts or turbulence. For the same reason, many transport aircraft fly at reduced maximum angles of bank in cruise conditions. Hence, it can be assumed that the highest bank angle which can be tolerated by all aircraft types is in the order of 20 degrees.

7.4 By calculation, the radius of turn of an aircraft flying at 1 400 km/h (750 kt) ground speed, with a bank angle of 20 degrees, is 22.51 NM (41.69 km). For purposes of expediency, this has been reduced to 22.5 NM (41.6 km). Following the same logic for the lower airspace, it is considered that up to FL 200 (6 100 m) the maximum figures to be encountered are a true airspeed of 740 km/h (400 kt), with a tailwind of 370 km/h (200 kt). Keeping the maximum bank angle of 20 degrees, and following the same formula, the turn would be defined along a radius of 14.45 NM (26.76 km). For expediency, this figure may be rounded up to 15 NM (27.8 km).

7.5 Given the above, the most logical break point between the two ground speed conditions is between FL 190 (5 800 m) and FL 200 (6 100 m). In order to encompass the range of turn anticipation algorithms used in current flight management systems (FMS) under all foreseeable conditions, the turn radius at FL 200 and above should be defined as 22.5 NM (41.6 km) and at FL 190 and below as 15 NM (27.8 km).

ATTACHMENT B. METHOD OF ESTABLISHING ATS ROUTES FOR USE BY RNAV-EQUIPPED AIRCRAFT

(Paragraph 2.7.1 and Section 2.11 refer)

1. Introduction

1.1 This guidance material is the result of studies carried out in several States. It also reflects the long existence of RNAV criteria in several States. It must be noted that some of the values contained herein have not been derived by means of the collision-risk/target level of safety method. This is indicated where applicable.

1.2 States are encouraged to keep ICAO fully informed of the results of their application of the provisions of this guidance material.

2. Operational applications of RNAV routes based on RNP 4

2.1 General

2.1.1 This guidance material is meant for use on RNAV routes that are established within the coverage area of ground-based electronic aids that will provide necessary updates and guard against RNAV "blunder" errors.

2.1.2 Only those aircraft that have been granted airworthiness/operational approval in accordance with Sections 5.5 and 5.6, *Manual on Required Navigation Performance (RNP)* (Doc 9613) are to be afforded air traffic services on RNAV routes developed in accordance with this material.

2.1.3 The use of RNAV equipment should be permitted for navigation along ATS routes defined by VOR. Additionally, RNAV routes may be provided where practicable and when justified by the number of aircraft with RNAV capability. The routes may be:

a) fixed RNAV routes;

b) contingency RNAV routes; and

c) random RNAV routings.

2.1.4 The navigational performance required of such RNAV equipment envisages a level of navigational accuracy for en-route purposes having a navigation performance equal to or better than a track-keeping accuracy of ±11.1 km (6 NM) for 99.5 per cent of the flight time of all aircraft using RNAV equipment. Navigational performance of this type is expected to be consistent with a track-keeping accuracy of ±7.4 km (4 NM) for 95 per cent of flight time of all aircraft using RNAV equipment. This level is similar to that currently achieved by aircraft without RNAV capability operating on existing routes defined by VOR or VOR/DME, where the VORs are less than 93 km (50 NM) apart.

2.2 Protected airspace for RNAV ATS routes based on RNP 4

2.2.1 The minimum protected airspace provided for RNAV ATS routes should be 11.1 km (6 NM) either side of the intended track, within which RNAV-equipped aircraft can be expected to remain for 99.5 per cent of the flight time. Before applying the values stemming from this concept, account should be taken of any practical experience gained in the airspace under consideration as well as the possibility of achieving improvements in the overall navigation performance of aircraft. In this context, when lateral deviations are being controlled with the aid of radar monitoring, the size of the protected airspace required may be reduced in accordance with the following:

	Percentage containment					
	95	*96*	*97*	*98*	*99*	*99.5*
km	±7.4	±7.4	±8.3	±9.3	±10.2	±11.1
NM	±4.0	±4.0	±4.5	±5.0	±5.5	±6.0

2.2.2 Radar monitoring studies indicate that any potential reduction of the protected airspace is closely related to traffic characteristics, information available to the controller, and sector workload. Finally, it is worth considering that the analysis of RNAV accuracy performed in terms of containment measurements by some European States has shown that flights with RNAV capability were within 5 NM of the route centre line for 99.5 per cent of the time (EUR Doc 001, RNAV/4 refers). If the appropriate ATS authority considers that more

protection is required, e.g. because of proximity of prohibited, restricted or danger areas, climb and descent paths of military aircraft, etc., additional buffers should be provided.

2.2.3 Where there is an angular difference of more than 25 degrees between route segments, additional protected airspace, as indicated in Attachment A, 3.5 to 3.12 and Section 7, should be provided.

Note.— Different levels of navigation accuracy may be required by States for operations of RNAV-equipped aircraft. These requirements are not covered by this guidance material and may necessitate changes to protected airspace criteria.

2.3 Spacing between parallel RNAV routes based on RNP 4

When utilizing protected airspace as described in 2.2, route centre lines may be spaced such that the protected airspaces encompassing the 99.5 per cent containment values do not overlap. When implementing a spacing encompassing less than the 99.5 per cent containment values, radar monitoring is required.

3. Spacing between parallel tracks or between parallel RNAV route centre lines based on RNP type

3.1 It should be noted that, where indicated, the spacings depicted below are based on safety assessments performed specifically for a particular network of tracks or routes. As such, the assessments evaluated traffic characteristics which might be unique to the network being assessed. For example, some of these characteristics are traffic density, the frequency of aircraft passing with minimum separation, communication and surveillance facilities, etc. Additional information on performing safety assessments is contained in the *Manual on Airspace Planning Methodology for the Determination of Separation Minima* (Doc 9689).

3.2 When determining the spacing between parallel tracks or ATS routes (hereinafter referred to as a "system"), the safety assessment, involving an examination of items such as those listed in 3.1 above, should be performed against a minimum acceptable safety level.

3.2.1 Where "fatal accidents per flight hour" is considered to be an appropriate metric, a target level of safety (TLS) of 5×10^{-9} fatal accidents per flight hour per dimension should be applied for determining the acceptability of future en-route systems that will be implemented after the year 2000. Until then, a TLS of 2×10^{-8} fatal accidents per flight hour per dimension may be applied for this purpose.

3.2.2 However, where "fatal accidents per flight hour" is not considered to be an appropriate metric, justifiable alternative metrics and methods of assessment providing an acceptable level of safety may be established by States and, as appropriate, be implemented by regional agreements.

3.3 If, at the time a system is established or upon a subsequent system safety assessment, it is determined that the system does not meet the appropriate level of safety for the method of assessment being used, a reassessment should be considered. This assessment should be undertaken in accordance with Doc 9689 to determine if a level of safety equivalent to or better than the minimum acceptable level can be met.

3.4 Examples of spacings for systems in specific areas or regions based on RNP type are provided below. Where these spacings are based on the characteristics of a specific area or region (reference system), other States or regions will need to evaluate their own systems for comparability with the reference system.

3.4.1 For procedural environments:

a) **RNP 20**

Spacing: 185 km (100 NM);

Basis: Existing usage, based on long-standing, operational experience; and

Minimum ATS requirements:

NAV — All aircraft need RNP type 20 approval appropriate for the routes/tracks to be flown

COM — Voice communications through a third party

SUR — Procedural-pilot position reports.

b) **RNP 12.6**

Spacing: 110 km (60 NM);

Basis: Collision risk model performed for NAT Organized Track Structure (*Report of the Limited/North Atlantic Regional Air Navigation Meeting (1976)* (Doc 9182)); and

Minimum ATS requirements:

NAV — All aircraft need RNP type 12.6 approval appropriate for the routes/tracks to be flown

COM — Voice communications through a third party

SUR — Procedural-pilot position reports

Other — System safety must be evaluated periodically.

Note.— Direct controller/pilot communications may be desirable in certain areas, such as areas of known convective weather.

c) **RNP 10**

Spacing: 93 km (50 NM);

Basis: Collision risk model performed by the United States Federal Aviation Administration for the Pacific Region based on North Pacific traffic characteristics; and

Minimum ATS requirements:

NAV — All aircraft need RNP type 10 approval appropriate for the routes/tracks to be flown

COM — Voice communications through a third party

SUR — Procedural-pilot position reports

Other — System safety must be evaluated periodically.

Note.— Direct controller/pilot communications may be desirable in certain areas, such as areas of known convective weather.

d) **RNP 5 (or RNP 4 or better)**

Spacing: 30.6 km (16.5 NM) in a unidirectional system
33.3 km (18 NM) in a bi-directional system;

Basis: Comparison to a high-density continental reference system (VOR spacing) as described in Attachment A; and

Minimum ATS requirements:

NAV — All aircraft need RNP type 5 approval appropriate for the routes/tracks to be flown, and the NAVAID infrastructure must be provided sufficient to support RNP 5 operations

COM — Direct VHF controller/pilot voice communications

SUR — Procedural-pilot position reports.

Note 1.— Guidance material relating to the use of RNP 5 is contained in the Manual on Required Navigation Performance (RNP) *(Doc 9613).*

Note 2.— This spacing was not developed for applicability in remote and/or oceanic airspace where an appropriate VOR infrastructure is not available.

3.4.2 For radar environments:

a) **RNP 4**

Spacing: 14.8-22.2 km (8-12 NM);

Basis: Comparison to a reference system — containment areas, determined in accordance with 2.2.1, do not overlap; and

Minimum ATS requirements:

NAV — All aircraft need at least RNP type 4 approval appropriate for the routes/tracks to be flown, and the NAVAID infrastructure must be provided sufficient to support RNP 4 operations

COM — Direct VHF controller/pilot voice communications

SUR — Radar which meets existing standards

Other — System safety, including controller workload, must be evaluated.

b) **RNP 5**

Spacing: 18.5-27.8 km (10-15 NM);

Basis: Comparison to a reference system — containment areas, adapted from the provisions of 2.2.1 above to reflect RNP 5, do not overlap; and

Minimum ATS requirements:

NAV — All aircraft need at least RNP type 5 appropriate for the routes/tracks to be flown, and the NAVAID infrastructure must be provided sufficient to support RNP 5 operations

COM — Direct VHF controller/pilot voice communications

SUR — Radar which meets existing standards

Other — System safety, including controller workload, must be evaluated.

ATTACHMENT C. TRAFFIC INFORMATION BROADCASTS BY AIRCRAFT (TIBA) AND RELATED OPERATING PROCEDURES

(See Chapter 4, 4.2.2, Note 2)

1. Introduction and applicability of broadcasts

1.1 Traffic information broadcasts by aircraft are intended to permit reports and relevant supplementary information of an advisory nature to be transmitted by pilots on a designated VHF radiotelephone (RTF) frequency for the information of pilots of other aircraft in the vicinity.

1.2 TIBAs should be introduced only when necessary and as a temporary measure.

1.3 The broadcast procedures should be applied in designated airspace where:

a) there is a need to supplement collision hazard information provided by air traffic services outside controlled airspace; or

b) there is a temporary disruption of normal air traffic services.

1.4 Such airspaces should be identified by the States responsible for provision of air traffic services within these airspaces, if necessary with the assistance of the appropriate ICAO Regional Office(s), and duly promulgated in aeronautical information publications or NOTAM, together with the VHF RTF frequency, the message formats and the procedures to be used. Where, in the case of 1.3 a), more than one State is involved, the airspace should be designated on the basis of regional air navigation agreements and promulgated in Doc 7030.

1.5 When establishing a designated airspace, dates for the review of its applicability at intervals not exceeding 12 months should be agreed by the appropriate ATS authority(ies).

2. Details of broadcasts

2.1 VHF RTF frequency to be used

2.1.1 The VHF RTF frequency to be used should be determined and promulgated on a regional basis. However, in the case of temporary disruption occurring in controlled airspace, the States responsible may promulgate, as the VHF RTF frequency to be used within the limits of that airspace, a frequency used normally for the provision of air traffic control service within that airspace.

2.1.2 Where VHF is used for air-ground communications with ATS and an aircraft has only two serviceable VHF sets, one should be tuned to the appropriate ATS frequency and the other to the TIBA frequency.

2.2 Listening watch

A listening watch should be maintained on the TIBA frequency 10 minutes before entering the designated airspace until leaving this airspace. For an aircraft taking off from an aerodrome located within the lateral limits of the designated airspace listening watch should start as soon as appropriate after take-off and be maintained until leaving the airspace.

2.3 Time of broadcasts

A broadcast should be made:

a) 10 minutes before entering the designated airspace or, for a pilot taking off from an aerodrome located within the lateral limits of the designated airspace, as soon as appropriate after take-off;

b) 10 minutes prior to crossing a reporting point;

c) 10 minutes prior to crossing or joining an ATS route;

d) at 20-minute intervals between distant reporting points;

e) 2 to 5 minutes, where possible, before a change in flight level;

f) at the time of a change in flight level; and

g) at any other time considered necessary by the pilot.

2.4 Forms of broadcast

2.4.1 The broadcasts other than those indicating changes in flight level, i.e. the broadcasts referred to in 2.3 a), b), c), d) and g), should be in the following form:

ALL STATIONS (necessary to identify a traffic information broadcast)

(call sign)

FLIGHT LEVEL (number) (or CLIMBING* TO FLIGHT LEVEL (number))

(direction)

(ATS route) (or DIRECT FROM (position) TO (position))

POSITION (position**) AT (time)

ESTIMATING (next reporting point, or the point of crossing or joining a designated ATS route) AT (time)

(call sign)

FLIGHT LEVEL (number)

(direction)

Fictitious example:

"ALL STATIONS WINDAR 671 FLIGHT LEVEL 350 NORTHWEST BOUND DIRECT FROM PUNTA SAGA TO PAMPA POSITION 5040 SOUTH 2010 EAST AT 2358 ESTIMATING CROSSING ROUTE LIMA THREE ONE AT 4930 SOUTH 1920 EAST AT 0012 WINDAR 671 FLIGHT LEVEL 350 NORTHWEST BOUND OUT"

2.4.2 Before a change in flight level, the broadcast (referred to in 2.3 e)) should be in the following form:

ALL STATIONS

(call sign)

(direction)

(ATS route) (or DIRECT FROM (position) TO (position))

LEAVING FLIGHT LEVEL (number) FOR FLIGHT LEVEL (number) AT (position and time)

2.4.3 Except as provided in 2.4.4, the broadcast at the time of a change in flight level (referred to in 2.3 f)) should be in the following form:

ALL STATIONS

(call sign)
(direction)

(ATS route) (or DIRECT FROM (position) TO (position))

LEAVING FLIGHT LEVEL (number) NOW FOR FLIGHT LEVEL (number)

followed by:

ALL STATIONS

(call sign)

MAINTAINING FLIGHT LEVEL (number)

2.4.4 Broadcasts reporting a temporary flight level change to avoid an imminent collision risk should be in the following form:

ALL STATIONS

(call sign)

LEAVING FLIGHT LEVEL (number) NOW FOR FLIGHT LEVEL (number)

followed as soon as practicable by:

ALL STATIONS

(call sign)

RETURNING TO FLIGHT LEVEL (number) NOW

2.5 Acknowledgement of the broadcasts

The broadcasts should not be acknowledged unless a potential collision risk is perceived.

3. Related operating procedures

3.1 Changes of cruising level

3.1.1 Cruising level changes should not be made within the designated airspace, unless considered necessary by pilots to avoid traffic conflicts, for weather avoidance or for other valid operational reasons.

* For the broadcast referred to in 2.3 a) in the case of an aircraft taking off from an aerodrome located within the lateral limits of the designated airspace.

** For broadcasts made when the aircraft is not near an ATS significant point, the position should be given as accurately as possible and in any case to the nearest 30 minutes of latitude and longitude.

3.1.2 When cruising level changes are unavoidable, all available aircraft lighting which would improve the visual detection of the aircraft should be displayed while changing levels.

3.2 Collision avoidance

If, on receipt of a traffic information broadcast from another aircraft, a pilot decides that immediate action is necessary to avoid an imminent collision risk, and this cannot be achieved in accordance with the right-of-way provisions of Annex 2, the pilot should:

a) unless an alternative manoeuvre appears more appropriate, immediately descend 150 m (500 ft), or 300 m (1 000 ft) if above FL 290 in an area where a vertical separation minimum of 600 m (2 000 ft) is applied;

b) display all available aircraft lighting which would improve the visual detection of the aircraft;

c) as soon as possible, reply to the broadcast advising action being taken;

d) notify the action taken on the appropriate ATS frequency; and

e) as soon as practicable, resume normal flight level, notifying the action on the appropriate ATS frequency.

3.3 Normal position reporting procedures

Normal position reporting procedures should be continued at all times, regardless of any action taken to initiate or acknowledge a traffic information broadcast.

— END —