International Civil Aviation Organization

FIFTEENTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/15)
Bangkok, Thailand, 23 to 27 August 2004

Agenda Item 2.4: **Other Air Navigation Matters**

REVIEW OF THE STATEMENT OF BORPC

(Presented by the Secretariat)

SUMMARY

An updated Statement of Basic Operational Requirements and Planning Criteria (BORPC) for use by all regions is deemed necessary and should be prepared in consultation with States and international organizations. Proposals to update the Statement are presented in this working paper for an initial review by APANPIRG.

Action by APANPIRG is contained in paragraph 5.

1. INTRODUCTION

1.1 In accordance with the *Directives to Regional Air Navigation Meetings and Rules of Procedure for their Conduct* (Doc 8144, Part II, paragraph 1.1.1), the work of a Regional Air Navigation (RAN) Meeting is to be based on the updated Statement of Basic Operational Requirements and Planning Criteria (BORPC). Accordingly, the Commission (151-12) last approved the Statement of BORPC on 17 June 1999 for use, inter alia, at the third Caribbean/South American Regional Air Navigation (CAR/SAM/3) Meeting held in Buenos Aires, Argentina, in October 1999. The updated Statement was then circulated to States and international organizations in September 1999 (State letter A 16/8.4–99/93 dated 3 September 1999 refers).

2. NEED FOR THE REVIEW

2.1 As a result of the Planning and Implementation Regional Groups (PIRGs) carrying out most of the planning tasks in recent times, RAN meetings are not frequently convened and are consequently held only when specifically required. In fact, since 1999, no RAN meeting has been convened; moreover, none are scheduled for the near future. It should be noted, however, that a number

of advancements in many of the fields of air navigation systems have taken place since the last update of BORPC in 1999.

2.2 The Commission (162-5), while reviewing the report of the thirteenth meeting of the ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG/13) on 30 January 2003, called upon the Secretariat to initiate the task of revising the BORPC immediately following the eleventh meeting of the Air Navigation Conference (AN-Conf/11) held in 2003 (C-WP/11957 reporting on APANPIRG/13: Conclusion 13/35 – Amendment to the Statement of Basic Operational Requirements and Planning Criteria refers).

3. APPROACH TO THE REVIEW

3.1 The 1999 Statement of BORPC serves as the basis for the suggested modifications. As shown by the redline/strikeout method, the proposed changes are the consolidated inputs received via the coordination process amongst different Sections/Offices/Bureaux of ICAO. The rationale for amendments are summarized in the introductory note in the Appendix attached hereto.

3.2 While reflecting the outcome of AN-Conf/11, the updated Statement in the Appendix to this working paper, includes the following recent developments in different areas of the air navigation systems:

a) air traffic management (ATM) operational concept;

b) air traffic services (ATS) and aerodrome safety management;

c) introduction of new air-to-air VHF communication channel (INTERPILOT) on the frequency 123.450 MHz;

d) approach with vertical guidance (APV) procedures based on area navigation barometric vertical navigation (RNAV Baro-VNAV) or satellite-based augmentation system (SBAS);

e) revised strategy for the introduction of non-visual aids for approach and landing;

f) emergence of automatic dependent surveillance-broadcast (ADS-B) in surveillance systems;

g) closure of regional area forecast centres (RAFCs) and new provisions related to the exchange of operational meteorological information (OPMET);

h) withdrawal of supersonic aircraft operations; and

i) human resource development capabilities and integration of human factors knowledge into the design and certification of facilities.

4. EXTENSION OF APPLICABILITY TO ALL REGIONS

4.1 Whereas the Statement of BORPC is considered a vision statement and should apply equally to every region, it has until now been applicable in all regions except for the European Region. Moreover, it may be observed that a common approach is being adopted by all the regional air navigation planning and implementation groups, which are based on global requirements such as ICAO standards and recommended practices (SARPs), Global Air Navigation Plan for CNS/ATM systems and the recently approved ATM operational concept. Noting that a common Statement would be another tool for ensuring interregional harmonization and, eventually, a global ATM system, the Commission agreed to henceforth extend its application to all regions.

5. ACTION BY APANPIRG

5.1 APANPIRG is invited to:

a) review the draft revised Statement of BORPC, contained in the appendix hereto;

b) note that the draft revised Statement of BORPC, as modified by the Commission was circulated to States and selected international organizations for comments;

c) note that the revised Statement of BORPC is applicable to all regions; and

d) note that a final draft revised Statement of BORPC, updated in light of the comments to be received from States and international organizations, will be submitted to the Commission for approval in its 167th Session (October-December 2004).

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APPENDIX

REVISED STATEMENT OF BASIC OPERATIONAL REQUIREMENTS AND PLANNING CRITERIA (BORPC) FOR REGIONAL PLANNING

Notes on the presentation of the proposed modifications

1. Editorial changes

~~Text to be deleted is shown with a line through it.~~	text to be deleted
New text to be inserted is highlighted with grey shading.	new text to be inserted

~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading new text to replace existing text

2. Rationale for proposed changes to the Statement

First introductory paragraph:	Reflects the applicability to all ICAO regions
Second introductory paragraph:	Takes into account outcome of AN-Conf/11 including the ATM operational concept.
Paragraphs 1.1 to 1.3:	Editorial.
Paragraphs 1.3.1 and 1.3.3 (old):	Considers withdrawal of supersonic aircraft operations.
Paragraphs 1.6 and 1.7:	Incorporates human resource development capabilities and integration of human factors knowledge into the design and certification of facilities.
Paragraph 2.1.1:	Emphasis on user requirements and partly editorial.
Paragraph 2.1.5:	Elaborates the requirements at alternate aerodromes.
Paragraph 2.2.1:	Emphasis on user requirements.
Paragraph 2.3 :	Aligns with new requirements in Annex 14 regarding aerodrome certification and safety management.
Paragraphs 3.1, 3.2.1 and 3.2.2:	Aligns with ATM operational concept.
Paragraphs 3.2.4, 3.3.2 and 3.3.8 (old):	Consequent to withdrawal of supersonic aircraft operations.
Paragraph 3.3.8 (new):	Aligns with latest amendments to Annex 11.
Paragraph 3.4.1:	Consistent with ATM operational concept.
Paragraph 3.5:	Harmonizes with the recent provisions in Annex 11 concerning ATS Safety Management.
Paragraph 5.1.3:	Aligns with the terminology used in Annex 3.
Paragraph 5.2.5:	Confirms the introduction of new air-to-air VHF communication channel (INTERPILOT) on the frequency 123.450 MHz.
Paragraph 5.3.1:	Avoids specificity.
Paragraph 6.2.2.1:	Shift of text from 6.2.2.3 to 6.2.2.1.
Paragraph 6.2.2.2 (new):	Makes a general statement about expected evolution of GNSS.
Paragraphs 6.2.2.4 and 6.2.2.5:	Endorses RNAV procedures.
Paragraph 6.2.3.1:	Affirms revised strategy for the introduction of non-visual aids for approach and landing.
Paragraph 6.2.5.1:	Agrees with the text in 6.2.2.
Paragraph 6.2.6:	Endorses RNAV procedures.
Paragraphs 7.1 and 7.2:	Introduces the new surveillance element ADS-B.

Paragraph 8:	Takes into account closure of regional area forecast centres (RAFCs) and new provisions related to the exchange of operational meteorological information (OPMET) Furthermore all references to supersonic aircraft operations are deleted on account of its withdrawal.
Paragraph 9.7:	Stresses on the requirements for a quality management system in accordance with ICAO provisions.
Paragraphs 9.9 and 9.10:	Reflects the requirements for different charts which were not specified earlier.

REVISED STATEMENT OF
BASIC OPERATIONAL REQUIREMENTS AND PLANNING CRITERIA (BORPC)
FOR REGIONAL AIR NAVIGATION PLANNING

On ~~17 June 1999~~, xxxx the Air Navigation Commission approved this Statement of Basic Operational Requirements and Planning Criteria (BORPC) which is applicable to all the ICAO regions ~~except the European Region~~.

The Commission has considered that in planning the facilities and services related to ~~the~~ communications, navigation and surveillance/air traffic management (CNS/ATM) systems, the Global Air Traffic Management Operational Concept ~~of Operations~~ supplemented by the *Global Air Navigation Plan for CNS/ATM Systems* (Doc 9570), ~~accepted by the Council,~~ provides the framework to be followed. ~~Among the information included in the Global Plan, the Statement of ICAO Policy on CNS/ATM Systems Implementation Chapter 2 (ICAO's Planning Structure for CNS/ATM) and Chapter 3 (Global Planning Methodology) are considered particularly pertinent to regional planning.~~ In addition, relevant recommendations, accepted by the Council, contained in the report of the Eleventh Air Navigation Conference (Montreal, 22 September to 3 October 2003) should be taken into account. The importance of planning on the basis of homogeneous areas and major traffic flows, as referred to in the Global Plan, is also stressed. As ATM requirements are developed, the BORPC will be updated to take into account most up-to-date work on follow-up activities related to the operational concept.

The Commission has also considered it unnecessary to repeat in this statement any pertinent requirements already contained in the Convention, Annexes or Procedures for Air Navigation Services.

1. GENERAL (applicable to both international commercial air transport and international general aviation)

1.1 Air navigation facilities, services and procedures recommended for the area under consideration should form an integrated system designed to meet the requirements of all international civil aircraft operations. The plan should meet the requirements of all operations planned to take place in the area during the next five years, but not necessarily limited to that period, taking due account of the long-term planning and implementation strategies regarding the ~~communications, navigation and surveillance/air traffic management (~~CNS/ATM~~)~~ systems. Due account should be taken of the ~~and its~~ possible effects that changes could have on adjacent regions.

1.2 Traffic forecasts have a special role in planning the implementation of CNS/ATM systems. The forecasts represent the demand for future ~~air traffic management (~~ATM~~)~~. Forecasts of aircraft movements within homogeneous ATM areas and along major international air traffic flows form the basis for planning of the infrastructure and arrangements which will supply the required level of air traffic services (ATS). ~~A uniform strategy has been agreed by ICAO for the purpose of preparing traffic forecasts in support of the regional planning process.~~

1.3 The planning should be based on historical trends or, if otherwise available, traffic forecasts and should be used taking into ~~take~~ account ~~of~~ the ~~following~~ normal ranges of operating characteristics of the aircraft. ~~listed therein. However, the table of aircraft operations referred to in ICAO Doc 8144 (Directives to Regional Air Navigation Meetings and Rules of Procedure for their Conduct) could be used in the absence of traffic forecasts.~~ The system should be sufficiently flexible to accommodate aircraft operational characteristics outside the normal range.

1.3.1 Aircraft, engaged or planned to be engaged, in international operations have been grouped into the following categories:

~~a) supersonic turbo-jet aeroplanes;~~

~~b)~~a) ~~subsonic~~ turbo-jet aeroplanes;

~~c)~~b) multi-engine turboprop aeroplanes;

~~d)~~c) piston-engine aeroplanes and single-engine turboprop aeroplanes with:

1) a normal cruising speed of more than 260 km/h (140 kt) (type A); and
2) a normal cruising speed up to 260 km/h (140 kt) (type B);

~~e)~~d) helicopters; and

~~f)~~e) other aircraft (V/STOL, gliders, balloons, etc.).

Note.— Group ~~f)~~e) to be included only to the extent that it requires consideration in regional planning.

1.3.2 The normal operating characteristics listed below for each group of aircraft should be taken into account in the development of facilities, services and procedures to the extent that relevant categories operate, or will operate, within the system.

~~1.3.3 **Supersonic turbo-jet aeroplanes**~~

~~a) *Climb performance*: At subsonic speed 20-50 m/s (4 000 - 10 000 ft/min); at supersonic speed 8-16 m/s (1 500 - 3 000 ft/min) during transonic acceleration up to 13 100 m (FL 430); at supersonic cruising speed 2 – 8 m/s (500 – 1 500 ft/min) above 13 100 m (FL 430).~~

~~b) *Speed range in cruising flight*: At subsonic speed (Mach 0.95); at supersonic speed above 13 100 m (FL 430) Mach 1.7 - 2.0.~~

~~c) *Range of desirable cruising levels*: At subsonic speed 7 600 – 11 200 m (FL 250 - 370); at supersonic cruise-climb technique speed 15 240 - 18 280 m (FL 500- 600).~~

~~d) *Descent performance*: At supersonic speed: 20 - 25 m/s (4 000 - 5 000 ft/min); at subsonic speed 15 - 20 m/s (3 000 - 4 000 ft/min).~~

~~e) *Contingency performance*: If unable to obtain or maintain supersonic speed, SST aircraft will use the values shown in a) or d) above against subsonic speed.~~

1.3.~~4~~3 **~~Subsonic~~ Turbo-jet aeroplanes**

a) *Climb performance*: 8 – 25 m/s (1 500 – 5 000 ft/min).

b) *Speed range in cruising flight*: 780 – 1020 km/h (420 – 550 kt) (Mach 0.71 - 0.92).

c) *Range of desirable cruising levels*: 8 250 – 13 700 m (FL 270 – 450).

d) *Descent performance*: 10 – 25 m/s (2 000 – 5 000 ft/min).

1.3.5~~4~~ **Multi-engine turboprop aeroplanes**

a) *Climb performance*: 5 – 15 m/s (1 000 – 3 000 ft/min).

b) *Speed range in cruising flight*: 460 – 650 km/h (250 – 350 kt).

c) *Range of desirable cruising levels*: 5 200 – 8 250 m (FL 170 – 270).

d) *Descent performance*: 8 – 15 m/s (1 500 – 3 000 ft/min).

1.3.6~~5~~ **Piston-engine aeroplanes and single-engine turboprop aeroplanes**

a) *Climb performance*:

1) Type A: 2 – 10 m/s (500 – 2 000 ft/min);
2) Type B: 2 – 5 m/s (500 – 1 000 ft/min).

b) *Speed range in cruising flight*:

1) Type A: 260 – 460 km/h (141 – 250 kt);
2) Type B: 110 – 260 km/h (60 – 140 kt).

c) *Range of desirable cruising levels*:

1) Type A: up to 6 100 m (FL 200);
2) Type B: up to 3 050 m (FL 100).

d) *Descent performance*:

1) Type A: 5 – 10 m/s (1 000 – 2 000 ft/min);
2) Type B: 2 – 5 m/s (500 – 1 000 ft/min).

1.3.7~~6~~ **Helicopters**

a) *Climb performance*: up to 8 m/s (1 500 ft/min).

b) *Speed range in cruising flight*: up to 370 km/h (200 kt).

c) *Range of desirable cruising levels*: up to 3 050 m (FL 100).

d) *Descent performance*: up to 8 m/s (1 500 ft/min).

Note 1.— Further to 1.3 above, it is emphasized that the values given 1.3.3 to 1.3.7~~6~~ represent average values covering the majority of aircraft types in each category. Also, depending on circumstances (e.g. load, stage length of a flight) considerable deviations from them may occur for specific flights.

Note 2.— Performance of military aircraft not covered by the above values may be considerably in excess of those quoted. It is, however, assumed that in such cases national arrangements will be made to cater for these aircraft.

1.4 Planning should not include an aerodrome or other facility or service used only by operators of the State in which the aerodrome or other facility or service is located unless such planning is required to protect the integrity of the plan.

1.5 Planning for facilities and services, in addition to meeting the operational requirements, should take into account the need for:

a) efficiency in operation; and

b) economy in equipment and personnel,

with due consideration being given to capability for future expansion without major redesign or replanning.

1.6 Planning should take into account the need for an adequate number of technically ~~trained and competent~~ qualified personnel to be employed in the system to supervise, maintain and operate air navigation facilities and services and should result in recommendations, as necessary, to meet such needs. Human resource development capabilities should be compatible with the plans to implement facilities and services. A systematic and quantitative approach towards analyzing human resource needs should be used to ensure that the consequential training capabilities are available and accessible.

1.7 The facilities, services and procedures recommended for implementation should not result in imposing on flight crew or ground personnel, employed in the system developed in accordance with the plan, a workload level that would impair safety or efficiency. The integration of human factors knowledge into the design and certification of facilities, services and procedures is therefore essential. In order to achieve a workload level that would not impair safety and efficiency, as well as to introduce the capability for future expansion without major redesign or re-planning, human factors issues should be considered during the process of design and certification of facilities, services and procedures, before they are operationally deployed.

1.8 Special operational features of the area under consideration, such as those which may have been associated with causal factors noted in accident investigation reports and incident reports, should be taken into account, particularly if there are indications, such as those given in the "recommendations" of aircraft accident investigation reports and incident reports, that special measures are called for to prevent recurrence of accidents and incidents from the same cause or causes.

1.9 Planning for facilities and services should normally provide for their availability on a 24-hour basis. In cases where part-time availability is deemed adequate to meet the operational requirements, a brief description of the circumstances should be given in the plan. Lighting aids should be planned when use of the aerodromes at night or during low visibility conditions is expected.

1.10 It is essential that the overall plan:

a) satisfy the requirements of all aircraft, including domestic and military traffic to the extent that it may affect international traffic;

b) ensure compatibility of facilities, services and procedures with those recommended for operations in adjacent areas;

c) ensure that operators have access to information necessary to exercise effective operational control;

d) provide for speedy exchanges of necessary information between the various units providing air navigation services and between such units and operators; and

e) take account of aircraft performance and navigational capability in specifying requirements for the carriage of airborne equipment, as well as having due regard for the operational environment.

1.11 In the development of the plan, full cognizance should be taken of the cost-effectiveness of the recommended facilities, services and procedures. Planning should be directed towards facilitating implementation of essential improvements required for existing and anticipated operations in the region. The objective should be to expedite the eradication of current deficiencies in the air navigation facilities and services. Project management techniques should be employed for the implementation of ~~communications, navigation and surveillance (~~CNS~~)~~ facilities and services to facilitate the phased introduction of ~~air traffic management (~~ATM~~)~~ system enhancements.

2. AERODROMES

2.1 International commercial air transport operations

2.1.1 Regular aerodromes and their alternates should be determined ~~to meet~~ based on the needs identified by users ~~of the flights listed in the table of aircraft operations or the use, as approved by the Council, of traffic forecasts~~. When studying the requirements for alternate aerodromes, the guiding principle should be that, to the greatest practicable extent, the requirements for alternate aerodromes be satisfied by regular aerodromes used for international aircraft operations. Additionally, ~~consideration should be given to provisions to meet~~ the requirements of extended-range twin-engine operations for en-route alternate aerodromes ~~for extended-range twin-engine operations, as and when necessary~~ should also be considered.

2.1.2 Physical characteristics, visual aids, and emergency as well as other services should be determined for each regular and alternate aerodrome required for international operations and should include runway length and strength, as well as the aerodrome reference code(s) selected for runway and taxiway planning purposes.

2.1.3 Where at an aerodrome, planning for Category II or III operations, as the case may be, is not a requirement during the plan period but such operations are contemplated at a time beyond the plan period, planning should take into account the possible requirement for Category II or III operations so that at least one runway and the related ground-air environment may be provided in the future to accommodate such operations.

2.1.4 In cases where the extension or development of an aerodrome to meet infrequent critical operations would entail disproportionate expenditures, alternative solutions should be explored.

Note.— If it is found that the full operational requirements cannot be met at an aerodrome, then the maximum practicable development to facilitate operations should be recommended and the relevant reasons for this included in the report.

2.1.5 At alternate aerodromes, the physical characteristics should be determined in accordance with the landing requirements of the diverted critical aircraft and the take-off requirements for the aircraft for a flight to the aerodrome of intended destination. To ensure safe taxiing operations, a specified taxiway route should be determined for the diverted critical aircraft. The adequacy of the emergency response and rescue and fire fighting services to meet the requirements of the diverted critical aircraft should be reviewed to plan the necessary augmentation from sources nearby.

Note.— Where more than one alternate aerodrome is available, the requirements should be based on the types of aircraft each is intended to serve.

2.2 International general aviation (IGA)

2.2.1 Aerodromes, in addition to those required for international commercial air transport operations, should be determined to meet the needs of the IGA flights ~~listed in the table of aircraft operations or the use, as approved by the Council, of traffic forecasts~~ as identified by user requirements.

2.2.2 Physical characteristics, visual aids, and emergency as well as other services should be determined for each aerodrome to meet at least the needs of the most commonly used aircraft operated or intended to be operated at the aerodrome by IGA and should include runway length and strength, as well as the aerodrome reference code(s) selected for runway and taxiway planning purposes.

2.3 Certification of aerodromes and safety management system

2.3.1 *Annex 14 – Aerodromes, Volume I – Aerodrome Design and Operations*, requires States to certify their aerodromes used for international operations in accordance with the specifications in that Annex as well as other relevant ICAO specifications through an appropriate regulatory framework. Additionally, the Annex recommends that States certify aerodromes open to public use. The regulatory framework should include the establishment of criteria for certification of aerodromes. Furthermore, the certification should be based on the review and approval/acceptance of an aerodrome manual to be submitted by the aerodrome operator which would include all relevant information such as location, facilities, services, equipment, operating procedures, organisation and management structure of the operator. The aerodrome manual should also include details of the aerodrome safety management system as implemented by the aerodrome operator. The intent of a safety management system is to ensure the implementation of aerodrome safety policies by an aerodrome operator, which provide for the control of safety at, and the safe use of, the aerodrome.

2.3.2 The existence of basic aviation law that empowers a suitable aviation civil regulatory agency is a primary requirement. Such an entity may be the Civil Aviation Authority or the Director General of Civil Aviation, which is adequately staffed to assess an application for grant of the aerodrome certificate, inspect and evaluate the aerodrome facilities and services, operating procedures, and coordinate with other appropriate agencies such as the aviation security agency, air traffic services provider, aeronautical information services, meteorological services, etc. as detailed in the aerodrome manual submitted with the application.

Note.— Further guidance on certification of aerodromes can be found in the Manual on Certification of Aerodromes *(Doc 9774)*.

3. AIR TRAFFIC MANAGEMENT

3.1 Air traffic management should enable aircraft operators to meet their planned times of departure and arrival and adhere to their preferred flight profiles with minimum constraints without compromising agreed levels of safety. The air traffic services to be provided, the airspace organization, the associated facilities, and the required navigation performance should be determined on the basis of an agreed network of ATS routes or organised track system taking account of ~~and~~ the type, density and complexity of traffic.

3.2 Airspace management

3.2.1 The airspace structure and organization should include a network of ATS routes or organized track system established so as to enable aircraft to operate along, or as near as practicable to, the preferred flight path, in both the horizontal and vertical planes, from the departure aerodrome to the destination aerodrome. ATS routes based on area navigation~~, also including flexible routes,~~ should be recommended where appropriate and feasible. ATS routes shall be great circles between significant points, wherever possible. Standard instrument arrival routes (STARs) should be established when the density of air traffic justifies their application in a terminal control area (TMA) and to facilitate the description of the route and procedure in air traffic control clearances. Standard instrument departure routes (SIDs) should be established for each instrument runway. ~~SIDs and STARs should be laterally segregated to the extent possible.~~

3.2.2 Whenever the circumstances warrant, the airspace organization should be designed to support the ultimate goal of allowing each aircraft to fly its own optimized flight path. To achieve this,

procedures to support collaborative decision making should be developed. The airspace organization should be indicated in accordance with the ICAO airspace classification.

3.2.3 Airspace restrictions should be subject to a continuing review procedure with the object of eliminating them or reducing their restrictive effects to a minimum, with particular emphasis on the need to achieve effective civil/military coordination. Permanent segregation of airspace should be avoided. Temporary airspace reservations, where necessary to cater for large formation flights or other military air operations, should be minimized in time and space, closely coordinated, and promulgated in a timely manner. Military operations should not only be promulgated in a timely manner but also through international dissemination (international NOTAM).

~~3.2.4 Planning for routes required for supersonic aircraft should take account of areas that are to be protected from the adverse effect of sonic boom and of the possible need for the pilot-in-command to avoid any hazardous meteorological conditions which may be encountered in the area in which transonic acceleration is planned. To cater for such circumstances, an alternative route or routes should be available, and alternative points for starting transonic acceleration may be required.~~

3.3 **Air traffic services**

3.3.1 Flight information service and alerting service should be provided throughout the area under consideration. The plan of flight information regions (FIRs) should provide for the least number of FIRs compatible with efficiency of service and with economy. In this connection, the evolutionary introduction of CNS/ATM systems should be taken into account and consideration should be given to cooperative efforts for introducing more efficiency in airspace management by reducing the number of FIRs. In delineating FIR boundaries, due consideration should be given to:

a) the need for adequate air-ground communications coverage from the location of the flight information centre/area control centre (FIC/ACC);

b) the need to minimize frequency changes and position reporting by aircraft, and coordination between FICs/ACCs; and

c) the need to minimize problems relating to climbing and descending traffic at major aerodromes located in the vicinity of FIR boundaries.

3.3.2 Area control service should be provided for instrument flight rules (IFR) flights operating in controlled airspace ~~along all ATS routes to be used by international aircraft operations,~~ except where the type and density of traffic clearly do not justify the provision of such service. ~~Flights by supersonic aircraft, during the transonic and supersonic phases of flight, should be provided with air traffic control service ensuring separation from all other flights.~~ Controlled airspace, in the form of airways, control areas of larger dimensions and terminal control areas, should be recommended to encompass all relevant ATS routes. In delineating control area boundaries, due account should be taken of the factors listed in 3.3.1 above.

3.3.3 Approach control service should be provided at all aerodromes used for international aircraft operations and equipped with navigation aids for instrument approach and landing, except where the type and density of traffic clearly do not justify the provision of such service. Controlled airspace, in the form of terminal control areas and control zones, should be recommended to encompass at least the climb to cruising level of departing aircraft and the descent from cruising level of arriving aircraft.

3.3.4 Aerodrome control service should be provided at all regular and alternate aerodromes to be used for international commercial air transport operations. Aerodrome control service should also be provided at those additional aerodromes used by international general aviation aircraft where the type and density of traffic warrant it. At aerodromes used by international general aviation aircraft, where the type

and density of traffic clearly do not justify the provision of aerodrome control service, the provision of aerodrome flight information service by a unit located at the aerodrome should be recommended.

3.3.5 Air traffic advisory service should not be recommended as part of the plan. Where provided (to IFR flights in advisory airspace or on advisory routes), its replacement by air traffic control service at the earliest possible time should be recommended.

3.3.6 The air traffic services system and procedures should:

a) permit the most efficient use to be made of the airspace by all users and provide for the most expeditious handling of the various types of traffic;

b) be so designed that the number of air-ground communications contacts, frequency changes and secondary surveillance radar (SSR) code changes required of aircraft, and the amount of coordination required between ATS units, are kept to a minimum;

c) ensure the prompt and timely transmission to all aircraft concerned of information on hazardous ~~weather~~ meteorological conditions, operational flight information and other available information affecting the safety and efficiency of flight;

d) require the use of uniform altimeter setting procedures throughout the area under consideration when operating below the established transition level or climbing up to the established transition altitude; and

e) establish a common transition altitude on an area basis and, where possible, on a regional basis.

3.3.7 Information on destination ~~weather~~ meteorological conditions, the integrated operational status of facilities associated with the runway in use, and the runway conditions, should be provided to aircraft (in voice or data format) by the transmission of operational flight information service (OFIS) messages, including VOLMET, or by the appropriate area control centre or flight information centre upon request, prior to commencement of descent ~~or, in the case of supersonic aircraft, prior to the deceleration/descent phase~~. Where this information is transmitted in voice format, a discrete frequency should be assigned for this purpose. Air-ground data links are particularly efficient for this type of service, as well as for clearance delivery, and should be recommended when a sufficient number of aircraft are appropriately equipped.

3.3.8 Contingency plans should be developed to mitigate the effects of volcanic eruptions or tropical cyclones as required. In addition, contingency plans should be developed to mitigate disruptions in air traffic services due to any other cause.

~~3.3.8 The flight plan to be submitted for a flight by a supersonic aircraft should provide, within the existing flight plan format, the specific information on transonic and supersonic flight phases necessary for ATS purposes.~~

~~3.3.9 Procedures should be developed to facilitate ATC handling of descent by aircraft from cruise necessitated by solar cosmic radiation.~~

3.3.~~10~~9 To assist in the prevention of controlled flight into terrain (CFIT), efforts should be made to implement a minimum safe altitude warning (MSAW) system or equivalent.

3.3.~~11~~10 To assist in the prevention of CFIT, every effort should be made, in cooperation with the operators, to identify locations at which unwanted ground proximity warning system (GPWS) warnings occur. These warnings can occur due to conflict between ATS procedures, or operator procedures, and the characteristics of the terrain and/or those of the GPWS equipment in use. Effort

should further be made, with cooperation between the ATS authority and the operators to eliminate the occurrence of unwanted GPWS warnings by appropriate adjustment of ATS and/or operator procedures.

Note.— Where adjustment of procedures is not possible, or is not effective, it may be possible to eliminate unwanted warnings, at a specific location, by GPWS envelope modulation. This possibility will be based on technical data of the equipment manufacturer and will be proposed by the operator for acceptance by the operator's authority.

3.4 **Air traffic flow management and capacity management**

3.4.1 Air traffic flow management and capacity management should be provided to ensure an optimum flow of air traffic to, from, through or within defined areas during times when demand exceeds, or is expected to exceed, the available capacity of the ATS system, including relevant aerodromes. However, this should not preclude the need for planning airspace to adequately meet demand.

3.5 **Safety management**

3.5.1 The standards and recommended practices relating to the implementation by States of safety management programmes for ATS are contained in Annex 11 – *Air Traffic Services*, Section 2.26. Further provisions relating to the implementation of these safety management programmes are contained in Chapter 2 of the *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444).

3.5.2 Annex 11, Section 2.26 requires States to implement systematic and appropriate safety management programmes in relation to the provision of ATS. It will therefore be necessary for all States to establish regulatory provisions concerning ATS safety management, together with the necessary supporting infrastructure to enable them to discharge their responsibilities in relation to oversight of these provisions.
There are two prerequisites for the introduction of a regulatory system. These are:

a) the provision, in the basic aviation law of the State, for a code of air navigation regulations and the promulgation thereof; and

b) the establishment of an appropriate State body, hereinafter referred to as the Civil Aviation Authority (CAA), with the necessary powers to ensure compliance with the regulations.

Note.— Further guidance can be found in the Manual on ATS Safety Management (*Doc xxxx*).

4. **SEARCH AND RESCUE (SAR)**

4.1 Planning for search and rescue service should take into account, to the maximum practicable extent, existing facilities even if they are provided for purposes not connected with search and rescue. Such planning should take into account the delimitation of maritime search and rescue regions.

4.2 A single SAR point of contact (SPOC) should be designated for each SRR to facilitate cooperation with the associated mission control centre (MCC) of the COSPAS-SARSAT* system.

Note.— A SPOC may be an aeronautical or a maritime RCC.

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* COSPAS – Space system for search for vessels in distress
SARSAT – Search and rescue satellite-aided tracking

4.3 Where aircraft of the long-range and longer-range categories are required for the provision of air coverage of large oceanic search and rescue regions, but such aircraft cannot be made available by the State responsible for search and rescue services, specific cooperative arrangements should be made for the deployment of such aircraft from other locations in an attempt to meet the requirements for sufficient air coverage of the appropriate regions.

4.4 Search and rescue organization, plans, procedures, operations, and equipment should be in accordance with the provisions of Volumes 1, 2 and 3 of the *International Aeronautical and Maritime Search and Rescue Manual* (Doc 9731), to the extent practicable.

5. COMMUNICATIONS

5.1 Aeronautical fixed service (AFS) planning and engineering

5.1.1 The AFS recommended should be designed to meet the agreed requirements for AIS, ATS, MET, SAR and aircraft operating agencies for voice, message and data communications.

5.1.2 The planning of the aeronautical fixed telecommunication network (AFTN) should be based on the guidance material contained in the *Manual on the Planning and Engineering of the Aeronautical Fixed Telecommunication Network* (Doc 8259) and taking into account the predominating characteristics for conditions in the region or area concerned.

5.1.3 ~~a) If a meteorological operational telecommunication network is recommended, it should be designed so as to meet transit time criteria as follows:~~

The aeronautical fixed service (AFS) should be designed so as to meet transit time criteria as follows:

In the peak season of the year, even in the average peak hours, at least 95 per cent of the messages should achieve transit times of less than the following:

SIGMET and AIRMET messages, volcanic ash and tropical cyclone advisory ~~messages~~ information and special air-reports	5 minutes
Amend~~ments~~ed aerodrome forecast (in meteorological code form) (TAF) ~~to aerodrome forecasts~~	5 minutes
~~Aerodrome reports/landing forecasts/aerodrome forecasts/selected special reports:~~	
~~from 0 to 550 NM~~	~~5 minutes~~
~~for distances exceeding 550 NM~~	~~10 minutes~~
METAR/SPECI, trend forecasts and TAF from	
0 to 900 km (500 NM)	5 minutes
for distances exceeding 900 km (500 NM)	10 minutes

Transit times for request/reply for international OPMET data banks should be less than 5 minutes.

~~b) If international OPMET data banks are recommended, transit time for request/reply should be less than 5 minutes.~~

5.1.4 ~~Aerodrome forecast messages~~ TAF bulletins originated by meteorological offices in the region should be available, at all locations in the region to which they are addressed, at least 30 minutes before their period of validity commences.

5.1.5 The dissemination means for world area forecast system (WAFS) products should be such as to guarantee availability of these products throughout the region at international aerodromes and other locations as appropriate to meet operational needs.

5.1.6 Planning of ATS ground to ground communication networks comprising direct and switched ATS speech circuits should take account of operational voice-communication requirements. It should also take into account relevant ICAO documentation with regard to the application of analogue and digital voice switching and signalling systems.

5.1.7 With the introduction of automation in air traffic management many coordination functions will be accomplished through data interchange between ATM systems using ATN applications such as ATS Interfacility Data Communication (AIDC) or ATS message handling services (ATSMHS) ~~, for example~~. As such, the planning for ATN should include the provision of ~~AFTN/AMHS~~ suitable gateways to facilitate the exchange of information between existing and newly established networks.

5.1.8 For planning of AFS, attention should be paid to the establishment of institutional arrangements for the implementation by States of coordinated digital networks, using appropriate technology to meet, in an integrated way, current and future communication requirements.

5.2 Aeronautical mobile service (AMS) and aeronautical mobile satellite service (AMSS)

5.2.1 Air-ground data link and voice communications facilities should be recommended to meet effectively and reliably the agreed requirements for air traffic services as well as, to the extent required, all other classes of traffic acceptable on the AMS. The facilities should employ voice and data communications links based on available transmission media (e.g. HF, VHF, satellite). This decision should be based on system performance and economical criteria to comply with operational needs.

5.2.1.1 Regional planning should take into account AMSS ground earth station (GES) redundancy requirements in coordination with the AMSS service provider(s) with a view to avoiding an unnecessary proliferation of facilities.

5.2.2 ATIS and VOLMET or OFIS broadcasts should be recommended only if overloading of air-ground channels due to request/reply communications has occurred, or is expected to occur. When justified by the number of aircraft suitably equipped, data links should be recommended for these functions, as well as for certain clearance delivery ~~ies~~.

5.2.3 Aerodromes having a significant volume of international general aviation traffic should be served by stations of the AMS, and such stations should operate on frequencies within the bands normally used by aircraft constituting this traffic.

5.2.4 Selective calling (SELCAL) devices should be employed, wherever possible and necessary, at aeronautical stations.

5.2.5 An air-to-air VHF communication channel (INTERPILOT) on the frequency 123.450 MHz should be used ~~is approved for use~~ over remote and oceanic areas, provided users are out of range of VHF ground stations, to enable pilots to exchange the necessary operational information. ~~The recommendation for use of frequency 123.45 MHz for this purpose has been adopted by the Council of ICAO with an applicability date of 4 November 1999.~~

5.3 Frequency assignment plans

5.3.1 Frequency assignment planning ~~work~~ should be done in accordance with the method applicable to the region ~~proposed by the ASIA/PAC/2 RAN Meeting (1983) (Recommendation 6/1, which~~

~~was approved by the Council of ICAO on 28 June 1983, refers)~~ and using the relevant ICAO regional office frequency lists.

6. NAVIGATION

6.1 General

6.1.1 The planning of navigation aids should be based on a system basis, recognizing that the requirements for both long range and short range navigation may be met by different navigation systems having area navigation capability, including the global navigation satellite system (GNSS), and it may be practicable to establish ATS routes not provided with ground station-referenced aids for suitably-equipped aircraft. For routes or areas which require that aircraft achieve an acceptable level of navigation accuracy, the requirement should be specified e.g. in the form of a required navigation performance (RNP) type to support a selected horizontal separation minimum, or a minimum aircraft system performance specification (MASPS) to support a selected vertical separation minimum. The navigation systems should meet the needs of all aircraft using it and form an adequate basis for the provision of air traffic services.

6.1.2 Where aircraft are using different systems for navigation and position determination within the same controlled airspace, the facilities involved should, in so far as practicable, be located and oriented to enable a fully integrated air traffic control structure to be established.

6.1.3 Planning should take into account the need of civil aircraft for sufficiently accurate navigation guidance to remain clear of restricted, prohibited and danger areas as required.

6.2 International commercial air transport operations

6.2.1 En-route aids

6.2.1.1 The en-route aids to be recommended should provide navigation assistance to permit en-route navigation on the agreed air traffic services route network with the accuracy required.

6.2.1.2 It is expected that GNSS will ultimately meet all requirements for en-route navigation. Planning for other en-route aids should take due account of the need for a gradual transition towards the use of GNSS in lieu of en-route ground-based navigation aids. Pending implementation of GNSS, VHF omnidirectional radio range (VOR) supplemented as necessary by distance measuring equipment (DME) should be installed as the primary aid for this purpose.

6.2.1.3 Where VOR is used, supplemented as necessary by DME, a total navigation error value for VOR of ±5° (95 per cent probability) should be assumed for planning purposes. However, the specific value of VOR radial signal error for individual facilities/radials should be obtained by flight checking, and if these values are worse than ±3°, appropriate precautions should be taken in respect of the routes concerned.

6.2.1.4 Long-distance radio navigation aids continue to be provided where required.

6.2.2 Terminal area aids

6.2.2.1 The terminal area aids should permit navigation for approach, holding and departure to be carried out with the accuracy required.

6.2.2.~~1~~2 It is expected that GNSS will ultimately meet all requirements for terminal navigation. Planning for other terminal aids should take due account of the need for a gradual transition towards the use of GNSS in lieu of terminal area ground-based navigation aids. Introduction of GNSS-based

navigation services, such as Basic GNSS and satellite-based augmentation system (SBAS), should be considered as initial transition steps.

6.2.2.~~2~~3 ~~The terminal area aids to be recommended should permit navigation for approach, holding and departure to be carried out with the accuracy required.~~ Where VOR is used as the primary aid, it should be so located as to permit the most efficient approach and air traffic control procedures and to give the pilot maximum assistance in adhering to requisite patterns. Whenever possible, VORs should be located and operated so that they can serve both the requirements for en-route and terminal navigation guidance, including holding. Where the provision of VORs for the holding is not practicable, non-directional beacons (NDBs) can be used for this purpose.

6.2.2.4 Consideration should be given to the provision of DME to be collocated with VORs whenever this is required to ensure necessary ATC flexibility in the routing of air traffic in a given TMA using area navigation (RNAV) procedures based on VOR/DME and when improved accuracy in navigation is a prerequisite to such flexibility.

6.2.2.5 Consideration should also be given to the provision of suitably located DMEs in support of RNAV procedures based on DME/DME.

6.2.3 **Non-visual aids to final approach and landing**

6.2.3.1 The standard non-visual aids to final approach and landing ILS, MLS and GNSS, supporting precision approach and landing operations, shall comply with general provisions in *Annex 10 – Aeronautical Telecommunications, Volume I – Radio Navigation Aids*, Chapter 2, 2.1 and technical specifications in Chapter 3, and their introduction and application are expected to be in line with the strategy contained in Attachment B to Volume I.

6.2.3.2 In planning the requirements for aids to final approach and landing, each aerodrome should be considered in relation to its traffic, its ~~weather~~ meteorological conditions and other aspects of its physical environment. In addition, the following two aspects should be taken into consideration in the determination of specific requirements:

a) *The aerodynamic and handling characteristics of the aircraft*

Turbo-jet aeroplanes have need for precise approach path guidance during approach and landing, irrespective of weather conditions. Such guidance should be provided to runways intended to serve these aeroplanes as follows:

1) On a runway having significant traffic the facilities to be provided should be an ICAO standard non-visual aid to final approach and landing, complemented by a visual approach slope indicator system. When a standard non-visual aid cannot be implemented in the first instance, this should not delay the installation of a visual approach slope indicator system.

2) On a runway not having significant traffic, the facilities to be provided should at least include a visual approach slope indicator system.

b) *Routine auto-coupled approaches*

Where auto-coupled approaches are to be made on a routine basis, an ICAO standard non-visual aid to final approach and landing, i.e. ILS, ~~or~~ MLS or GNSS (GBAS), should be provided as appropriate to the type of operation planned at the aerodrome. In the case of an ILS of facility performance Category I, the ILS should be of Category II signal quality, without necessarily meeting the associated reliability and availability criteria for backup equipment and automatic change-over of facility performance Category II, but

it should be adjusted and maintained to the greatest possible extent and accuracy, and its performance characteristics should be published in AIPs or other suitable documents.

6.2.4 **Precision approach and landing procedures**

6.2.4.1 Precision approach and landing operations are to be based on standard non-visual aids indicated in 6.2.3.1 above.

6.2.~~3.3~~5 **Non-precision instrument approach procedures**

6.2.~~3.3~~5.1 Non-precision instrument approach procedures ~~can~~ are to be based on terminal area aids ~~other than the standard non-visual aids~~ (see 6.2.~~3.1~~2 above) which should also support SIDs and STARs. These approach procedures should be constructed whenever possible in accordance with the concept of the stabilized approach; to provide an equivalent three degree final approach glide path; to eliminate stepped approaches; and to provide a final approach fix.

6.2.~~3.3~~5.2 Particular account should be taken of 6.2.~~3.3~~5.1 in the design of non-precision instrument approach procedures for use with GNSS which should also support SIDs and STARs.

6.2.6 **RNAV procedures**

6.2.6.1 RNAV procedures can be based on terminal area aids (e.g. VOR/DME, DME/DME) or GNSS (e.g. Basic GNSS, SBAS or GBAS positioning services).

6.2.6.2 Consideration should be given to approach with vertical guidance (APV) procedures based on RNAV Baro-VNAV or SBAS.

6.3 **International general aviation**

6.3.1 **Short-distance aids**

6.3.1.1 Appropriate aids such as GNSS for short-distance navigation should be provided to serve the additional aerodromes referred to in 2.2.1 where the density of traffic and the meteorological conditions so warrant, due account being taken of the airborne equipment carried by aircraft. These aids should, as appropriate, be located so as to permit instrument approaches.

6.4 **Flight testing of visual and non-visual navigation aids**

6.4.1 Cooperative arrangements for the flight testing of visual and non-visual navigation aids (Annex 10, Volume I, Chapter 2, paragraph 2.7) should be recommended where flight testing on a national basis would be impracticable or uneconomical.

7. **SURVEILLANCE**

7.1 Surveillance systems should provide ~~an~~ adequate support to ~~—~~ and meet the operational requirements. ~~needs of — ATM.~~ A table of ~~radar~~ surveillance facilities/services (including radars, ADS

and ADS-B), together with an associated chart, is considered to be a useful tool in the planning and implementation of surveillance systems. ~~, including automatic dependent surveillance (ADS).~~

7.2 Surveillance should be provided as an integral part of air traffic control where practicable and desirable or necessary in the interest of safety, efficiency and economy of operations, in particular for those areas where traffic density and/or the multiplicity or complexity of ATS routes create constraints. Primary and/or secondary surveillance radar systems may be used to fulfil this requirement. ~~When technology permits,~~ Subject to availability and cost effectiveness and provided that the required level of safety is maintained, automatic dependent surveillance (ADS) and automatic dependent surveillance – broadcast (ADS-B) may be used in airspace where surveillance by radar is either impracticable or cannot be economically justified in terms of traffic volumes and air safety.

7.3 Provision should also be made for the use of surveillance systems for the purpose of monitoring air traffic and identifying civil aircraft in areas where they might otherwise be intercepted.

Note.— This requirement does not constitute a justification or operational requirement for installation of new radars. Since interceptions would normally only take place under existing military radar control, this should be interpreted as a requirement for a State to make better use of existing measures and to improve civil/military coordination.

8. METEOROLOGY

8.1 World area forecast system (WAFS) – Regional aspects

8.1.1 Planning for regional aspects of the WAFS should be undertaken, with particular reference to user States' requirements for WAFS products, service areas and areas of coverage of charts to be included in flight documentation.~~8.1.2~~ Areas of coverage of charts to be provided under the WAFS should be selected so as to ensure the required coverage for flights departing aerodromes ~~in each service area, whilst minimizing, as far as practicable, the workload of regional area forecast centres (RAFCs) and the occupancy of telecommunication channels~~.

~~8.1.3 The transmission of RAFC products normally should be completed nine hours before validity time. The time period should be adjusted so as to meet the needs of the majority of the flight stages for which the charts are required.~~

8.1.~~4~~2 Requirements for the issuance of medium-level significant weather (SIGWX) ~~charts~~ forecasts (FL 100 – 250) under the WAFS should only be specified for limited geographical areas having a large number of international flight operations using those flight levels and for extended-range operations.

~~8.1.5 Requirements for upper air wind/temperature charts for flight levels additional to flight level 340 should only be specified where such flight levels are used by a significant number of flight operations.~~

~~8.1.6 Where a significant number of SST operations form part of the regional plan, a requirement for SIGWX and upper air wind/temperature charts covering flight levels appropriate to those operations should be specified.~~

8.2 Meteorological services ~~to be provided~~ at aerodromes

8.2.1 The meteorological service to be provided for operators and flight crew members should be specified for each ~~regular~~ international aerodrome.

8.3 Aerodrome forecasts

8.~~2.2~~3.1 ~~Aerodrome forecasts~~ TAF and amendments thereto should be exchanged to meet the needs of current flight operations, including ~~flights under centralized operational control~~ international general aviation. ~~Aerodrome forecasts~~ TAF for the aerodromes of departure and destination and their respective alternates, and en-route alternates~~, including those for extended-range operations,~~ should be disseminated so as to be available at departure aerodromes and at ~~stations~~ ATS units designated to provide ~~OFIS (including~~ data link-VOLMET or VOLMET~~)~~ broadcasts for aircraft in flight. In addition, they should be disseminated to be available at ATS units for transmission to aircraft in flight up to a distance from the aircraft corresponding to two hours' flying time.

8.~~2.3~~3.2 The determination of the aerodromes at which landing forecasts are required should take into consideration relevant operational and climatological factors, including the weekly number of flights requiring those forecasts and the incidence of adverse ~~weather~~ meteorological conditions.

~~8.2.4 For international general aviation, information concerning weather conditions at aerodromes of destination and at relevant alternate aerodromes and concerning en-route weather conditions should be made available or should be easily procurable.~~

8.~~3~~4 Meteorological observations and reports

8.~~3~~4.1 Meteorological observations and reports should be made at hourly intervals. However, the intervals should be half-hourly at aerodromes where the volume of traffic and the variability of ~~weather~~ meteorological conditions so justify, and/or ~~they~~ reports are required for ~~any OFIS (including~~ data link-VOLMET or VOLMET~~)~~ broadcasts, ~~which may be recommended~~ and relevant OPMET bulletin exchange schemes.

8.~~3~~4.2 ~~Routine and selected special reports~~ METAR and SPECI should be exchanged to meet the needs of current flight operations. ~~Reports~~ METAR and SPECI for ~~final destinations and departure and destination alternates~~ the aerodromes of departure and destination and their respective alternates, and en-route alternates should be disseminated so as to be available at departure aerodromes and at ATS units designated to provide data link-VOLMET or VOLMET broadcasts for aircraft in flight ~~within about two hours' flying time from the aerodrome to which those reports refer~~. In addition, they should be disseminated to be available at ATS units for transmission to aircraft in flight up to a distance from the aircraft corresponding to two hours' flying time. ~~For extended-range operations and flights conducted under centralized operational control, reports for final destinations, departure, en-route and destination alternates for the whole route should be exchanged so as to be available at the aerodrome of departure using, to the extent possible, services of international operational meteorological (OPMET) data banks and/or predetermined AFTN distribution.~~

~~8.3.3 Routine reports for significant observing stations along and adjacent to the route* should be disseminated so as to be available at the departure aerodrome for up to a distance corresponding to two hours'* flying time from the aerodrome, and for aircraft in flight for a distance corresponding to two hours'* flying time from the aircraft.~~

~~8.3.4 Arrangements should be made for the provision of reports of runway visual range for precision approach runways and for runways used for take-off during periods when the visibility or runway visual range is less than 1 500 metres.~~

8.~~4~~5 Aircraft reports and SIGMET and AIRMET information

8.~~4~~5.1 For international air routes having a high density of air traffic, air-reporting exemption or designation procedures should be developed to reduce the frequency of routine air-reports commensurate with the minimum requirements of meteorological offices. The procedures should be included in the *Regional Supplementary Procedures* (Doc 7030).

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* ~~With possible exceptions for certain routes~~

8.~~4~~5.2 SIGMET and AIRMET messages, as well as special air-reports which have not been used for the preparation of a SIGMET, should be disseminated to meteorological ~~watch~~ offices so as to ~~enable them to~~ be ~~made~~ available ~~for aircraft prior to~~ at departure aerodromes for the whole route and at ATS units designated to provide data link-VOLMET or VOLMET broadcasts for aircraft in flight. ~~and~~ In addition, they should be disseminated to be available at the ATS units for transmission to aircraft in flight for the route ahead up to a distance corresponding to two hours' flying time. ~~In the case of non-stop flights operating on especially long routes, SIGMETs and special air-reports for the whole route should be made available at the departure aerodrome and for transmission to aircraft in flight.~~

~~8.4.3 Notwithstanding the requirements stated in 8.4.2, SIGMETs and special air-reports related to tropical cyclones and volcanic ash clouds should be available at departure aerodromes for the whole route for non-stop flights intending to cross areas which may be affected by these phenomena.~~

~~8.4.4 Arrangements should be made for the transmission to ATS units of information on hazardous weather conditions, including SIGMET information, special air-reports, wind shear warnings, aerodrome warnings and thunderstorms, with a view to ensuring the adequate and timely availability of such information for ground-to-air transmission, including VOLMET broadcasts.~~

8.~~5~~6 **International Airways Volcano Watch (IAVW) - Regional aspects**

8.~~5~~6.1 Planning for regional aspects of the IAVW should be undertaken, including the designation of volcanic ash advisory centres (VAAC) and selected State volcano observatories. ~~responsible for providing advisory information to meteorological watch offices and area control centres on the occurrence, extent and movement of volcanic ash in the atmosphere~~.

8.~~6~~7 **Tropical Cyclone Watch - Regional aspects**

8.~~6~~7.1 Planning for regional aspects of the tropical cyclone watch should be undertaken for regions affected by tropical cyclones, including the designation of tropical cyclone advisory centres (TCAC) ~~should be designated for regions affected by tropical cyclones~~ amongst the centres of the WMO Tropical Cyclone Programme. ~~The TCAC should be responsible for monitoring the development of tropical cyclones in the region and providing advisory information to meteorological watch offices regarding the position, forecast direction and speed of movement, central pressure and maximum surface wind of the tropical cyclones.~~

9. AERONAUTICAL INFORMATION SERVICES AND AERONAUTICAL CHARTS

9.1 The designation of international NOTAM offices and their areas of responsibility should be based on maximum efficiency in the dissemination and exchange of aeronautical information/data by telecommunications and on optimum use of the aeronautical fixed service (AFS).

9.2 Arrangements for the international exchange of elements of the Integrated Aeronautical Information Package and aeronautical charts should be established to meet the needs of all forms of international civil aviation.

9.3 Arrangements for the transmission and exchange of NOTAMs should be ~~examined~~ planned with a view to recommending measures to ensure that adequate information is available to users in a timely manner, and that its presentation is efficient as to format and selective as to contents.

9.4 The advantages of using AIS automation integrated systems should be considered when planning the exchange of aeronautical information/data.

9.5 Priority for the planning and implementation of AIS aerodrome units should be based on aerodrome designation (RS, RNS, RG, AS and EAS) as set out in the ANP AOP-1 table.

9.6 Pre-flight information bulletins (PIBs) ~~originated by AIS aerodrome units~~ should be made available at ~~each~~ designated international airports at least one hour before each flight in order to meet the operational requirements of users.

9.7 Planning and arrangements should be made for the introduction by States of one quality management system for aeronautical information and charts services. The system must include procedures, processes and resources necessary to ensure that the procedures are put in place in all the functional stages of aeronautical data process, from origination until the next intended user.

9.8 Aeronautical geographical coordinates should be stated in terms of the World Geodetic System ~~—~~ 1984 (WGS-84). ~~should be implemented in support of GNSS-based operations and to assist in the prevention of CFIT (paragraph 3.3.13 refers). The status of WGS-84 implementation should be the object of periodic examination.~~

9.9 Arrangement should be made for those States that have not yet done so, to make available, as applicable, at least the following types of charts:

a) Aerodrome Obstacle Chart — ICAO Type A;
b) Aerodrome Obstacle Chart — ICAO Type C;
c) Precision Approach Terrain Chart — ICAO;
d) Enroute Chart — ICAO ;
e) Area Chart — ICAO ;
f) Standard Departure Chart — Instrument (SID) — ICAO;
g) Standard Arrival Chart — Instrument (STAR) — ICAO;
h) Aerodrome/Heliport Chart — ICAO;
i) Instrument Approach Chart — ICAO;
j) Visual Approach Chart; and
k) World Aeronautical Chart — ICAO 1:1 000 000

9.10 States which have not yet produced the World Aeronautical Chart — ICAO 1:1 000 000 should in accordance with established sheet distribution and regional arrangements, take measures to ensure the preparation of the sheets for which they are responsible, either through individual effort or with the collaboration of other States or specialized cartographic agencies.

— END —