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BASIC AIR NAVIGATION PLAN
AFRICA-INDIAN OCEAN REGION
VOLUME I - BASIC ANP

First Edition

2001

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NE PAS UTILISER POUR L'EXPLOITATION
NO DEBE USARSE PARA FINES DE OPERACIONES

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ORGANISATION DE L'AVIATION CIVILE INTERNATIONALE
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AFI REGIONAL AIR NAVIGATION PLAN

VOLUME I - BASIC AIR NAVIGATION PLAN (Basic ANP)

Volume I:
AFI BASIC AIR NAVIGATION PLAN
(BASIC ANP)

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1. INTRODUCTION

1.1 New concept for air navigation plans

1.1.1 Air navigation plans set forth in detail the facilities, services and procedures required for international air navigation within a specified area. Such plans contain recommendations which governments can follow in programming the provision of their air navigation facilities and services, with the assurance that facilities and services furnished in accordance with the plan will form with those of other States an integrated system adequate for the foreseeable future.

1.1.2 On 26 February 1997, the ICAO Council decided that the regional air navigation plans (ANPs) should be published in two volumes: a Basic ANP and a Facilities and Services Document (FASID). It was agreed that the Basic ANP would contain stable plan material such as:

a) the geographical area constituted by the flight information regions (FIRs) covered by the plan;

b) the basic operational requirements and planning criteria (BORPC), as approved by the Air Navigation Commission (ANC) for application in all regions except Europe; and

c) the latest planning and implementation guidance formulated for the region through recommendations by regional air navigation (RAN) meetings.

1.1.3 It was agreed that the FASID would set forth the dynamic material from the plan constituted by the facilities and services required for international air navigation within the specified area. The FASID would also include appropriate additional guidance, particularly with regard to implementation, to complement the material contained in the Basic ANP.

1.2 Introduction of CNS/ATM elements into the plan

1.2.1 While the traditional focus of a regional ANP has been to cover the facilities and services required for a period of five years, the introduction of CNS/ATM systems with longer planning horizons is recognized and CNS/ATM planning and implementation elements are being introduced progressively into regional ANPs.

1.2.2 Such introduction of CNS/ATM planning elements is guided by the ICAO Global Air Navigation Plan for CNS/ATM systems, which has been developed so that it has a clear and functional relationship with the regional air navigation plans. This has been accomplished by dividing the Global Plan into two parts. Volume I guides further development of the operational requirements and planning criteria of the regional air navigation plans. The tables in Volume II form the framework to guide the implementation of CNS/ATM systems on a global basis, using the traditional regional planning processes, leading to a global integrated ATM system. The document therefore offers, under one cover, a global snapshot of progress achieved and work remaining toward implementation of CNS/ATM systems, thereby serving as a consolidated planning tool.

1.3 Format and scope of the plan

1.3.1 The first volume of this document is the Basic Air Navigation Plan. It contains general planning criteria, implementation guidelines and stable plan elements. The second volume, the Facilities and Services Implementation Document (FASID) sets forth in general terms the facilities, services and procedures required for international air navigation within a specified area. This FASID contain specifications which governments can follow in programming the provision of their air navigation facilities and services, with the assurance that facilities and services furnished in accordance with the basic plan will form with those of other States an integrated system adequate for the foreseeable future.

1.3.2 In technical scope the plans comprise statements of required facilities and services in the AOP, AIS, ATM, CNS, MET and SAR fields, in sufficient detail to ensure proper functioning of the plan as a whole and its adequacy to meet present and foreseen operational requirements. They also include any special procedures considered necessary to supplement the world-wide procedures contained in Annexes and PANS. As living documents, the format and content of the Basic ANP and FASID should be kept under review by the planning and implementation regional group (PIRG's) in order, inter alia, to meet the requirements of the Global ICAO Communications, Navigation, Surveillance (CNS), Air Traffic Management (ATM) Systems.

1.3.3 In geographical scope the plan is related to one or more of the nine ICAO air navigation regions. The plan may call for the provision of basic facilities and services beyond the charted boundaries of a region where such facilities and services are necessary to meet the requirements of international air navigation within that region.

1.4 States' responsibilities

1.4.1 Each Contracting State is responsible for the provision of facilities and services in its territory under Article 28 of the Convention. The Council has recommended that these facilities and services include those specified in the air navigation plans.

1.4.2 Inclusion in air navigation plan documents of basic facilities and services in non-Contracting States and territories is simply a recognition that they are needed by or likely to affect international civil aircraft operations of Contracting States or the facilities and services of these States.

1.5 Contents of the plan

1.5.1 This Basic Air Navigation Plan document presents in general terms the ICAO plan for the provision of facilities and services for international air navigation in the ICAO AFI Region. It has incorporated in an evolutionary manner requirements emanating from introduction of the Global ICAO Air Navigation Plan for CNS/ATM Systems. The companion document to this plan, the AFI Facilities and Services Implementation Document (FASID) includes detailed information on States' facilities, services, and plans for implementation. Facilities and services outside of the prescribed regional boundaries may also have been included in order to maintain the integrity of "systems" and to ensure in so far as possible that all the facilities and services provided by any one State appear in one air navigation plan document.

1.5.2 Most of the contents of the plan have originated from recommendations of the Seventh AFI Regional Air Navigation Meeting (Abuja, May 1997), and the AFI Air Navigation Planning and Implementation Regional Group (APIRG) activities.

1.5.3 The statement of basic operational requirements and planning criteria for regional planning on which the plan is based is found in Part I - BORPC. In addition, planning in the AFI Region takes into account traffic forecasts which are compiled by the AFI Traffic Forecasting Group. Part II - GEN contains information on traffic forecasting in the AFI Region. Part II also includes information on the present approach to planning which is based on

homogeneous ATM areas and major traffic flow as well as a set of General Guidelines on the establishment and provision of a multi-national facility/service.

1.5.4 It should also be noted that the plan does not list all facilities and services existing in the region but only those required as approved by ICAO Council for international civil aviation operations. Aeronautical information publications, NOTAM and other State documents should be consulted for information on additional facilities and services and for operational information in general.

1.6 AFI Regional Planning

1.6.1 Planning in the AFI Region is organized largely through the PIRG mechanism. The approach being taken to planning is similar to that of other regions and is based on homogenous areas and major international flows as indicated below. In 1998, as a result of a Council-approved special implementation project (SIP) carried out in the CAR/SAM regions a practical regional planning methodology has started to emerge. The different elements of the methodology included the following analysis:

a) Establishment of present level of airspace utilisation;

b) Projection of traffic growth;

c) Identification of congestion (segments) on the flow;

d) Identification of possible ATM solutions;

e) Identification of CNS elements to support ATM solutions;

f) Cost/benefit analysis to determine viability of the project; and

g) Sensitivity analysis to determine most appropriate technical and operational solution as well as their timing for implementation.

1.6.2 The technical cooperation project (UNDP/ICAO RLA/98/003 is conducting in consultation with States concerned the analysis of all the different traffic flows identified in Volume II of the AFI Regional CNS/ATM Plan, applying the methodology developed by the SIP.

1.6.3 The methodology being used has as a cornerstone the use of cost/benefit techniques based on ICAO's Circular 257 which deals with this subject in a substantive way. The recommended approach is used to estimate the economic viability of a planned investment project, that is the extent to which the total benefit of the investment exceeds its total cost. States may wish to identify socio-economic benefits, as well.

1.6.4 To ensure the successful implementation of the ANP in general and that of the CNS/ATM systems in particular, the providers of air traffic services and that the users of these services and financing organizations all need to be advised of the financial implications and convinced of the economic viability of new systems. This can be achieved through the development of a comprehensive cost/benefit analyses which include the financial consequences affecting all the partners involved in the implementation process. Cost/benefit analyses can also provide guidance on the appropriate timing for implementation of various elements of a new system. In addition, to demonstrate the financial viability, business cases for homogeneous ATM areas and/or major air traffic flows can be conducted at the regional, sub-regional or national level.

1.6.5 The costs of air navigation systems elements are to be included in the cost basis for air navigation services charges and, where relevant, airport charges, and recovered in accordance with the principles contained in the *Convention on International Civil Aviation* (Doc 7300) and the *Statements by the Council to Contracting States on Charges for Airports and Air Navigation Services* (Doc 9082).

1.6.6 Financing CNS/ATM systems elements, particularly at the national level, are normally to be approached in a manner similar to that applied to conventional air navigation systems. However, a characteristic of most CNS/ATM systems elements which differentiates them from conventional air navigation systems is their multinational dimension. Consequently, and because of the magnitude of the investments involved, financing of basic systems elements may, in many cases, need to be a joint venture by the States involved at the regional or global level.

1.7 Principles and guidelines for the development of a CNS/ATM plan and its implementation for the region

1.7.1 ICAO's strategic vision is to foster implementation of a seamless, global air traffic management system that will enable aircraft operators to meet their planned times of departure and arrival and adhere to their preferred flight profiles with minimum constraints and without compromising agreed levels of safety.

1.7.2 ICAO's mission of implementation is to develop a seamless, globally coordinated system of air navigation services that will cope with world wide growth in air traffic demand while:

a) improving upon the present levels of safety;

b) improving upon the present levels of regularity;

c) improving upon the over-all efficiency of airspace and airport operations, leading to increased capacity;

d) increasing the availability of user-preferred flight schedules and profiles; and

e) minimizing differing equipment carriage requirements between regions.

1.7.3 It is against this background and in consonance with the Statement of ICAO Policy on CNS/ATM systems implementation and Operation approved by the Council 141/13) on 9 March 1994 and reproduced at the Appendix to Chapter 2 of the Global Plan that CNS/ATM systems are being planned and included in the regional air navigation plan.

CNS-ATM evolution concept

1.7.4 The following CNS/ATM system evolution tables and its objectives constitute the long- term vision of the make up and benefits of future systems in the AFI Region. These tables are presented as reference for use by States in the region in its transition planning process. Final systems configurations described in these tables do not constitute an obligation by States to implement all systems as describes herein. The implementation tables for the AFI Region are contained in the FASID section of this plan.

1.7.5 Table 1-1, CNS Systems Evolution, describes equipment in current and future systems under several operating environments. Table 1-2, Objectives of CNS/ATM Systems, outlines the benefits that these systems can deliver to Air Traffic Management and Flight Operations.

1.7.6 This plan contains a number of the CNS/ATM elements which have been developed in the AFI Regional CNS/ATM plan that is maintained as a working tool by the APIRG mechanism. APIRG continues to study

possible contributions that could enhance the final configuration of CNS/ATM Systems. That mechanism provides for the regular transfer of mature CNS/ATM planning material from the working tool that the CNS/ATM plan constitutes.

1.7.7 Meteorology, aeronautical information service, aerodromes and search and rescue evolution will be included in the evolution tables when the further development of the Global Air Navigation Plan for CNS/ATM systems will be taking place.

Table 1-1. CNS Systems Evolution

	Function	Current System	Future System
Oceanic/Continental en-route airspace with low density traffic (Note 6)	Navigation	LORAN-C NDB VOR/DME Barometric altitude INS/IRS	RNAV/RNP GNSS Barometric altitude High altitude GNSS (Note 2) INS/IRS
	Air-ground communications Ground-ground communications	VHF and HF communication voice system AFTN and ATS speech circuits	VHF and AMSS voice/data communications via ATN (Note 5) HF voice poles only (Note 4) HFDL Data communications via the ATN
	Surveillance	Primary radar/SSR Voice position reports	ADS via the ATN
Continental airspace with high density traffic	Navigation	LORAN-C NDB VOR/DME Barometric altitude INS/IRS	RNAV/RNP GNSS Barometric altitude High altitude GNSS altimetry (Note 2) INS/IRS
	Air-ground communications Ground-ground communications	VHF communications voice systems AFTN and ATS speech circuits	VHF and AMSS voice/data Communications and SSR Mode S data link via the ATN Data communications via the ATN
	Surveillance	Primary radar SSR Mode A/C	SSR Mode A/C or SSR Mode S ADS via the ATN
Oceanic airspace with high-density traffic	Navigation	MNPS LORAN-C Barometric altitude INS/IRS	RNAV/RNP GNSS Barometric altitude High altitude GNSS altimetry (Note 2) INS/IRS
	Air-ground communications Ground-ground communications	HF voice systems AFTN and ATS speech circuits	AMSS voice/data communications via the ATN Data communications via the ATN
	Surveillance	Voice positions reports via HF speech circuits	ADS via the ATN
Terminal areas with high-density traffic	Navigation	NDB VOR/DME ILS Barometric altitude INS/IRS	RNAV/RNP GNSS ILS, NDB (Note 3) VOR/DME (Note 3) Barometric altitude INS/IRS
	Air-ground communications Ground-ground communications	VHF voice systems AFTN and ATS speech circuits	VHF and AMSS voice/data Communications and SSR Mode S data link via the ATN (Note 6) Data communications via the ATN
	Surveillance	PSR SSR Mode A/C	PSR (Note 3) SSR Mode A/C or SSR Mode S ADS via the ATN (Note 1)

Note 1 - The need for primary radar is reduced
Note 2 - To be used where barometric altimetry is not functional especially at high altitudes
Note 3 - Will be progressively withdrawn
Note 4 - Until such time as satellite communications are available
Note 5 - Includes low-altitude, off shore and remote areas
Note 6 - Depends on outcome of feasible studies

Table 1-2. Objectives of CNS/ATM Systems

	AIR TRAFFIC MANAGEMENT	FLIGHT OPERATIONS
General	• ensure that all necessary information including information needed for dynamic flight planning is available to all ground and airborne systems • enhance functional integration of ground systems with airborne systems and the ATM-related aspects of flight operations • enhance the accuracy of conflict prediction and resolution and the provision of real time information to controllers and operators	• enhance the accuracy of information related to flight progress • enhance functional integration of airborne systems and flight operations with ground systems • ensure the provision of accurate information between airborne system elements with ground system elements necessary for dynamic flight planning
Air Operations Safety	• ensure the provision of well adapted and harmonized safe procedures on a global basis • ensure that separation between aircraft is maintained • ensure that clearance between aircraft and obstacles is maintained • provide for enhanced contingency planning • ensure that rapid alerting service is available • ensure that safety levels are maintained as the use of automation increases	• improve pilot situational awareness* • ensure adequate clearance from terrain • enable aircraft to maintain their own separation under specific circumstances* • ensure that safety levels are maintained as the use of automation increases • ensure integrity of database information
Regularity and Efficiency of Air Operations	• provide for the application of global ATM under all operational conditions • improve the application of tactical airspace management through dynamic user involvement, leading to more efficient airspace utilization • improve strategic airspace management while increasing tactical airspace flexibility • ensure the provision of information necessary for tactical and strategic ATFM • enhance over-all tactical and strategic ATFM so that demand does not exceed capacity • increase available capacity without increasing controller workload	• ensure that aircraft can operate under all types of weather conditions • provide for the application of user-preferred flight profiles • ensure that the necessary infrastructure is available to support gate-to-gate operations • improve user capability to optimize flight planning dynamically, in order to improve airspace capacity through more flexible operations • minimize aircraft operating cost penalties • minimize differing equipment carriage requirements between regions
COMMUNICATIONS, NAVIGATION AND SURVEILLANCE		
Communications	• to enhance coverage, accessibility, capability, integrity, security and performance of aeronautical communication systems in accordance with ATM requirements	
Navigation	• to enhance coverage and allow for all weather navigation capability in all airspace, including approach and landing, while maintaining or improving integrity, accuracy and performance in accordance with ATM requirements	
Surveillance	• to enhance and extend effective surveillance to oceanic and remote areas while improving air traffic situational awareness* in the cockpit in accordance with ATM requirements	

* Emerging concept or technology-consensus still to be reached

1.8 Procedure for the amendment of regional plans, including FASID material

1.8.1 The Basic ANP and FASID may be amended by a regional air navigation meeting or by following the amendment procedures below:

PROCEDURE FOR THE AMENDMENT OF APPROVED BASIC AIR NAVIGATION PLANS

(Approved by Council on 25 February 1998)

Introduction

The procedure outlined below has been evolved to provide a means of maintaining basic regional plans in a current condition by correspondence.

General criteria

The Assembly has resolved that regional plans shall be revised when it becomes apparent that they are no longer consistent with current and foreseen requirements of international civil aviation and that, when the nature of a required change permits, the associated amendment of the regional plan shall be undertaken by correspondence between the Organization and the Contracting States and international organizations concerned.

When a State cannot immediately implement a particular part or a specific detail of a regional plan, although it intends to do so when practicable, this in itself should not cause the State to propose an amendment to the plan.

Procedure

If, in the light of the above criteria, any Contracting State (or group of States) of a region wishes to effect a change in the approved basic air navigation plan for that region it should propose to the Secretary General, through the regional office accredited to that State, an appropriate amendment to the plan, adequately documented; the proposal should include the facts that lead the State to the conclusion that the amendment is necessary. Such amendments may include additions, modifications or deletions. (This procedure does not preclude a State having previous consultation with other States before submitting an amendment proposal to the regional office.)

The Secretary General will circulate the proposal, adequately documented, with a request for comments to all provider and user States of the region considered affected as well as to user States outside the region and international organizations which may be invited to attend suitable ICAO meetings and which may be concerned with the proposal. If, however, the Secretary General considers that the proposed amendment conflicts with established ICAO policy, or that it raises questions which the Secretary General considers should be brought to the attention of the Air Navigation Commission, the proposal will be first presented, adequately documented, to the Commission. In such cases, the Commission will decide the action to be taken on the proposal.

If, in reply to the Secretary General's inquiry to States and selected international organizations, no objection is raised to the proposal by a date specified, the proposal shall be submitted to the President of the Council, who is authorized to approve the amendment on behalf of the Council.

If, in reply to the Secretary General's inquiry to States and selected international organizations any objection is raised, and if objection remains after further consultation, the matter will be documented for formal consideration by the Air Navigation Commission. If the Commission concludes that the amendment is acceptable in its original or other form, it will present appropriate recommendations to the Council.

Proposals for the amendment of regional plans submitted by international organizations directly concerned with the operation of aircraft, which may be invited to attend suitable ICAO meetings and which attended the meeting(s) where the relevant plan was prepared, will be dealt with in the same manner as those received from States, except that, before circulating a proposal to States and selected international organizations pursuant to paragraph 3.2 above, the Secretary General will ascertain whether it has adequate support from the State or States whose facilities will be affected. If such support is not forthcoming, the proposal will be presented to the Commission, and the Commission will decide on the action to be taken on the proposal.

Proposals for the amendment of regional plans may also be initiated by the Secretary General provided that the State or States whose facilities will be affected have expressed their concurrence with the proposal.

Amendment to regional plans which have been approved in accordance with the above procedure will be promulgated at convenient intervals.

PROCEDURE FOR THE AMENDMENT OF FACILITIES AND SERVICES IMPLEMENTATION DOCUMENT (FASID)

(Approved by Council on 26 February 1997)

.Amendments of the FASID shall be effected on the basis of an adequately documented proposal submitted by a Contracting State (or a group of States) to the ICAO Regional Office; the proposal should include the facts that lead to the conclusion that the amendment is necessary. Such amendments may include additions, modifications or deletions to the FASID. (This procedure does not preclude a State having previous consultation with other States before submitting the amendment proposal to the ICAO Regional Office.)

The ICAO Regional Office will circulate the proposal, adequately documented, with a request for comments to the provider States in the region and to user States except those which obviously are not affected, and, for information and comments if necessary, to international organizations which may be invited to attend suitable ICAO meetings and which may be concerned with the proposal. If, however, it is considered that the proposed amendment conflicts with established ICAO policy, or that it raises questions which should be brought to the attention of the Air Navigation Commission, the proposal will be adequately documented and presented to the Air Navigation Commission. In such cases, the Commission will decide the action to be taken on the proposal.

If, in reply to the ICAO Regional Office's inquiry, no objection is raised to the proposal by a specified date, it will be deemed that a regional agreement on the subject has been reached and the proposal shall be incorporated into the FASID.

If, in reply to the ICAO Regional Office's inquiry, any State objects to the proposal, and if objection remains after further consultation, the matter will be documented for discussion by the respective planning and implementation regional group (PIRG) and, ultimately for formal consideration by the Air Navigation Commission, if necessary. If the Commission concludes that the amendment is acceptable in its original or other form, it will present appropriate recommendations to the Council.

Proposals for the amendment of the FASID submitted by international organizations directly concerned with the operation of aircraft in the region, which may be invited to attend suitable ICAO meetings where the FASID was prepared, will be dealt with in the same manner as those received from States, except that, before circulating the proposal to all interested States, it will be ascertained whether the proposal has adequate support from the State or States whose facilities or services will be affected. If such support is not forthcoming, the proposal will not be pursued.

Proposals for the amendment of the FASID may also be initiated by the ICAO Regional Office provided that the State or States whose facilities or services will be affected have expressed their concurrence with the proposal.

Amendments to the FASID which have been approved in accordance with the above procedure will be promulgated at convenient intervals.

PART I - BASIC OPERATIONAL REQUIREMENT AND PLANNING CRITERIA (BORPC)

PART I - BASIC OPERATIONAL REQUIREMENTS AND PLANNING CRITERIA (BORPC)

1. INTRODUCTION

1.1 On 17 June 1999, the Air Navigation Commission approved this Statement of Basic Operational Requirements and Planning Criteria which is appropriate to all the ICAO regions except the European Region.

1.2 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 Navigation Plan for CNS/ATM Systems, 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. The importance of planning on the basis of homogeneous areas and major traffic flows, as referred to in the Global Plan, is also stressed.

1.3 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.

2. GENERAL (APPLICABLE TO BOTH INTERNATIONAL COMMERCIAL AIR TRANSPORT AND INTERNATIONAL GENERAL AVIATION)

2.1 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 and its possible effects on adjacent regions.

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

2.3 The planning should be based on traffic forecasts and should 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.

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

a) supersonic turbo-jet aeroplanes;

b) subsonic turbo-jet aeroplanes;

c) multi-engine turboprop aeroplanes;

d) 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) helicopters; and

f) other aircraft (V/STOL, gliders, balloons, etc.). ***Note.*** *– Group f) to be included only to the extent that it requires consideration in regional planning*

2.5 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.

2.6 **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.

2.7 **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).

2.8 **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).

2.9 **Piston-engine aeroplanes and single-engine turboprop aeroplanes**

a) *Climb performance*:

—Type A: 2 – 10 m/s (500 – 2 000 ft/min);

—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).

2.10 **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 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.*

2.11 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.

2.12 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.

2.13 Planning should take into account the need for an adequate number of technically trained and competent 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 need.

2.14 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.

2.15 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.

2.16 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.

2.17 It is essential that the over-all 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.

2.18 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.

3. AERODROMES

3.1 International commercial air transport operations

3.1.1 Regular aerodromes and their alternates should be determined to meet the needs 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 requirement of en-route alternate aerodromes for extended-range twin-engine operations, as and when necessary.

3.1.2 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.

3.1.3 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.

3.1.4 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.*

3.1.5 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.

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

3.2 International general aviation (IGA)

3.2.1 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.

3.2.2 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.

4. AIR TRAFFIC MANAGEMENT

4.1 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 and the type, density and complexity of traffic.

4.2 Airspace management

4.2.1 The airspace structure and organization should include a network of ATS routes 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 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.

4.2.2 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. The airspace organization should be indicated in accordance with the ICAO airspace classification.

4.2.3 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 co-ordination. 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 co-ordinated, and promulgated in a timely manner. Military operations should not only be promulgated in a timely manner but also through international dissemination (international NOTAM).

4.2.4 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.

4.3 **Air traffic services**

4.3.1 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 co-operative 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 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.

4.3.2 Area control service should be provided for IFR flights 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 4.3.1 above.

4.3.3 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.

4.3.4 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.

4.3.5 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.

4.3.6 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 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 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.

4.3.7 Information on destination weather, 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.

4.3.8 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.

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

4.3.10 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.

4.3.11 To assist in the prevention of CFIT, every effort should be made, in co-operation 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 co-operation 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.*

4.4 **Air traffic flow management**

4.4.1 Air traffic flow 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.

5. SEARCH AND RESCUE

5.1 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.

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

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

5.3 Where aircraft of the long-range (LRG) 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.

5.4 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.

6. COMMUNICATIONS

6.1 Aeronautical fixed service (AFS) planning and engineering

6.1.1 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.

6.1.2 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.

6.1.3 a) If a meteorological operational telecommunication network is recommended, it 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, AIRMET, volcanic ash and tropical cyclone advisory messages and special air-reports	5 minutes
Amendments 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

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

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

6.1.4 Aerodrome forecast messages 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.

6.1.5 The dissemination means for 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.

6.1.6 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.

6.1.7 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 service (AMHS), for example. As such, the planning for ATN should include the provision of AFTN/AMHS gateways to facilitate the exchange of information between existing and newly established networks.

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

6.2 **Aeronautical mobile service (AMS) and aeronautical mobile satellite service (AMSS)**

6.2.1 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.

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

6.2.2 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 clearance delivery.

6.2.3 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.

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

6.2.5 An air-to-air VHF communication channel (INTERPILOT) 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.

6.3 Frequency assignment plans

6.3.1 Frequency assignment work should be done in accordance with the method 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.

7. NAVIGATION

7.1 General

7.1.1 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.

7.1.2 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.

7.1.3 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.

7.2 International commercial air transport operations

7.2.1 En-route aids

7.2.1.1 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.

7.2.1.2 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, VOR supplemented as necessary by DME should be installed as the primary aid for this purpose.

7.2.1.3 Where VOR is used, supplemented as necessary by DME, a total navigation error value for VOR of ±5E (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 ±3E, appropriate precautions should be taken in respect of the routes concerned.

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

7.2.2 **Terminal area aids**

7.2.2.1 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.

7.2.2.2 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, NDBs can be used for this purpose. 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 and when improved accuracy in navigation is a prerequisite to such flexibility.

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

7.2.3.1 The standard non-visual aids to final approach and landing, supporting precision approach and landing operations, shall comply with general provisions in Annex 10, Volume I, 2.1, and their introduction and application are expected to be in line with the strategy contained in Attachment B to Volume I.

7.2.3.2 In planning the requirements for aids to final approach and landing, each aerodrome should be considered in relation to its traffic, its weather 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, 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.

7.2.3.3 **Non-precision instrument approach procedures**

7.2.3.3.1 Non-precision instrument approach procedures can be based on aids other than the standard non-visual aids (see 7.2.3.1 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.

7.2.3.3.2 Particular account should be taken of 7.2.3.3.1 in the design of non-precision instrument approach procedures for use with GNSS which should also support SIDs and STARs.

7.3 **International general aviation**

7.3.1 Short-distance aids

7.3.1.1 Appropriate aids such as GNSS for short-distance navigation should be provided to serve the additional aerodromes referred to in 3.2.1 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.

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

7.4.1 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.

8. **SURVEILLANCE**

8.1 Surveillance systems should provide an adequate support to ! and meet the needs of ! ATM. A table of radar facilities, 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).

8.2 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, provided that the required level of safety is maintained, automatic dependent surveillance (ADS) may be used in airspace where surveillance by radar is either impracticable or cannot be justified in terms of traffic volumes and air safety.

8.3 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.*

9. **METEOROLOGY**

9.1 **World area forecast system (WAFS) ! Regional aspects**

9.1.1 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.

9.1.2 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.

9.1.3 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.

9.1.4 Requirements for the issuance of medium-level significant weather (SIGWX) charts (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.

9.1.5 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.

9.1.6 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.

9.2 **Meteorological services to be provided**

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

9.2.2 Aerodrome forecasts and amendments should be exchanged to meet the needs of current flight operations, including flights under centralized operational control. Aerodrome forecasts 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 designated to provide OFIS (including VOLMET) broadcasts for aircraft in flight.

9.2.3 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 conditions.

9.2.4 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.

9.3 **Meteorological observations and reports**

9.3.1 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 conditions so justify, and/or they are required for any OFIS (including VOLMET) broadcasts which may be recommended and relevant OPMET bulletin exchange schemes.

9.3.2 Routine and selected special reports should be exchanged to meet the needs of current flight operations. Reports for final destinations and departure and destination alternates should be disseminated so as to be available at departure aerodromes within about two hours' flying time from the aerodrome to which those reports refer. In addition, they should be disseminated to be available 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.

9.3.3 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.

9.3.4 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.

9.4 Aircraft reports and SIGMET information

9.4.1 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).

9.4.2 SIGMET 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 departure and 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.

9.4.3 Notwithstanding the requirements stated in 9.4.2, 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.

9.4.4 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.

9.5 International Airways Volcano Watch (IAVW) - Regional aspects

9.5.1 Planning for regional aspects of the IAVW should be undertaken, including the designation of volcanic ash advisory centres (VAAC) 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.

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* With possible exceptions for certain routes

9.6 Tropical Cyclone Watch

9.6.1 A tropical cyclone advisory centre (TCAC) should be designated for regions affected by tropical cyclones. 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.

10. AERONAUTICAL INFORMATION SERVICES AND AERONAUTICAL CHARTS

10.1 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).

10.2 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.

10.3 Arrangements for the transmission and exchange of NOTAMs should be examined 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.

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

10.5 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.

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

10.7 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 4.3.11 refers). The status of WGS-84 implementation should be the object of periodic examination.

PART II - GENERAL PLANNING ASPECTS (GEN)

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1. INTRODUCTION

1.1 As traffic volumes grow world wide, the demands on the ATS provider in a given airspace increase, as do the complexities of air traffic management. The number of flights unable to follow optimum flight paths also increases with an increase in traffic density. This creates pressure to upgrade the level of ATS by, inter alia, reducing separation standards.

1.2 Air Traffic Forecasts

1.3 Air traffic forecasts are produced in response to the needs of Member States of ICAO, air navigation service providers and regional planning groups, in particular the AFI Planning and Implementation Regional Group (APIRG).

1.4 A uniform strategy has been adopted by ICAO for the purpose of preparing traffic forecasts in support of the regional planning process. This involves the establishment of a small group of forecasting and planning experts in each of the ICAO regions. The AFI Traffic Forecasting Task Force (TF/TF) was formed in 1998 with the objective of developing traffic forecasts and other planning parameters required for the planning of Air Navigation Services in the AFI Region.

1.5 The main purpose of the AFI-TF/TF is to support the planning of air navigation services in the AFI region. Traffic forecasts and peak-period planning parameters are important in anticipating where and when airspace and airport congestion occur. It is then possible to plan for the required expansion of capacity. These forecasts also have an important role in planning the implementation of CNS/ATM systems components. The primary users of the forecasts developed by the AFI TF/TF are expected to be member states of ICAO, ATS service providers in the region, and APIRG.

1.6 Implementation of CNS/ATM systems are expected to be able to provide increased system capacity and full utilisation of capacity resources as required to meet traffic demand [Doc 003, para. 2.1.3.2 b)] , while producing additional benefits in the way of dynamic accommodation of user-preferred three-dimensional and four-dimensional flight trajectories [Doc 003, para. 2.1.3.2 c)] and maintenance of, or increase in, the existing level of safety [Doc 003, para. 2.1.3.2 a)] . The potential of new technologies to significantly reduce service costs, however, will require new arrangements in the provision of services and changes in air traffic management procedures.

1.7 Chapter 3 of the Global Plan provides the means to begin the process of identification of ATM requirements, on the basis of identified homogeneous ATM areas and major international traffic flows, followed by the determination of the regional and global CNS system elements needed to meet the ATM requirements.

1.8 **Regional Implementation Concept**

1.9 The Regional Implementation Concept defined by APIRG is linked to ATM improvement for the AFI Region and the communication, navigation and surveillance requirements this generates. The ATM improvements have been defined on the basis of the major international traffic flows identified in the homogenous areas as set out in the FASID Table xxx.

1.10 The method of identifying homogeneous ATM areas involves consideration of the varying degrees of complexity and diversity of the world-wide air navigation infrastructure. Based on these considerations, it is considered that planning could best be achieved, at the global level, if it were organized based on ATM areas of common requirements and interest, taking into account traffic density and level of sophistication required.

1.11 Major international traffic flows consist of areas which include groupings of routes wherein it is specified a detailed plan for the implementation of CNS/ATM systems and procedures, where the objective is to attain a seamless system throughout the area concerned. These are defined by origin and destination geographic areas which could be States/Territories, specific portions of States/Territories, or groupings of smaller States/Territories. They may also include Oceanic and Continental en-route airspaces.

1.12 The basic planning parameter is the number of aircraft movements which must be provided with ATM services along a particular international traffic flow. Estimates and forecasts of annual aircraft movements over the planning period are required for high level planning. Forecasts of aircraft movements in peak periods, such as during a particularly busy hour, are needed for detailed planning. Additionally, the establishment of major international traffic flows will require appropriate civil/military coordination and consideration of special use airspace (SUA).

1.13 Considering the global guidelines described in the preceding paragraphs, the AFI Region should take into account the need to coordinate their regional plan with the adjacent Regions, specially with the EUR Region, since air traffic density between this Region and the AFI Regions is quite high. Coordination of the regional AFI plan for the CNS/ATM transition with the indicated regions will be necessary. Finally, in the long-term there would be a continuing need for coordination after the completion of the Global Transition Plan.

1.14 **States/Territories Plans**

1.15 States/Territories have the responsibility for implementation of the new CNS/ATM system within their areas of responsibility. It will however be necessary for each State within the AFI Region to develop and publish its own CNS/ATM implementation plan, taking into account of the AFI regional CNS/ATM Plan. These State Plans should be coordinated within the Flight Information Regions and with adjacent Flight Information Regions to ensure the optimum use is made of all aspects of CNS/ATM.

1.16 **Airlines Plans**

1.17 The airlines have already invested significant sums to equip aircraft with transitional CNS/ATM systems such as FANS. Data link, RNAV and Satcom. These systems permit use of currently available technologies to obtain early benefits within the CNS/ATM concept. To retain a cost-effective evolution towards CNS/ATM the airlines believe that it is imperative to ensure that appropriate accommodation for these transitional systems be retained.

1.18 The airlines will continue to pursue implementation of CNS/ATM on an evolutionary basis.

1.19 **Benefits**

1.20 With the benefits from the new CNS/ATM systems, there is need and enthusiasm for its implementation, but there are many hard decisions to be made, particularly on timing. Global and regional cooperation on an unprecedented scale will be required.

1.21 The regional planning process is the principal engine of ICAO's planning and implementation work. It is here that the top-down approach, comprising global guidance and regional-harmonization measures, converges with the bottom-up approach constituted by States/Territories and aircraft operators and their proposals for implementation options.

1.22 In its most basic form, the output from the regional planning process should be a listing of air navigation facilities and services together with their achievable time frames, necessary for CNS/ATM systems implementation. These listings will be included in the AFI regional air navigation plan (ANP) and maintained updated by the AFI planning and implementation regional group (APIRG) with the assistance of ICAO's Regional Offices.

1.23 The objective of the global plan is to guide a progressive and coordinated world-wide implementation of the elements of the future air navigation system in a timely and cost-beneficial manner. To this end, the plan fulfills two principal functions:

a) it provides guidelines for use by regional planning bodies, States/Territories, service providers and users, for transitions from the current ground-based air navigation system to the future satellite-based system; and

b) it functions as a benchmark for the evaluation of implementation progress.

1.24 The implementation of the current CNS/ATM systems has basically been a regional responsibility, i.e. States/Territories or groups of States/Territories working together within the framework of the concept and implementation strategy developed for the respective region by the corresponding regional planning group. ICAO air navigation planning should continue to be conducted through the established regional planning process.

1.25 **Evolution and Implementation**

1.26 In considering the overall system concept, the questions of evolution and transition are most important. For instance, careful planning will be necessary to ensure that aircraft of the future are not unnecessarily required to carry a multiplicity of existing and new CNS equipment. In addition, as already referred to, there is a close relationship between the required CNS services and the desired level of ATM and, finally, there is, for reasons of both economy and efficiency, a need to ensure that differences in the pace of development around the world do not lead to incompatibility between elements of the CNS/ATM system. Particularly, because of the wide coverage of satellite CNS systems, the above considerations call for conscientious world-wide and regional co-ordination of the planning and implementation if such systems are to be optimized.

1.27 **Human factors considerations**

1.28 The high level of automation and interdependency of the CNS/ATM system raises several human factors issues. Lessons learned concerning human factors indicate that they should be considered as an integral part of any plan to implement the new technologies. The most important human factors issue regarding the human-machine interface is the ability of the human operator to maintain situational awareness. A by-product of degraded situational awareness is mode error. Mode error is defined as a joint human-machine system breakdown in which a human loses track of the current machine configuration, and a machine interprets the human's input differently from that intended. The "joint human-machine system" should be considered during design of the systems so that mode errors can be pro-actively anticipated and eliminated. Furthermore, existing air navigation systems and CNS/ATM systems will operate in parallel for period of time. Operating old and new systems in parallel will introduce human factors considerations that will also need to be considered.

1.29 Human factors issues should be considered before CNS/ATM technologies are implemented, during the process of design and certification of the technology and associated standard operating procedures. States in the AFI Region and organizations which design and provide CNS/ATM systems should take into account ICAO guidelines when developing national regulations and incorporate Human Factors Standards in the processes of design and certification of equipment and procedures.

1.30 Involving human factors expertise during technology design might incur additional initial expenses, but the costs are paid once in the system's lifetime. Coping with flawed human-technology interfaces through training will result in a requirement for continuous training and higher costs.

1.31 **Training planning**

1.32 A major goal of CNS/ATM systems is to create a seamless air navigation system. A seamless air navigation environment will require an international team prepared to perform their jobs in such an environment. At the same time, shortcomings in human resource planning and training are frequently cited as an important reason for the lack of implementation of Regional Air Navigation Plans. Human resource development challenges will be compounded during the transition period to CNS/ATM systems. As the existing and emerging air navigation technologies will operate in parallel for a period of time, civil aviation personnel will need to learn new skills, as well as retain the skills needed to operate and maintain existing systems. To meet this challenge, a cooperative approach should be used in civil aviation training within the AFI Region. This approach should:

a) ensure that the training requirements of the AFI Region are available within the regions;

b) facilitate a training planning process that would help to determine the training capabilities needed within the region or sub-regions for specialized types of training that individual States cannot justify based on their national training needs alone;

c) ensure that an adequate market exists to support the development and ongoing implementation of high quality training within one or more training centres within the region or sub-regions; and

d) endeavour to distribute regional training activities among more training centres within the region or sub-regions.

1.33 Appropriate bodies should be established to facilitate regional and sub-regional training planning. A quantitative approach should be used to determine the training capabilities needed within a region or sub-

region. Decisions concerning training capabilities required should be based on an aggregate of training demand for existing air navigation technologies, as well as emerging technologies. A State-to-State consultative process should be used to formulate a plan for the establishment of specific regional training centres.

1.34 APIRG should ensure that training offered within the AFI region is sufficient to meet the implementation requirements of the regional air navigation plan.

2. IMPLEMENTATION STRATEGY

[Doc 003, paras. 2.1.1 to 2.1.3.3]

2.1 The provider, user States and Organizations concerned acknowledge that the AFI Region stands to derive great benefits from the introduction of the new integrated ICAO CNS/ATM System. It is recognized that it is only with the full coordination of implementation activities that the complete benefits of CNS/ATM will be realized.

2.2 Consequently, and in order to ensure a coherent, timely, co-ordinated, cost-effective, operationally oriented implementation of the integrated ICAO CNS/ATM system in the AFI Region, the approach and strategy contained in this document are adopted at the AFI Regional level for use and compliance by provider and user States and Organisations concerned.

2.3 In deciding the possible introduction at regional level of new elements of the integrated CNS/ATM system requiring the carriage of additional equipment on-board aircraft, APIRG will take into consideration the need of airspace users to be given adequate advance notice for major new equipment fittings.

2.4 General Principles

2.4.1 The AFI Region shall aim at taking advantage in a timely manner, of those individual elements of the CNS/ATM systems for which positive benefit in relation to overall cost has been demonstrated or recognized by those concerned.

2.4.2 It is recognized that the full implementation of all ATM objectives with their CNS requirements will take time. The AFI Region, therefore, will adopt a step by step approach starting with the ATM objectives which can be achieved with in the short term with minimum CNS requirements or relatively low cost.

2.4.3 The introduction of individual elements of the new integrated CNS/ATM concept in the AFI Region shall be carried out in a co-ordinated and coherent manner, under the aegis of the AFI Planning and Implementation Regional Group (APIRG). In this context it is essential to ensure that:

a) adjacent systems shall interface in such a way that airspace boundaries between control sectors, Flight Information Regions, or Air Navigation Regions, are transparent.

b) systems must remain responsive to operational requirements at every step of development, avoiding to the extent possible, discontinuities in evolution likely to cause disturbances to the operational environment.

2.4.4 At least in the short and medium term, the difference in equipage between the domestic and regional operators on the one hand, and the transcontinental operators on the other hand, will be significant. The transcontinental operators will be fully equipped to operate in regions such as Europe and will certainly value taking advantage of their capabilities to obtain more economic flight profiles. As far as the domestic and regional operators are concerned, because they would not operate in other regions with the new CNS/ATM requirements for equipage/approval, they may not derive a positive cost/benefit from equipping. In light of the foregoing, long haul operators which are adequately certified and/or approved should be given timely full benefit and the domestic and regional operators be allowed to choose either to equip (approved or certified) or to fly segregated airspace.

2.4.5 The seamless airspace, which is indispensable for total benefit, will not be achieved without close coordination among providers and between providers and users. It is then more and more necessary and important that providers and users agree before any decision on implementation is taken. In this regard the following should be kept in mind:

! Communications

The objective of the region is full deployment of an ATN environment with the possibility to accommodate FANS1/A and the highest degree of functionality possible.

! Navigation

The ultimate objective of the region is a navigation system based on satellite as a sole means of navigation for all phases of flight. As far as augmentation is concerned, any deployment should be in line with the regional policy as defined and approved by APIRG.

! Surveillance

Even if the region is recognized as a valid candidate for ADS, enough caution is necessary at all levels in order to avoid ground equipage with prototypes and/or systems without operational benefits.

2.4.6 All planned operations, including domestic, civil and military operations to the extent that they may influence the ATS system, should be taken into account when system capacity is defined to meet the requirements.

2.5 The objectives

2.5.1 The future system must evolve from the present system so as to meet user needs to the maximum extent possible while taking the potential benefits from the application of new system technologies. This evolution should be guided by the principle of maintaining an optimum separation assurance.

2.5.2 Of the overall goals of the future ATM system, the following are specially of relevance in the AFI context:

a) maintenance of, or increase in, the existing level of safety;

b) increased system capacity and full utilisation of capacity resources as required to meet traffic demand;

c) dynamic accommodation of user-preferred three-dimensional and four-dimensional flight trajectories;

d) accommodation of full range of aircraft types and airborne capabilities;

e) improved provision of information to the users such as weather conditions, traffic situation, availability of facilities;

f) improved navigation and landing capabilities to support advanced approach and departure procedures;

g) increased user involvement in ATM decision making including air-ground computer dialogue for flight negotiation;

h) create, to the maximum extent possible, a single continuum of airspace, where boundaries are transparent to users; and

i) organize airspace in accordance with ATM provision and procedures.

2.5.3 Priority should be given to the implementation of systems or functions specifically aimed at the attainment of any of these stated objectives.

2.6 Implementation mechanism

[Doc003, para. 3.4.4.1]

2.6.1 Implementation Coordination Groups (ICGs)

2.6.1.1 The achievement of the intended benefits along each routing or within each area of affinity is entirely dependent on the coordinated implementation of the required elements by all concerned, provider and users alike. This part introduces the three pillars on which the attainment of that objective will rely: the Implementation Worksheets, the Implementation Coordination Groups (ICG's), and the Time lines Reference Sheets (TRS).

[Doc003, para. 3.4.4.3]

2.6.1.2 Implementation Coordination Groups (ICGs) should be established for each routing and for each area of affinity. Members will be all those providers and users alike, required to implement systems either on the ground or airborne on the area of routing concerned, i.e., States and or Organizations responsible for the provision of services in the FIRs concerned, and the Users Organizations.

[Doc003, para. 3.4.4.4]

2.6.1.3 On their implementation role, the ICGs are independent of the Regional Planning machinery. They will nevertheless be guided by the IWS, on which they are free to improve and detail as necessary. However, any substantive modification either of objectives or time frames must be submitted to APIRG through the CNS/ATM Sub-Group in order to ensure overall conformity at the Regional level. The ICGs will, in their work, give due regard to the maintenance of, or increase in, the existing level of safety.

[Doc003, para. 3.4.4.5]

2.6.1.4 The ICAO Secretariat will coordinate the establishment and activities of ICGs. The ICGs will appoint a coordinator for each element (i.e. for each IWS). The coordinator will be responsible to initiate and coordinate actions required to carry out implementation and among all concerned. The coordinator will also be responsible to report to the CNS/ATM Sub-group on progress, on eventual constraints being experienced, or on any other matters of concern. These will be mostly reflected in the TRS as detailed below.

[Doc003, para. 3.4.4.6]

2.6.1.5 The Time lines Reference Sheets are intended to ensure timeliness of implementation and to identify deviations so that corrective action can be initiated on a timely manner. They show, again for each element and for each area of affinity, the planned date of implementation and the FIRs and States concerned. Against each FIR, they will show the date on which the responsible authority has declared it can meet the requirement. This will allow for immediate identification of any significant deviation where corrective action may be required.

PART III - AERODROME OPERATIONS (AOP)

PART III - AERODROME OPERATIONS (AOP)

1. INTRODUCTION

1.1 This part of the Africa and Indian Ocean Basic Air Navigation Plan contains elements of the existing planning system and introduces the basic planning principles, operational requirements and planning criteria related to Aerodrome Operational Planning (AOP) as developed for the AFI Region.

1.2 As a complement to the statement of basic operational requirements and planning criteria set out in Part I of the Basic ANP, Part III constitutes the stable guidance material considered to be the minimum necessary for effective planning of AOP facilities and services in the Africa and Indian Ocean Region. This guidance material has been developed through the ICAO regional planning processes which, in the case of the AFI Region, is based largely on the work of the Regional Offices in close cooperation with AFI States and on the outcome of the AFI regional air navigation meetings. Background information of importance in the understanding and effective application of this part of the plan is contained in the Report of the Seventh Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9702) and the Sixth Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9298).

1.3 The Standards, Recommended Practices and Procedures to be applied and other related guidance material are contained in:

a) Annex 14 - Aerodromes, Volume I
b) Annex 10 - Aeronautical Telecommunications - Volume I;
c) Airport Planning Manual (Doc 9184);
d) Aerodrome Design Manual (Doc 9157);
e) Airport Services manual (Doc 9137).

1.4 The elements of guidance referred to above are presented in the following paragraphs with appropriate cross-references to APIRG conclusions and/or AFI RAN Meeting recommendations. A basic list of aerodromes (including their designations) required in the AFI Region to serve international civil aviation operations is given in the following Table AOP 1. The details of the facilities and services to be provided by States in order to fulfill the requirements in this field are contained in the AFI FASID (Part III).

2. AERODROME OPERATIONAL PLANNING (AOP)

2.1 *General* (Table FASID AOP 1)
[AFI/7, Rec. 2/2, 3.1]

2.1.1 The requirements indicated in Table FASID AOP 1 constitute the plan for the runway physical characteristics, radio, lighting and marking aids of regular and alternate aerodromes required for international scheduled air transport, non-scheduled air transport and general aviation operations.

2.1.2 Table FASID AOP 1 lists the alternate aerodromes for each regular aerodrome. An aerodrome which is required for alternate use normally does not serve all route stages planned into the associated regular aerodrome. Route stages served by a particular alternate aerodrome are identified in the Report of the Meeting (Doc 9702).

2.2 *Maintenance of physical characteristics in excess of those tabulated in Table FASID AOP 1*
[AFI/6, Rec. 4/2]

2.2.1 At aerodromes already provided with physical characteristics in excess of those indicated in Table FASID AOP 1, it should be ensured that the full characteristics are maintained. It should be understood that the extent to which the physical characteristics in excess of those tabulated in Table FASID AOP 1 should be maintained will be determined by States in the light of prevailing circumstances and cost/benefit considerations.

2.3 *Retention of visual and non-visual aids in excess of those tabulated in Table FASID AOP 1*
[AFI/7, Rec. 3/3]

2.3.1 States which already provide at aerodromes visual and non-visual aids in excess of those indicated in Table FASID AOP 1 should ensure that they are retained.

2.4 *Implementation of physical characteristics, visual and non-visual aids at aerodromes*
[AFI/6, Rec. 4/7]

2.4.1 Requirements listed in Table FASID AOP 1 should be studied and a plan for their implementation developed, taking into account the following criteria:

a) *General*

1) States should consult with interested aircraft operators and other users to re-confirm the Plan requirements or study the provision of alternative facilities, where appropriate.

2) Periodic meetings should be arranged between States and interested aircraft operators to review the progress of implementation of the Plan requirements and to consider any action necessary.

b) *Physical characteristics*

1) Any requirements for extending a runway should be considered before the implementation of approach and landing aids for that runway for two reasons:

i) the length of the time required to plan and implement a runway extension;

ii) the extension of a runway normally requires the relocation of the runway end or threshold and the touchdown zone which, in turn, will determine the positioning of other visual and non-visual aids.

2) When a new runway is under construction or where an existing runway is being extended or strengthened, it is recommended that provision be made to facilitate the installation at a later date of centre line and touchdown zone lighting, even though this may not be a present requirement.

c) *Visual and non-visual aids*

1) Many of the aerodromes will have development plans progressing from non-instrument runways through instrument approach runways to precision approach runways Category I and Category II and the installation of aerodrome visual and non-visual aids should follow the criteria laid down below:

i) when developing a runway for non-instrument operations planned for use at night and during the lower range of visual meteorological conditions by day, consideration should be given to the provision of a simple approach lighting system, runway edge lights, threshold lights, runway end lights, taxiway lights and, where necessary, obstruction lights. Before commencing any turbo-jet aircraft operations, at least a visual approach slope indicator system is required. An aerodrome beacon may be required depending on local circumstances;

ii) for instrument approach runways planned for day and night operations, requirements are stated in the appropriate Annexes and include a simple approach lighting system, runway edge lights, threshold lights, runway end lights, taxiway lights and, where necessary, obstruction lights. As for non-visual aids, an ILS localizer only, or VOR, or VOR/DME, or locator are required. For turbojet aircraft operations, a visual approach slope indicator system is required (see 2) below). An aerodrome beacon may be required depending on local circumstances;

iii) for precision approach runway Category I, the visual aids have to be considered in relation to Annex 14, Chapters 5 and 6, Volume 1 and include a precision approach Category I lighting system, runway edge lights, threshold lights, runway end lights, taxiway lights, and where necessary, obstruction lights. For turbojet aircraft operations, a visual approach slope indicator system is required (see 2) below). An aerodrome beacon may be required depending on local circumstances. For efficient operations by turbojet aircraft having the capability of making auto coupled approaches, it is necessary that the signal quality of the ILS be stable down to the runway. This requirement may be met by ensuring that the signal quality meets the standard for a Category II ILS. Consideration should therefore be given to the application of Annex 10, Volume I, 3.1.3.3.2.2, 3.1.3.4.2, 3.1.3.6.2, 3.1.3.7.3, 3.1.3.11.3.2, 3.1.5.4.2, 3.1.5.6.3, 3.1.5.7.3.2 and other relevant paragraphs. Further, the introduction of ILS Category II signals quality should be promulgated in the Aeronautical Information Publication in accordance with Annex 10, Attachment C, 2.13.

2) Where cost benefit considerations have to be taken into account, the following order of priority for the installation of the aids to final approach and landing is recommended. It should be understood that the priorities listed below should be considered in the light of operational factors if, for cost/benefit reasons, it is not possible, for the time being, to implement the full guidance facilities referred to in sub-paragraphs c)1) ii) and c)1) iii) above.

First priority:

ILS on a main landing runway which has significant traffic.

Visual approach slope indicator system on a main landing runway, whether the runway is provided with a fully operational ILS or not.

Second priority:

Visual approach slope indicator system at the reciprocal end of a main landing runway provided with an ILS.

Third priority:

Visual approach slope indicator system on a main landing runway already provided with an operational ILS and which is used by turbojet aircraft.

3) Progression to full Category II precision approach would require visual and non-visual aids in accordance with Annex 10 and Annex 14, Volume 1.

3. Aerodrome services

3.1 *Aerodrome equipment, installations and services*
[AFI/7, Conc. 4/2]

That for the general improvement of the safety, efficiency and regularity of aircraft operations, States take appropriate action to provide as soon as possible the equipment, installations and services recommended in Annex 14, Volume I, Chapters 8 and 9.

3.2 *Rescue and fire fighting services*
[AFI/7, Conc. 4/6]

a) The attention of States concerned should be drawn to existing deficiencies in the rescue and fire fighting services at their aerodromes;

b) States should give priority to the provision of adequate rescue and fire fighting services at their international aerodromes in accordance with the provisions of Annex 14, Volume I;

c) the regional offices should continue the practice of carrying out regular reviews of the status of RFF services at international aerodromes in States in their respective areas of accreditation;

d) States should be encouraged to continue efforts on training of RFF personnel including familiarization of the types of aircraft operating at their aerodromes in consultation with aircraft operators; and

e) this subject should be maintained in the work programme of AOP/SG.

3.3 *Removal of disabled aircraft*
[AFI/7, Rec. 4/5]

States should ensure that adequate coordination between airline operators and airport administrations exists to plan for the removal of disabled aircraft on or adjacent to movement areas, and that information concerning the capability for such aircraft removal is included in the aeronautical information publications.

3.4 *Pavement surface conditions*
[AFI/7, Rec. 4/4]

States should make a survey of runways and identify those which have harmful irregularities and poor braking action when wet, in order to promulgate information in accordance with the provisions in Annex 15 and for taking appropriate corrective action.

3.5 *Bird hazard control and reduction*
[AFI/7, Conc. 4/7]

States facing bird hazard problems should:

a) establish a local bird hazard committee involving civil aviation authorities, airport authorities, aircraft operators, relevant public administrations, as well as local authorities, for ensuring a coordinated approach towards eliminating bird hazards in and around an aerodrome in accordance with the provisions contained in Annex 14, Volume I and the *Airport Services Manual*, Part 3 and make use of relevant expertise to advise on bird hazard reduction methods;

b) take necessary measures to make airports and their vicinity unattractive to birds in accordance with the provisions of the *Airport Services Manual*, Part 3, Chapter 7;

c) set up bird control units at airports to implement effective measures for dispersal of birds as the situation dictates;

d) remove basic attractions to birds, in particular, water, food, nesting sites and resting places, etc.;

e) avoid, where possible, the creation of refuse dumps that would attract birds, within a distance of 13 km from the aerodrome, in such a way that in the opinion of the Civil Aviation Authorities, the safety of aircraft operations is not endangered (refer to *Airport Services Manual*, Part 3, Chapter 7);

f) require that operators at their aerodromes provide timely reports on bird strike incidents/accidents involving their aircraft;

g) submit bird strike reports to ICAO, on a regular basis, to facilitate effective use of the IBIS programme as called for in ICAO Doc 9332;

h) ensure that the most recent information on the presence of birds and associated hazards be made available to the ATC tower for advising arriving and departing aircraft;

i) promulgate a requirement in the aerodrome part of their AIP to report bird hazard information (including strikes and near misses) using the form and associated procedures specified in the *Airport Services Manual*, Part 3, Chapter 3; and

Note.— The requirement in their AIP should clearly indicate the name, address and AFTN or facsimile number of the authority responsible for the investigation of bird strikes;

j) take active part in workshops on bird hazards organized by the ICAO Regional Offices concerned to permit region-wide exchange of views and experiences on the matter.

3.6 *Power supply at aerodromes*
[AFI/7, Conc. 4/8]

a) States which face critical standby power supply problems at their aerodromes should do their utmost to correct these deficiencies; and

b) All States should:

1) give priority to the provision of adequate power supply at their aerodromes;

2) organize at various levels electrical equipment maintenance workshops;

3) use funds that may be derived from autonomous airport authorities to defray airport expenses, funds which should be established, wherever possible, keeping in mind that these autonomous authorities should be financially independent;

4) use renewable energy sources such as photovoltaic cells, windmills, thermogenerators, etc., to generate power for radio navigation aids and obstacle lightings;

5) ensure that technical personnel are kept abreast of new technologies by implementing adequate training programmes, if necessary through ICAO/UNDP projects, bilateral assistance or funds-in-trust; and

6) reinforce exchanges of experience in this field, and possibly call on experts available in some States in the region to assist other States.

3.7 *Aerodrome fencing and security lighting*
[AFI/7, Conc. 4/9]

States should:

a) for security and safety reasons urgently provide and maintain at their aerodromes adequate fences or other suitable barriers including adequate security lighting, where necessary, to prevent the entrance to the movement areas of unauthorized persons and/or animals which would be a hazard to aircraft; and

b) give particular attention to the provision of perimeter roads for security patrols and necessary adequate exit gates for rescue and fire fighting vehicles in case of emergency.

3.8 *Establishment of preventive maintenance programmes by States*
[AFI/7, Conc. 4/10]

States should ensure that necessary resources are available to establish and implement adequate preventive maintenance programmes at their airports in order to prevent failure or degradation of their facilities which would impair safety of aircraft operations, lead to critical failures, damage installations or result in expensive repair work.

Appendix A - International Aerodromes Required in the AFI Region

EXPLANATION OF THE TABLE

Column

1 Name of the city and aerodrome, preceded by the location indicator.

Designation of the aerodrome as:

RS — international scheduled air transport, regular use
AS — international scheduled air transport, alternate use

When an aerodrome is needed for more than one type of use, normally only the use highest on the above list is shown. An exception is that AS aerodromes are identified even when they are required for regular use by international non-scheduled air transport or international general aviation, as some specifications in Annex 14, Volume I, place special requirements on these aerodromes.

Example 1 —An aerodrome required for both RS and RG use would only be shown as RS in the list.

Example 2 —An aerodrome required for both RS and AS use would only be shown as RS in the list. However, the table of aerodrome characteristics may still show specific requirements for AS use.

City/Aerodrome — Use

ALGERIA

DAUA ADRAR/Touat
RS

DAAG ALGER/Houari Boumediene
RS

DABB ANNABA/El Mellah
RS

DAAE BEJAIA/Bejaia
RS

DABC CONSTANTINE/Mohamed Boudiaf
RS

DAUG GHARDAIA/Noumérate
RS

DAUH HASSI-MESSAOUD/Oued Irara
RS

DAUI IN-SALAH/In-Salah
RS

DAOO ORAN/Es Sénia
RS

DAAT TAMANRASSET/Aguennar
AS

DABS TEBESSA/Tébessa
RS

DAON TLEMCEN/Zénata
RS

DAUZ ZARZAITINE/In Amenas
RS

ANGOLA

FNHU HUAMBO/Albano Machado
RS

FNLU LUANDA/4 de Fevereiro
RS

BENIN

DBBB COTONOU/Cadjehoun
RS

BOTSWANA

FBFT FRANCISTOWN/ Francistown
RS

FBSK GABORONE/Sir Seretse Khama Intl
RS

FBKE KASANE/Kasane
RS

FBMN MAUN/Maun
RS

FBSP SELEBI-PHIKWE/Selebi-Phikwe
RS

BURKINA FASO

DFOO BOBO-DIOULASSO/Bobo-Dioulasso
RS

DFFD OUAGADOUGOU/Ouagadougou
RS

BURUNDI

HBBA BUJUMBURA/Bujumbura
RS

CAMEROON

FKKD DOUALA/Douala
RS

FKKR GAROUA/Garoua
RS

FKKL MAROUA/Salak
RS

FKKN N'GAOUNDERE/N'Gaoundere
AS

FKYS YAOUNDE/Nsimalen
RS

CAPE VERDE

GVFM PRAIA/Francisco Mendes
RS

GVAC SAL I./Amilcar Cabral
RS

CENTRAL AFRICAN REPUBLIC

FEFF BANGUI/M'Poko
RS

FEFT BERBERATI/Berberati
RS

CHAD

FTTJ N'DJAMENA/N'Djamena
RS

COMOROS

FMCV ANJOUAN/Ouani
RS

FMCZ DZAOUDZI/Pamanzi, Mayotte I.
RS

FMCH MORONI/Prince Said Ibrahim
RS

CONGO

FCBB BRAZZAVILLE/Maya-Maya
RS

FCPP POINTE NOIRE/Agostino Neto
RS

COTE D'IVOIRE

DIAP ABIDJAN/Felix Houphouet Boigny Intl
RS

DIBK BOUAKE/Bouake
RS

DEMOCRATIC REPUBLIC OF THE CONGO

FZNA GOMA/Goma
RS

FZAA KINSHASA/N'Djili
RS

FZIC KISANGANI/Bangoka
AS

FZQA LUBUMBASHI/Luano
AS

FZWA MBUJI MAYI/Mbuji Mayi
AS

DJIBOUTI

HDAM DJIBOUTI/Ambouli
RS

EGYPT

HEBL ABU-SIMBEL/Abu-Simbel
RS

HEAX ALEXANDRIA/Alexandria
RS

HESN ASWAN/Aswan
RS

HECA CAIRO/Cairo Intl
RS

HEGN HURGHADA/Hurghada
RS

HELX LUXOR/Luxor
RS

HEMM MERSA-MATRUH/Mersa-Matruh
RS

HESH SHARM EL SHEIKH/Sharm El Sheikh
RS

HESC ST. CATHERINE/St. Catherine
RS

HETB TABA/Taba
RS

EQUATORIAL GUINEA

FGSL MALABO/Malabo
RS

ERITREA

HHAS ASMARA/Asmara Intl
RS

HHSB ASSAB/Assab
RS

ETHIOPIA

HAAB ADDIS ABABA/Bole Intl
RS

HADR DIRE DAWA/Dire Dawa Intl
RS

)FRANCE(Réunion)

FMEE SAINT-DENIS/Gillot La Réunion
RS

GABON

FOON FRANCEVILLE/M'Vengue
RS

FOOL LIBREVILLE/Leon M'Ba
RS

FOOG PORT GENTIL/Port Gentil
RS

GAMBIA

GBYD BANJUL/Banjul Intl
RS

GHANA

DGAA ACCRA/Kotoka Intl
RS

DGSI KUMASI/Kumasi
RS

DGLE TAMALE/Tamale
RS

GUINEA

GUCY CONAKRY/Gbessia
RS

GUXN KANKAN/Diankana
RS

GULB LABE/Tata
RS

GUNZ N'ZEREKORE/Konia
RS

GUINEA-BISSAU

GGOV BISSAU/Osvaldo Vieira Intl
RS

KENYA

HKEL ELDORET/Eldoret Intl
RS

HKMO MOMBASA/Moi Intl
RS

HKJK NAIROBI/Jomo Kenyatta Intl
RS

LESOTHO

FXMM MASERU/Moshoeshoe I. Intl
RS

LIBERIA

GLRB MONROVIA/Roberts Intl
RS

LIBYAN ARAB JAMAHIRIYA

HLLB BENGHAZI/Benina
RS

HLLS SEBHA/Sebha
RS

RS

GMAT TAN-TAN/Plage Blanche
RS

GMTN TETOUAN/Saniat-Rimel

HLLT TRIPOLI/Tripoli Intl
RS

MADAGASCAR

FMMI ANTANANARIVO/Ivato
RS

FMNA ANTSIRANANA/Arrachart
RS

FMNM MAHAJANGA/Amborovy
RS

FMNN NOSY-BE/Fascene
RS

FMMS SAINTE-MARIE/Sainte-Marie
RS

FMMT TOAMASINA/Toamasina
RS

FMSD TOLAGNARO/Tolagnaro
RS

MALAWI

FWCL BLANTYRE/Chileka
RS

FWLI LILONGWE/Lilongwe Intl
RS

MALI

GABS BAMAKO/Senou
RS

GAGO GAO/Gao
RS

GAKY KAYES/Kayes
RS

GAKL KIDAL/Kidal
RS

GAMB MOPTI-BARBE/Mopti-Barbe
RS

GANR NIORO/Nioro
RS

GATB TOMBOUCTOU/
Tombouctou
RS

MAURITANIA

GQPA ATAR/Atar
RS

GQNI NEMA/Nema
RS

GQPP NOUADHIBOU/Nouadhibou
RS

GQNN NOUAKCHOTT/Nouakchott
RS

GQPZ ZOUERATE/Zouerate
RS

MAURITIUS

FIMP MAURITIUS/Sir Seewoosagur Ramgoolam Intl
RS

MOROCCO

GMAD AGADIR/Al Massira
RS

GMTA AL HOCEIMA/Cherif Al Idrissi
RS

GMMN
CASABLANCA/Mohammed V
RS

GMFK ERRACHIDIA/Moulay Ali Cherif
AS

GMFF FES/Saïss
RS

GMMX MARRAKECH/Ménara
RS

GMMZ OUARZAZATE/Ouarzazate
RS

GMFO OUJDA/Angads
RS

GMME
RABAT/Salé
RS

GMTT TANGER/Ibnou-Batouta

RS

MOZAMBIQUE

FQBR BEIRA/Beira

RS

FQMA MAPUTO/Maputo Intl
RS

NAMIBIA

FYKT KEETMANSHOOP/Keetmanshop
RS
FYWB WALVIS BAY/Walvis Bay
RS
FYWH WINDHOEK/Hosea Kutako
RS

NIGER

DRZA AGADES/Sud
RS
DRRN NIAMEY/Diori Hamani Intl
RS
DRZR ZINDER/Zinder
AS

NIGERIA

DNAA ABUJA/Nnamdi Azikiwe
RS
DNCA CALABAR/Calabar
RS
DNIL ILORIN/Ilorin
AS
DNKA KADUNA/Kaduna
RS
DNKN KANO/Mallam Aminu Kano Intl
RS
DNMM
LAGOS/Murtala Muhammed
RS
DNMA MAIDUGURI/Maiduguri
RS
DNPO PORT HARCOURT/Port Harcourt Intl
RS
DNSO SOKOTO/Abubakar Saddiq III Intl
RS
)

RWANDA

HRYR KIGALI/Gregoire Kayibanda
RS

SAO TOME AND PRINCIPE

FPST SAO TOME/Sao Tomé
RS

SENEGAL

GOGS CAP SKIRING/Cap Skiring
RS
GOOY DAKAR/Leopold Sedar Senghor Intl
RS
GOSS SAINT LOUIS/Saint Louis
RS
GOTT TAMBACOUNDA/Tambacounda
RS
GOGG
ZIGUINCHOR/Ziguinchor
RS

SEYCHELLES

FSIA MAHE/Seychelles Intl
RS

SIERRA LEONE

GFLL FREETOWN/Lungi
RS

SOMALIA

HCMI BERBERA/Berbera
AS
HCMV BURAO/Burao
RS
HCMH HARGEISA/Hargeisa
RS
HCMK KISIMAYU/Kisimayu
AS
HCMM
MOGADISHU/Mogadishu
RS

SOUTH AFRICA

FAAB ALEXANDER BAY/Alexander Bay

FABL BLOEMFONTEIN/Bloemfontein
AS

FACT CAPE TOWN/Cape Town
RS

FADN DURBAN/Durban
RS
FAJS JOHANNESBURG/Johannesburg
RS
FAGM JOHANNESBURG/Rand

FALA LANSERIA/Lanseria
RS
FAUP UPINGTON/Upington
RS

SPAIN

GCLP GRAN CANARIA/Gran Canaria, Canary I.
RS
GCHI HIERRO/Hierro, Canary I.
RS
GCLA LA PALMA/La Palma, Canary I.
RS
CGRR LANZAROTE/Lanzarote, Canary I.
RS
GEML MELILLA/Melilla
RS
GCFV FUERTEVENTURA/
Fuerteventura, Canary I.
RS
GCXO TENERIFE NORTE/Los Rodeos, Canary I.
RS
GCTS TENERIFE SUR/Reina Sofia, Canary I.
RS

SUDAN

HSSJ JUBA/Juba
RS
HSKA KASSALA/Kassala
AS
HSSS KHARTOUM/Khartoum
RS
HSPN PORT SUDAN/Port Sudan Intl
RS

SWAZILAND

FDMS MANZINI/Matsapha
RS

TOGO

DXXX LOME/Tokoin
RS
DXNG NIAMTOUGOU/Niamtougou
RS

TUNISIA

DTTJ DJERBA/Zarzis
RS
DTMB MONASTIR/Habib Bourguiba
RS
DTTX SFAX/Thyna
RS
DTKA TABARKA/7 NOVEMBRE
RS
DTTZ TOZEUR/Nefta
RS
DTTA TUNIS/Carthage
RS

UGANDA

HUEN ENTEBBE/Entebbe Intl
RS

UNITED REPUBLIC OF TANZANIA

HTDA DAR-ES-SALAAM/Dar-Es-Salaam
RS
HTKJ KILIMANJARO/Kilimanjaro Intl
RS
HTZA ZANZIBAR/Zanzibar
RS

WESTERN SAHARA

GSAI EL AAIUN/El Aaiun
RS
GSMA SMARA/Smara

RS

GSVO VILLA CISNEROS/Villa Cisneros

RS

ZAMBIA

FLLI LIVINGSTONE/Livingstone Intl

RS

FLLS LUSAKA/Lusaka Intl

RS

FLMF MFUWE/Mfuwe

RS

FLND NDOLA/Ndola

RS

ZIMBABWE

FVBU BULAWAYO/Bulawayo

RS

FVHA HARARE/Harare

RS

FVFA VICTORIA FALLS/Victoria Falls

RS

PART IV - COMMUNICATIONS - NAVIGATION - SURVEILLANCE (CNS)

PART IV – COMMUNICATIONS-NAVIGATION-SURVEILLANCE (CNS)

1. Introduction

1.1 This part of the Africa-Indian Ocean Basic Air Navigation Plan contains material considered to be the minimum necessary for effective planning of CNS facilities and services in the Africa and Indian Ocean Region.

1.2 Most of the material contained in this part has been developed by the AFI Regional Planning and Implementation Group (APIRG) based on the Statement of Basic Operational Requirements and Planning Criteria (BORPC) and finalized by the CAR/SAM/3 RAN Meeting. Background information of importance in the understanding and effective application of this part of the plan is contained in the Report of the Seventh Africa-Indian Ocean Regional Air Navigation Meeting (Doc. 9702), in the Sixth Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9298) and the Report of the Limited Africa-Indian Ocean (COM/MET/RAC) Regional Air Navigation Meeting (Doc 9529).

1.3 The Standards, Recommended Practices and Procedures to be applied are contained in:

a) Annex 10 – *Aeronautical Telecommunications*, Volumes I, II, III, IV and V;

b) *Regional Supplementary Procedures* (Doc 7030).

1.4 The elements of material referred to above are presented in the following paragraphs with appropriate cross-references to AFI/7 RAN Meeting recommendations and/or conclusions.

2. Communications

2.1 General

2.1.1 The main function of the communication systems is to provide for the exchange of aeronautical voice, text and/or data between users or automated systems (for data). The infrastructure used for communications can also be used in support of specific navigation and surveillance functions.

2.1.2 There are basically two categories of aeronautical communications:

a) safety-related communications requiring high integrity and rapid delivery:

1) air traffic services communications (ATSC) carried out between ATS units or an ATS unit and aircraft for ATC, flight information, alerting, etc;

2) aeronautical operational control (AOC) communications carried out by aircraft operators on matters related to safety, regularity and efficiency of flights; and

b) on-safety related communications:

1) aeronautical administrative communications (AAC) carried out by aeronautical personnel and/or organizations on administrative and private matters; and

2) aeronautical passenger communications (APC).

2.1.3 In general, communication systems used in the communications, navigation, and surveillance/air traffic management (CNS/ATM) systems are capable of carrying both of the above-mentioned categories. However, safety-related communications shall always have priority over non-safety ones.

2.2 **Aeronautical fixed service (AFS)**

2.2.1 The aeronautical fixed service comprises:

a) the aeronautical fixed telecommunication network (AFTN);

b) data communications subnetworks and associated systems supporting the ground-ground applications of the aeronautical telecommunication network (ATN), namely the ATS message handling services (ATS MHS) and inter-centre communications (ICC);

c) gateways enabling inter-operation (to the extent possible) between a), and b) above;

d) ATS voice communication circuits and networks; and

e) aeronautical broadcast systems (e.g. for dissemination of world area forecast (WAFS).

2.2.2 *Means of implementation of the Aeronautical Fixed Services (AFS) Circuits*
[AFI/7, Rec. 14/20]

a) In deciding on implementation means for aeronautical fixed services, the following guidelines should be followed:

1) the aeronautical fixed service requirements should be implemented utilizing common carriers (leased circuits) where these are cost-effective and reliable;

2) for most of the AFI Region, recourse should be taken to commercially available very small aperture terminal (VSAT) networks to implement AFS requirements. Ground-based links would be used where offering the required degree of efficiency and reliability;

3) where dedicated aeronautical systems are implemented, (nationally or regionally), these must interface with the correspondents via public systems where possible; and

4) to minimize costs and enhance implementation, fixed service requirements should be multiplexed on single digital carriers where appropriate.

b) Where common carriers are provided by government agencies, States should ensure that these agencies:

1) give the highest priority to the implementation and ensure the highest degree of reliability of all aeronautical circuits;

2) give special consideration to the reliability of trunk circuits between the Post Telephone and Telegraph (PTT) centres and airports;

3) ensure priority restoration of service in the event of breakdown; and

4) apply preferential tariffs to aeronautical and meteorological administrations.

2.3 *Aeronautical Fixed Telecommunication Network (AFTN)* [AFI/7, Re. 9/7]

2.3.1 The AFTN plan is detailed in FASID Table...

2.3.2 *AFTN COM Centre Management*
[AFI/7, Rec. 9/5]

States concerned should take positive measures to ensure systems reliability and provide adequate management and supervision of facilities to eliminate system failure and to ensure the message integrity, data integration and timely delivery of messages. To that effect, a coordination mechanism between aeronautical authorities and telecommunications administrations should be established in order to facilitate the evaluation and improvement of aeronautical fixed services communications circuits.

2.3.3 *AFTN Circuits/Performance*
[AFI/7, Rec. 9/4]

States operating AFTN circuits should arrange for the monthly recording of circuits performance charts and for the exchange of completed forms between the stations concerned, with a copy to the relevant ICAO Regional Office.

2.3.4 *AFTN efficiency*
[AFI/7, Rec. 9/3]

States should take appropriate measures to achieve and maintain the availability of 97 per cent or better of the AFTN circuits.

2.3.5 *Aeronautical fixed service personnel training*
[AFI/6, Rec. 12/26]

States should take all possible steps to attract and train a highly competent AFS operating, maintenance and supervisory staff by adequate initial training and certification followed by periodic refresher training, including a programme of proficiency checks.

2.3.6 *Liaison visits by communication centre personnel*
[LIM AFI, Rec. 7/13]

States should organize periodic liaison visits by COM personnel to centres with which communications are exchanged, to improve the implementation and operation of the communications service.

2.4 *ATS direct speech circuits*

2.4.1 *Implementation of the ATS direct speech (DS) Circuits Plan (Chart COM 1C)*
[AFI/7, Rec. 9/8]

States should ensure that:

a) the VSAT technology and/or other reliable communications means be considered to speed up the implementation and improvement of the reliability of the ATS/DS circuits plan shown in Table COM 1C of the AFI FASID.

b) wherever the VSAT technology or other equally reliable communication means is implemented, priority be given to direct means of linking adjacent ATS centres; and

c) the use of VSAT, or other reliable technology, should not prevent the use of the switching concept whereby its use meets the agreed operational requirements.

2.5 *Satellite broadcast (FASID Chart CNS 8)*
[AFI/7, Rec. 9/10]

2.5.1 World area forecast system (WAFS) products should be disseminated in the AFI Region by satellite broadcast as part of the aeronautical fixed service.

2.5.2 The satellite broadcast to serve the AFI Region is the satellite distribution system for world area forecast systems products (SADIS) provided by the world area forecast centre (WAFC) London. The area to be served by the SADIS is given in *Part IV — Meteorology* of this document and in FASID Chart CNS 8 (i.e. INTELSAT 604 coverage area).

Note 1.— Area covered by SADIS is WAFS service areas 1, 4, 6 and 7 and western parts of service area 2 being the "footprint" of INTELSAT 604 located over the Indian Ocean, i.e. longitude from 20EW to 140EE.

Note 2.— Because of the lack of coverage of Cape Verde by the SADIS broadcast, this State has agreed to use the international satellite communication system (ISCS) satellite broadcast provided by WAFC Washington.

2.5.3 The Chart for coverage of the satellite distribution system for WAFS Products (SADIS) using INTELSAT604 at 60EE is shown on FASID Chart CNS 8.

3. Aeronautical mobile service

(FASID Table CNS 2A; FASID Charts CNS 2A, 3 and 4)

3.1 General

3.1.1 The aeronautical mobile service (AMS) communication plan comprises all facilities recommended in respect to air-ground communications for international air navigation, together with the frequencies recommended for assignment to these facilities. The plan is detailed in FASID Table CNS 2A.

3.1.2 *Provision of SELCAL*
[AFI/6, Rec. 13/4]

3.1.2 States should provide SELCAL on all HF en-route and VHF/GP channels. When possible, tests of SELCAL operation should be carried out on VHF/GP frequencies to reduce congestion on HF en-route frequencies.

3.1.3 *Elimination of interference on AMS frequencies*
[LIM AFI, Rec. 8/5]

3.1.3.1 States should coordinate, on a national basis with the appropriate interested authorities, a programme directed towards achieving the elimination of the interference currently being experienced on some of the frequencies allocated to the aeronautical mobile (R) service in the region; and, when reviewing methods for developing such a national programme, consideration should be given to the procedures in the Radio Regulations and prescribed therein;

— Chapters II, III and IV;

— Article 20 on International Monitoring; and

— Article 22 on Procedure in a case of Harmful Interference of the ITU Radio Regulations.

3.1.3.2 In the case of an unidentified interfering station, States should notify the regional office concerned, utilizing the procedure and report form developed by the Fifth Session of the Communications Division (1954) and updated by the Communications Divisional Meeting (1978), Doc 9239, Agenda Item 5.

3.1.3.3 In the case of persistent harmful interference to an aeronautical service which may affect safety, it should immediately be reported to ICAO, and to the ITU using the prescribed format (Attachment D refers), for appropriate action.

3.1.4 *Measures to reduce harmful interference fromcarrier systems*
[LIM AFI, Rec. 8/6]

States should:

a) where practicable, prohibit the use of carrier systems employing frequencies falling within any of the aeronautical radio bands. Where this is not practicable, installation and maintenance practices should provide a high degree of assurance that electromagnetic radiated energy will not create harmful interference to aeronautical safety services; and

b) establish national regulations to protect aeronautical radio communications and navigation facilities, taking into account the maximum permitted interfering field strength levels in the prescribed critical area around the aeronautical radio site.

3.1.5 *Measures to reduce harmful interference from VHF broadcast services*
[LIM AFI, Rec. 8/7]

States should:

a) take action to coordinate with the appropriate bodies within their administrations, and to assist in the establishment by the appropriate ITU bodies of adequate technical criteria to avoid harmful interference to the aeronautical safety services operating in the frequency band 108-137 MHz from broadcast services operating in the adjacent frequency band 100-108 MHz; and

b) establish national regulations to protect aeronautical radiocommunication and navigation services operating in the VHF bands from harmful interference emanating from broadcast services operating in adjacent VHF bands.

3.1.6 *VHF Frequency utilization list*

States should:

a) coordinate, as necessary, with the ICAO Regional Office concerned, all radio frequency assignments for both national and international facilities in the VHF, 117.975 - 137 MHz band.

b) Frequencies for new requirements and frequency changes for existing requirements should be coordinated with the ICAO Regional Office concerned prior to implementation of such frequencies.

c) States should report complete and accurate data for inclusion in the frequency list of the ICAO Regional Office concerned

d) The ICAO Regional Office concerned, should issue lists of frequencies in the VHF, 117.975 to 137 MHz band assigned to national and international aeronautical communication facilities.

3.1.7 *Notification of frequency assignments*
[AFI/6, Rec. 13/13]

States should:

a) notify the ITU, for inclusion in the International Frequency List, of the aeromobile frequencies assigned to the aeronautical stations within their jurisdiction;

b) notify the ITU of the cancellation of frequency assignments which are no longer required for use.

3.2 *VHF aeronautical mobile service facilities plan*
(Table COM 2)

3.2.1 *VHF channels for aerodrome and approach control*

[AFI/6, Rec. 13/14]

In those cases where the density of air traffic does not immediately warrant the implementation of both aerodrome and approach control VHF channels, and one channel can serve both purposes, the frequency assigned to approach control should be used first in the interest of minimizing interference within the service.

3.2.2 *Frequency stability and effective adjacent channel rejection characteristic in the VHF mobile service*
[AFI/6, Rec. 13/8]

3.2.2.1 In the AFI Region, ground and/or aircraft VHF stations should meet the specifications, with regard to frequency stability, for the 25 kHz channel spacing environment as specified in Annex 10, Volume III, Part I.

3.2.2.2 In the North African-Mediterranean coastal area, ground and/or aircraft VHF stations should also meet the specifications, with regard to receiver effective adjacent rejection characteristic for the 25 kHz channel spacing environment as specified in Annex 10, Volume III, Part I, and/or Attachment A to Part II.

3.3 *HF en-route radiotelephony networks*
(Table CNS2A , Chart CNS 2A)

3.3.1 *Measures to improve the aeronautical mobile service (HF)*
[AFI/6, Rec. 13/2]

States should take:

a) urgent measures to implement and upgrade AFS circuits, the lack or poor quality of which seriously hinder the current operation of the HF en-route aeronautical mobile (R) service;

b) steps to ensure that the aeronautical station operational and maintenance staff are adequately trained and demonstrate a high level of competence in the operation and maintenance of all communication services.

3.3.2 *Improved use of the HF AMS*
[AFI/6, Rec. 13/3]

States should take:

a) action to ensure the proper use of the HF AM(R)S solely for the exchange of communications between aeronautical and aircraft stations of the aeronautical mobile service;

b) urgent action to eliminate the need for the exchange of point-to-point communications over the AM(R)S by ensuring that adequate facilities for point-to-point communications are provided by other means, to be implemented in the near future.

3.3.3 VOLMET broadcasts

3.3.3.1 *HF VOLMET broadcast plan*

3.3.3.2 The plan for radiotelephony broadcasts of meteorological information from designated locations appears in Table ATS 2.

3.3.3.3 *HF VOLMET broadcasts*
[AFI/6, Rec. 13/12]

States required to provide HF VOLMET broadcasts in accordance with the AFI Air Navigation Plan should continue or introduce such broadcasts only after consultation with all airspace users has revealed that there is a need for such broadcasts, since there is already an excessive volume of "request/reply" meteorological traffic on the air-ground HF channels.

3.3.3.4 *VHF VOLMET broadcast*

The plan for the VHF VOLMET broadcast on a continuous basis from stations in the region appears in Table ATS 2A.

4. Navigation
(FASID Table....)

4.1 General

4.1.1 The aeronautical radio navigation plan comprises all facilities that provide navigation support to en-route, terminal, approach, landing and surface movement operations.

4.1.2 The growing number of modern aircraft equipped with area navigation (RNAV) and the increasing emphasis on required navigation performance (RNP) result in more flexible route selection and less dependence on any particular type of navigation system. Nevertheless, every single radio navigation facility must operate in strict conformance with the applicable standards.

4.1.3 It is foreseen that the provision of radio navigation services will gradually transition from ground-based to satellite-based system. The global navigation satellite system (GNSS) is the generic term used for the satellite-based aeronautical radio navigation system. Existing and/or emerging core navigation satellite constellations and associated aircraft-based, satellite-based and ground-based augmentation systems (ABAS, SBAS, and GBAS, respectively) all form elements of the GNSS.

4.1.4 *Planning principles for radio navigation aids*

States, in planning the implementation of radio navigation services, should consider the principles shown in Attachment H.

4.1.5 *Testing of radio navigation aids*
[AFI/6, Rec. 14/1]

States should make every effort to maintain radio navigation aids operationally efficient at all times through the application of the tests specified in Doc 8071, *Manual on Testing of Radio Navigation Aids, Volumes I (Testing of ground-based radio navigation systems) and Volume II (Testing of the global navigation satellite system (GNSS)).*

4.1.6 *Reliability of operation of radio navigation aids*
[AFI/6, Rec. 14/3]

Necessary measures should be taken to ensure that reliable and continued operation of radio navigation aids is achieved by:

a) holding adequate stocks of expendable parts and parts having a limited service life;

b) exchange of practical technical information relating to the operation of such aids;

c) arrangements for the exchange of spare parts between States where necessary and possible.

4.1.7 *Notification of frequency assignments to radio navigation aids*
[AFI/6, Rec. 14/4]

States should, in all cases where they assign frequencies to radio navigation aids, provide full details of these assignments to the relevant ICAO Regional Office, as well as taking the necessary action for notification to the ITU through the appropriate authorities.

4.1.8 *Flight checking of radio navigation aids*
[AFI/7, Concl. 10/1]

That States publish by aeronautical information circular (AIC) the date of the last flight check performed for each radio navigation aid.

4.1.9 *Geographical separation criteria for VOR and/or VOR/DME installations in the AFI Region*
[AFI/7, Rec. 10/2]

States in the AFI Region, when assigning frequencies for VOR and/or VOR/DME installations, use the criteria shown in Appendix A to Table COM 3.

4.1.10 *Geographical separation criteria for ILS installations in the AFI Region*
[AFI/7, Rec. 10/3]

States in the AFI Region, when assigning frequencies for ILS installations, use the criteria shown in Appendix A to Table COM 3.

4.1.11 *Frequency utilization lists LF/MF, 108 MHz to 117.975 MHz and 960 MHz to 1 215 MHz bands*
[LIM AFI, Rec. 9/3]

4.1.12 States should coordinate, as necessary, with the ICAO Regional Office concerned, all radio frequency assignments for both national and international facilities in the LF/MF, 108 MHz to 117.975 MHz and 960 MHz to 1 215 MHz bands.

4.1.13 Frequencies for new requirements and frequency changes for existing requirements should be coordinated with the ICAO Regional Office concerned prior to implementation of such frequencies.

4.1.14 States should report complete and accurate data for inclusion in the frequency list of the ICAO Regional Office concerned.

4.1.15 The ICAO Regional Office concerned should issue lists of frequencies in the LF/MF, 108 MHz to 117.975 MHz and 960 MHz to 1 215 MHz bands assigned to national and international aeronautical radio navigation facilities.

4.1.16 *Termination of the use of the band 1 559 - 1 610 MHz (allocated to the RNSS) by fixed services*

Considering that the sharing of the band 1 559 - 1 610 MHz allocated to the RNSS (including GNSS) with the fixed services is not feasible, States should coordinate with the corresponding national frequency management authority in order to:

a) determine if any fixed service stations operate in the band 1 559 - 1 610 MHz and, if so, either cease their operation or relocate them to other fixed-service bands before GNSS-based operations are approved; and

b) establish plans to avoid any future implementation of fixed service stations to operate in the band 1 559 - 1610 MHz.

4..1.17 *Navigation systems implementation and regional time lines*

It is intended to include regional timelines for navigation systems implementation when planning material is sufficiently mature.

5. Surveillance

(FASID Tables...)

5.1 General

5.1.1 The aeronautical surveillance plan comprises all facilities, systems and procedures that support the provision of aircraft position information to air traffic services (ATS) units.

5.1.2 Traditionally, aeronautical surveillance has been performed by means of voice position reporting, primary surveillance radar (PSR) or secondary surveillance radar (SSR). SSR Mode S ground stations have been implemented in several parts of the world and their operation depends on properly equipped aircraft (i.e. Mode S transponder with assigned 24-bit address). An inherent feature of the SSR Mode S (for surveillance and/or data link) is the unique 24-bit aircraft address assigned to each aircraft, and a worldwide scheme for allocation, assignment and operation of such addresses is already in place (Annex 10, Volume III, Part I, Chapter 9 refers).

5.1.3 However, advances in aeronautical data links and on board navigation systems now allow for aircraft to transmit their position and other information to the appropriate ATS units, or even broadcast such information. These systems have been designated as the automatic dependent surveillance (ADS), which is based on a contract between the ATS unit and the aircraft, and ADS-broadcast (ADS-B), which allows other aircraft and ground systems within its area of coverage to receive the information.

5.1.4 It is envisaged that the use of ADS/ADS-B will gradually increase, especially in areas where the provision of radars is not practical or economical. It is also foreseen that the use of PSR for international civil aviation operations will diminish.

5.1.5 *Planning and implementation of surveillance radar systems*

To be developed.

5.1.6 *Planning and implementation of ADS*

To be developed.

5.1.7 *Sharing of radar data*

To be developed.

5.1.8 *Application of procedures for 24-bit aircraft address assignment*
[AFI/7, Conc. 11/2]

That those States which have not already done so, establish, as a matter of urgency, procedures for the assignment of 24-bit aircraft addresses.

5.1.8.1 Examples of aircraft addressing assignment procedures are shown at Attachment J**.**

6. Aeronautical Radiofrequency management

6.1 General

The radio frequency spectrum is a scarce natural resource with finite capacity limits for which demand is constantly increasing. ICAO is just one of the entities competing for spectrum allocation on behalf of the aviation community it serves and, like its competitors, must continue to justify spectrum requirements.

The cornerstone of arguments to justify continued allocation of an adequate aeronautical spectrum are centred around safety-of-life issues, which are recognized internationally. On the other hand, there are increased demands for spectrum allocation from a growing number of competitors. Spectrum-efficient operation has thus become an obligation for all users and technological developments are helping in that regard.

However, the rules of the International Telecommunication Union (ITU) mechanism for spectrum allocation are such that safety-of-life and other justifying arguments need to be presented with force and States and international organizations have thus been invited by ICAO Assembly Resolution to support ICAO's position at World Radiocommunication Conferences (WRCs) and in regional and other international activities conducted in preparation for WRCs by a number of means.

6.2 Policy Statements

Given the quasi-triennial pattern of WRC meetings recently adopted by the ITU and the importance of keeping up with the rapid developments in telecommunications, ICAO decided to develop and maintain an ICAO radio frequency (RF) document in the form of the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation (Doc 9718-AN/957) which contains ICAO policy statements relevant to the aviation requirements for radio frequency spectrum. The handbook is intended to assist States and ICAO in preparing for ITU conferences.

6.3 Regional planning criteria

6.3.1 *Geographical separation criteria for VHF air-ground communications*

6.3.1.1 Annex 10, Volume V provides detailed guidance concerning the required geographical separation criteria between stations operating on co-channel or adjacent frequency assignments. Geographical separation criteria as shown in FASID Table CNS - xx should be used for international VHF frequency assignment in the AFI Region.

6.4 Radiofrequency interference issues

6.4.1 The subject of harmful interference to aeronautical communication, navigation and surveillance services has always been of paramount concern to the international civil aviation community. In particular, any interference to the aeronautical services in the band 108 - 137 MHz has usually been, and needs to be, treated by aviation administrations in an urgent and serious manner (para. 3.1.3 to 3.1.5 above refer).

ATTACHMENT A

OPERATIONAL FEATURES CONSIDERED NECESSARY FOR A MAIN AERONAUTICAL FIXED TELECOMMUNICATION NETWORK (AFTN) COMMUNICATIONS CENTRE

1. Meet AFTN requirements as defined in ICAO Annex 10, Volumes II and III and in the ICAO *Manual on the Planning and Engineering of the Aeronautical Fixed Telecommunication Network* (Doc 8259).

2. Throughput capability commensurate with operational requirements, number and modulation rate of circuits to be served, 100 per cent growth capability and with peak hour throughput equal to or better than 10 per cent daily load.

3. Capable of accommodating circuits employing international telegraph alphabet no. 2 (ITA-2) and international alphabet No. 5 (IA-5) with code conversion between them.

4. Capable of accommodating circuit modulation rates up to and including 9 600 bits/s.

5. Apply bit-oriented data link control procedures (Annex 10, Part I, Volume III, paragraph 8.6.4 refers) between main AFTN communication centres.

6. Provide for operational personnel to make changes, additions and deletions to accommodate:

   a) routing definitions; and

   b) line servicing (including circuits, stations, codes, protocols and modulation rates).

7. Provide for the generation of alarms/or reports and the ability to input supervisory commands (necessary to operationally control the system) by non-technical/non-programmer operational personnel.

8. Operate in a store and forward mode with incoming immediate messages written to duplicated mass storage devices before output.

9. Ensure that messages are not lost by the system.

10. Capable of servicing circuits operating at different speeds, codes, parity, modes of transmission, interfaces and protocols.

11. Capable of accommodating diversion routing.

12. Capable of message storage in event of circuit outage with no diversion route available.

13. Capable of accommodating predetermined distribution.

14. Provision of a designated terminal with keyboard for entering supervisory commands to control the operation of the switching system. This terminal permits, for example, the supervisor to control the system, examine or change message tables, display reports and system status, retrieve messages from storage and divert errors to an intercept terminal, and to provide for the recall of pre-formatted messages to assist the AFTN centre personnel in the generation of service messages.

15. Deliver supervisory reports to a designated station, including status of system operation, e.g., re-start recovery, changeover, etc.

16. Deliver journal records to a designated station, to include time of day, received message information and transmitted message information.

17. Deliver statistical information to a designated station.

18. Automatic functions initiated without supervisor intervention (e.g. message assurance features (time responses), generation of service messages, changeover, restart and recovery).

19. Provide diagnostic testing.

20. Dual mode operation with automatic changeover from a “hot” to “standby” and vice versa.

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ATTACHMENT B

GUIDANCE MATERIAL FOR THE PREPARATION OF AFTN MESSAGES TRAFFIC STATISTICS

References: ICAO *Manual on the Planning and Engineering of the Aeronautical Fixed Telecommunication Network* (Doc 8259)

Interim Pilot Study on the replanning of the AFS/AFTN presented by the ASPENN Regional Planning Group;

ICAO *Air Navigation Plan – Africa and Indian Ocean Region* (Doc 7474);

Report of the Fifth Meeting of the GREPECAS; and

Report of the Fifth Meeting of the GREPECAS COM/SG.

1. BACKGROUND

a) The GREPECAS, at its fifth meeting, requested (by Conclusion 5/19 – AFTN ANNUAL TRAFFIC STATISTICS) that ICAO Regional Offices coordinate with States, so that they provide traffic statistics of messages transmitted through the AFTN. This guidance material has been prepared in reply to referred Conclusion 5/19 and is aimed at providing a the methodology to prepare the AFTN traffic statistics applying a format shown as Attachment 1.

2. STATISTICS OF MESSAGE TRAFFIC TRANSMITTED THROUGH THE AFTN

a) General overview

2.1.1 From the point of view of the AFTN performance, it is necessary that the AFTN COM Centres, as part of their monitoring functions, prepare traffic statistics for the messages transmitted through the network. The statistics will allow, among other things, the network supervisor to configure the network to meet the messages traffic demand, in order to avoid/minimize congestion resulting in longer message transit times. The average congestion delay suffered by a message in awaiting access to a channel for its transmission is given by:

$$t = w.T/(1-w) \text{ where;}$$

t is the average congestion delay experienced by messages throughout the hour;

w is the channel occupancy factor;

T is the time required by the channel to transmit a message, which is inversely proportional to the channel modulation rate in bits/s.

2.1.2 The above expression shows a strong dependency between the congestion delay time and the channel occupancy factor. As the occupancy factor increases to values higher than 0.4 (40 per cent) the delay grows rapidly and tends to infinity when the occupancy factor approaches unity. The way to reduce delay is to decrease T, i.e. to increase the modulation rate of the AFTN channel or circuit.

b) **Method for preparation of statistics**

2.2.1 The objective of preparing statistics is to allow the Administrations to collect and process message traffic data transmitted through the AFTN, in order to determine the occupancy factor of an AFTN circuit, which affects the message transit time as indicated in section 1 above. The message transit time is defined as "the elapsed time between the instant of filing of a message with an AFTN station for transmission on the network and the instant that it is made available to the addressee". Furthermore, the transit time is formulated as an operational requirement 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 Messages	5 minutes
Amendments to aerodrome forecasts	5 minutes
Aerodrome reports/landing forecasts/selected special reports:	
from 0 to 550 nautical miles	5 minutes
for distances larger than 550 nautical miles	10 minutes

Transit times for Request/Reply of OPMET data banks should be less than five minutes.

2.2.1.1 The 95 per cent does not mean that the remaining 5 per cent may experiment any delay; actually, the Administrations should investigate if there is excess of delay and should try to avoid its occurrence.

2.2.1.2 As it can be observed from the formulation of the operational requirement of transit times, that the important matter to be determined to monitor the message traffic is the quantity of characters transmitted through the channel in the average peak hour during the peak season of the year, in which a maximum message traffic is produced.

2.2.1.3 In relation to the period of time for the peak season in the year, Doc 8259 neither establishes nor suggests specific periods. In this regard, the ASPENN Group recommended a one-month period as a compromise figure for the peak season, in order to perform studies on message traffic statistics for general purposes, with daily samples during one year. The GREPECAS adopted this criteria.

2.2.1.4 The quantity of characters transmitted in the peak hour is related to the circuit load or occupancy factor. Doc 8259 recommends that this factor be kept in the average peak hour in the peak season of the year lower than 0.4, this means, 40 per cent which would allow the AFTN channel to provide capacity for traffic in diversion and to keep the transit times under this condition within acceptable values. The occupancy factors higher than 0.4 significantly increase, as previously stated, the messages congestion delays. The practical way to measure the occupancy factor is to divide the number of characters transmitted in one hour by the maximum quantity of characters than can be transmitted in an hour through the channel. For example, in any channel through which baudot code messages (consisting of 5 information, 1 start and 1.5 stop bits) are transmitted, a maximum of 480*B characters can be sent, where B is the modulation rate. If B is 50 bits/s, a maximum of 24 000 characters can be sent in an hour. If information on the number of characters per hour and per channel is not available at the AFTN COM Centre and only the number of messages per hour is available, in order to obtain the number of characters per hour, the number of messages per hour should be multiplied by 300 (the average length of an AFTN message).

2.2.1.5 For the purpose of finding the AFTN circuit occupancy during the peak season of the year, the following method should be used:

Let N designate the number of days in the peak month. If during that month, the peak hour occupancies are $Lx_1 + Lx_2 + Lx_3$ ..... Lx_n, the average monthly occupancy will be:

$$Lx(average) = (Lx_1 + Lx_2 + Lx_3 + ... + Lx_n)/N \quad (2)$$

2.2.1.6 Figures obtained through above-mentioned method would provide data for columns 3 and 7 of the table shown in Attachment 1, in order to complete the information required in the AVERAGE LOAD FACTOR cell. For a good performance of the AFTN, the Lx(average) should be kept lower or equal to 0.4.

c) **Explanation on Attachment 1**

2.3.1 The table of Attachment A should be completed by each AFTN COM Centre during the period of one month with daily data of the message traffic of each of the AFTN international circuits/channels that are connected to the centre. This monthly evaluation is aimed at capturing the seasonal factor of the message traffic during the year. For each AFTN circuit/channel, it is required to indicate in the table the corresponding modulation rate and the line code [Baudot (ITA-2) or IA-5]. Likewise, it is required that the names with location indicators of the origin and destination stations should be also filled out in the Table header. As a relevant part and summary of the data processing, it is necessary to indicate the Transmission Average Load factor (TX) and the Reception Average Load Factor (RX). The explanation of the columns in the table of Attachment 1 is the following:

Column 1	Date of the data processed
Columns 2 and 6	Number of characters in the Peak Hour
Columns 3 and 7	Load Factor in the Peak Hour
Columns 4 and 8	Number of characters per day
Columns 5 and 9	Daily Load Factor (as a percentage figure)

.

2.3.1.1 Load factors could be calculated as follows:

a) to calculate the Peak Hour Load Factor (HLF), the number of characters (NCH) of columns 2 and 6 should be divided separately by the channel effective capacity (CEC) and multiplied by 100. The result will always be lower or equal to 100 per cent:

HLF(%) = NCH*100/CEC

Some examples of CEC are provided (for several modulation rates and line codes) in Attachment 2; and

b) to calculate the Daily Load Factor (DLF) of the channel, the number of characters (NCD) of columns 4 and 8 should be divided separately by the channel effective capacity (CEC) multiplied by 24 and the result is multiplied by 100. The result will always be lower or equal to 100 per cent:.

DLF(%) = NCD*100/CEC*24

2.3.1.2 To calculate the average load factor RX or TX (cells shown in the table header), the above expression (2) is applied with L_{x1} to L_{xn} taken from the cells of columns 3 and 7 with N equal to the number of days of the month of evaluation.

APPENDIX TO ATTACHMENT B

AFTN CIRCUITS LOAD STATISTICS

MONTH: ______________________________YEAR: ________________

ORIGEN STATION: (NAME)						**LOCATION INDICATOR:**		
DESTINATION STATION: (NAME)						**LOCATION INDICATOR:**		
MODULATION RATE AND CODE:						**NUMBER OF CHANNELS:**		
AVERAGE LOAD FACTOR RX: %					**AVERAGE LOAD FACTOR TX %**			
DATE	**R X**				**T X**			
	Peak Hour	**Percentage Hour**	**Daily Total**	**Daily Percentage**	**Peak Hour**	**Percentage Hour**	**Daily Total**	**Daily Percentage**
1	2	3	4	5	6	7	8	9

APPENDIX TO ATTACHMENT B

1. **ITA-2 Line Code (1½ stop bits)**

Modulation Rate	**Effective Capacity (Characters/Hour)**
50 bits/s	24 000
75 bits/s	36 000
100 bits/s	48 000
150 bits/s	72 000
300 bits/s	144 000

2. **IA-5 Line Code, Asynchronous (1 Stop Bit)**

Modulation Rate	**Effective capacity (Characters/Hour)**	
	Without Protocol	**CAT B Protocol (93%)***
300 bits/s	108 000	100 400
600 bits/s	216 000	200 880
1 200 bits/s	432 000	401 760
2 400 bits/s	864 000	803 520
4 800 bits/s	1 720 000	1 707 040
9 600 bits/s	3 456 000	3 214 080

3. **Line Code IA-5, Synchronic**

Modulation Rate	**Effective capacity (Characters/Hour)**	
	CAT B Protocol (93%)*	**(DHLC Protocol (97 %)****
2 400 bits/s	1 004 400	1 047 600
4 800 bits/s	2 008 800	2 095 200
9 600 bits/s	4 017 600	4 190 400

* The effective capacity has been reduced to 93 per cent to allow the protocol header.

** The effective capacity has been reduced to 97 per cent to allow the protocol header.

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ATTACHMENT C

PLANNING AND TECHNICAL PRINCIPLES FOR ATS VOICE NETWORKS

Planning and operation of ATS voice communication network in the AFI Region should be based on relevant ICAO SARPs and guidance material. Pending the availability of updated ICAO provisions relating to digital and analogue voice switching and signalling systems, the following principles should be applied for implementation of analogue voice network:

1. The voice switched network should be in compliance with Annex 10, Volume III, Part II, Chapter 4.

2. For satellite circuits, the additional propagation delay should be duly accounted for and the total delay be maintained, to the extent possible, within the limits of Recommendation Q.41 of the ITU-T.

3. The switch shall operate automatically, i.e. being able to receive and route calls from stations connected to the network without intervention of a third person.

4. The system should have the capability of providing priority access. Signalling tones should also be provided to announce intrusion.

5. The system should provide automatic call back capability.

6. The capability of conference service to ATS units should be provided as required.

7. Disconnect should occur automatically when either party terminates a two-party communication (“on hook” operation).

8. The configuration of the network should provide for alternate routing. Also, switches serving the network should provide automatic routing for primary and alternate routes.

9. The capability of tandem interconnection of circuits between the calling and the called stations should be provided, while recognizing that the number of such circuits in tandem is limited, particularly if satellite circuits are employed.

10. Interconnection through the switch between stations on local circuits, or between a local circuit and a trunk circuit, should not preclude or disturb other established connections. The switch shall be able to establish as many simultaneous communications as half the number of connected lines.

11. To protect the hearing of the operators, the signalling tones should be attenuated at least 10 dB with respect to receive level in the earphone.

12. To ensure the intelligibility and to permit the application of speech-plus data techniques, the system should be engineered to operate within the 300 to 2 640 Hz bandwidth.

13. To ensure the intelligibility of the communication, the attenuation level of the voice signal between users should not be greater than 6 dB.

14. The network segments that will contain more than one satellite link should be identified so that the necessary compensatory measures and procedures may be applied, as required.

15. It should be possible to change and/or reassign the numbers in the numbering plan by simple operations.

16. The signalling system between voice switches should be the ITU-T signalling system No. 5.

17. To limit misuse of the international network by unauthorized domestic units, it may be prudent to limit calls to and from international circuits to those units which have an operational requirement to use the facility while barring other users by means of software tables in the switching centre.

18. The end system provided for the user should afford minimum complexity of procedures and a minimum number of physical actions necessary to initiate a call.

19. The switches should have the capability of handling trunk circuits, local circuits and tie lines in sufficient number to satisfy the ATS requirements, as determined in each particular case.

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ATTACHMENT D

HARMFUL INTERFERENCE REPORT FORM

This form should be used in cases of harmful interference with aeronautical services and only in those instances where the procedure outlined in the ITU-R Radio Regulations has not produced satisfactory results. The form should only be submitted after at least the sections marked with an asterisk have been completed.

* State or organization submitting report . . . . . .

* 1. Frequency of channel interfered with . . . . . .
* 2. Station or route interfered with . . . . . .
* 3. Is the interference persistent? . . . . . .
* 3.1 Altitude, position, and time at which interference was observed:

Date	Time (GMT)	Altitude	Position

N.B. Report Forms should not be sent unless the interference has been observed a sufficient number of times to justify setting international administrative machinery into motion, or unless it is considers as really endangering a radio navigation or safety service

4. Has your Administration already applied, regarding this case of interference, any part(s) (and which) of the ITU procedures laid down in Article S15 of the ITU-R Radio Regulations?

=* 5. Call sign of IS (IS = Interfering Station) . . . . . .
6. Name of IS corresponding to the call sign . . . . . .
7. Notified frequency on which IS should operate (if known). . . . . .
8. (a) Approximate frequency of IS . . . . . kHz/MHz*
(b) Strength of IS (QSA or SINPFEMO - See ICAO Doc 8400/3) . . . . . .
9. Class of emission of IS . . . . . .
10. Language used by IS . . . . . .
11. Call sign of station in communication with IS . . . . . .

= N.B. If the callsign referred to in 5 could not be received, or if the callsign received is not in the international series and cannot be interpreted, the Report Form should not be sent unless at least one of the questions under 12. 13 and 14 can be answered

12. Location of the IS (accurate or approximate coordinates) . . . . . .
. . . . . .
13. Country where interfering station is believed to be located . . . . . .
. . . . . .
14. Bearing (in degrees true) of the IS (with indication of location of D/F station) . . . . . .
. . . . . .

ITU DEFINITION OF HARMFUL INTERFERENCE

Harmful Interference: interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with these Regulations.

* Delete abbreviation (KHz or MHz) which is not applicable.

ATTACHMENT E

AM(R)S PLANNING PRINCIPLES

In the planning of the AM(R)S the following principles should be taken into account:

a) based on the ATS providers and aircraft operators plans, the implementation of air-ground data link communications in the AFI Region should be carried out in a progressive manner taking into account cost-benefit considerations;

b) communications data links, when implemented, should be used for routine air-ground communications. Voice communications capability should be maintained for emergency purposes at the ATM units;

c) VHF communications, supported by extended range facilities where required, should be used to cover ATS routes to the maximum extend possible;

d) VHF planning should be based on channel spacing of 25 KHz and assignment of frequencies in the band 117.975 to 137 MHz should be based on the principles set out in Annex 10, Volume V;

e) in coordination with States, VHF frequency channels assignment for planned and operational air-to-ground communications should be recorded and published by the ICAO Regional Offices;

f) where full VHF coverage is provided, the requirements of HF should be withdrawn;

g) where full VHF RTF coverage is not practicable, or cannot be guaranteed at all times, HF RTF communications should be provided;

h) the assignments of HF/SSB frequencies for voice communications should be made in accordance with the allotment Plan and technical principles for the AM(R)S contained in Appendix S27 of the ITU-R Radio Regulations. The assignments for HF data communications should be made based on the agreement to be made in this respect between the ICAO and the ITU;

i) satellite voice communications must be capable of providing a quality equivalent to that of VHF voice and priority must be available for satellite ATS voice communications in both “to” and “from” aircraft direction;

j) in planning the AMS(R)S, proliferation of AMSS ground earth stations (GES) should be avoided; and

k) for the remote and oceanic areas without VHF coverage, satellite air-ground data links of the AMSS should be planned and complemented as necessary with HFDL services.

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ATTACHMENT F

GEOGRAPHICAL SEPARATION CRITERIA

Air/ground Communication for	Symbol	Designated Operational Coverage		Minimum Geographical Separation (NM)	Adjacent Channel Separation (NM)
		NM	up to m (ft)		
Aerodrome control	TWR	25	1 200 (4 000)	175	50
Surface movement control	SMC	Limits of the aerodrome	Surface	25	25
Approach control up to fl450	APP/U	150	13 700 (45 000)	820	180
Approach control up to fl250	APP/I	75	7 600 (25 000)	550	95
Approach control up to fl120	APP/L	50	3 650 (12 000)	370	60
Area control up to fl450	ACC/U	Within the area plus 50 NM	13 700 (45 000)	520 between limits of service areas	180 between limits of service areas
Area control up to FL250	ACC/L	Within the area plus 50 NM	7 600 (25 000)	390 between limits of service areas	95 between limits of service areas
SST high level operations or VHF/ER	ACC/ER	To be specified	20 000 (66 000)	1300	350
VOLMET up to FL450	V	Maximum omni-directional available	13 700 (45 000)	520	180

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ATTACHMENT G

AM(R)S VHF SUB-BANDS ALLOTMENT TABLE

Frequency Sub-band (MHz)	World-wide Utilization	AFI Application	Remarks
118.00-118.925	National/International	TWR	
119.00-121.375	National/International	APP	
121.5	Emergency frequency	Emergency frequency	
121.60-121.975	National/International	SMC	
122.00-123.05	National	-	
123.1	Aux. frequency SAR	Aux. frequency SAR	
123.15-123.675	National	-	Note 1
123.45	Air-to-air communications	Air-to-air communications	
123.70-126.675	National/International	ACC	
126.70-127.575	National/International	General purpose (GP)	
127.60-127.90	National/International	VOLMET/ATIS	
127.950-128.80	National/International	ACC	
128.850-129.850	National/International	APP	
129.90-132.025	National/International	AOC	
132.050-132.950	National/International	VOLMET/ATIS	
133.00-135.950	National/International	ACC	
136.00-136.875	National/International	-	
136.90-136.975	National/International	Reserved for VDL	

Note 1.– With the exception of 123.45 MHz which is also used as the worldwide air-to-air communications channel.

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ATTACHMENT H

PLANNING PRINCIPLES FOR AERONAUTICAL RADIO NAVIGATION AIDS

The current AFI aeronautical radio navigation plan is based on certain planning principles which have been developed through the years. An updated list of such planning principles, which incorporates the latest developments, especially with regard to satellite navigation matters, is presented below:

a) **NDB**:

1) an NDB should be implemented where the provision of a VOR is not feasible. Guidance material for NDBs is contained in Annex 10, Volume I, Attachment C, Section 6;

2) radio frequencies assigned to NDBs shall be selected from those available in the portion of the spectrum between 190 to 1 750 kHz. A minimum ratio of 15 dB between wanted and unwanted signals shall be used;

3) between 30ES and 30EN, the minimum value of field strength at the limit of the rated NDBs coverage shall be 120 microvolts/m. Otherwise, 70 microvolts/m shall be provided; and

4) in selecting frequencies for modulation tones of NDBs, the 1 020 Hz tone should be used unless interference on adjacent carrier frequencies is experienced, in which case 400 Hz may be used;

b) **VOR**:

1) for VORs located in the AFI Region required to serve flights up to FL 500 (using 100 kHz channel spacing in odd tenths of a megahertz in the band 111.975 - 117.975 MHz), a geographical separation of 550 NM for co-channel and 220 NM for adjacent channel frequency assignment should be used;

2) for VORs in congested areas where older receivers (with a 100 kHz spacing operate in a mixed 100 kHz - 50 kHz channel spacing environment, geographical separation for adjacent channel should be greater that 500 NM;

3) for VORs required for use in terminal areas 40 NM/FL250, geographical separation should be 200NM for co-channel and 60NM for adjacent channel.

4) for VORs required for use in final approach and landing (25NM/FL100), geographical separation should be 130Nm for co-channel, and 30 NM for adjacent channel if a frequency spacing 100 kHz is used.

5) it is recognized that in applying the concept of reduced service volumes to overcome difficulties in VOR frequency deployment in any given area of congestion, there may be a special requirement to exceed the minimally set service volume to accommodate a certain portion of airspace or certain operational procedures. In such case, an "expanded service volume" covering the airspace or operational procedure in question could be established and provided with special frequency protection. This could be done, in general, on a case-by-case basis;

c) **non-visual aids for final approach and landing:**

1) a regional strategy for the introduction of final approach and landing was developed by APIRG as part of the AFI Regional Plan for the Implementation of the CNS/ATM Systems. This strategy is presented in the attachment ;

2) in the AFI Region, the majority of aircraft carry ILS localizer and glide path receivers with channel spacing of 100 kHz and 300 kHz, respectively. Moreover, it is considered that the density of ILS facilities in the AFI Region is such that localizer and glide path frequencies can be assigned, in accordance with the provisions of Annex 10, Volume I, paragraph 3.1.6.1.1. The minimum geographical separation between ILS facilities would be 175 NM for co-channel and 45 NM for adjacent channel. Guidance material on this matter is provided in Annex 10, Volume I, Attachment C, paragraph 2.6; and

3) GBAS carrier frequencies will have to be selected in accordance with GNSS SARPs in Annex 10, Volume 1, Chapter 3, 3.7. ILS/GBAS and COM (VHF)/GBAS geographical separation criteria are currently under development. Until this criteria are defined and included in the SARPs, GBAS frequencies can be selected from the band 112.050 - 117.900 MHz;

d) **DME**:

1) for most DME facilities which operate in association with VORs, the same geographical separation criteria established for the VOR are equally applicable. Guidance material on geographical separation criteria for DME facilities is provided in Annex 10, Volume I, Attachment C, paragraph 7.1.7; and

e) **guidelines for transition to satellite navigation systems:**

1) the GNSS should be introduced in an evolutionary manner;

2) the ground infrastructure for current navigation systems must be available during the transition period;

3) States/regions should consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance;

4) States/regions should coordinate to ensure that separation standards and procedures for appropriately equipped aircraft are introduced approximately simultaneously in all flight information regions (FIRs) along major traffic routes; and

5) in planning the transition to GNSS, the following issues must be considered:

— schedule for availability and approval of GNSS-based service;

— extent of existing ground-based radio navigation service;

— level of user equipage;

— provision of other systems required for air traffic services (i.e. surveillance and communication);

— density of traffic/frequency of operations; and

— mitigation of risks associated with radio frequency interference.

ATTACHMENT I

REGIONAL STRATEGY FOR THE INTRODUCTION AND APPLICATION OF NON-VISUAL AIDS FOR APPROACH, LANDING AND DEPARTURE

[Doc 003, para. 2.2.3.1.1]

The AFI strategy for transition from ILS to new precision approach and landing systems is based on the worldwide strategy developed by the Special Communications/Operations Divisional Meeting (1995) (SP COM/OPS/95) for the introduction and application of non-visual aids to approach and landing which enables each region to develop an implementation plan for future systems. The AFI strategy, which will be kept under constant review states as follows:

a) continue ILS operations to the highest level of service as long as operationally acceptable and economically beneficial.

Note: To co-ordinate with the users any withdrawal of ILS and provide at least a five-year notice for the withdrawal of any ILS ground-based equipment.

b) promote the use of MMR or equivalent airborne capability to maintain aircraft interoperability;

c) validate the use of GNSS, with such augmentations as required, to support approach and departure operations, including Category I operations, and implement GNSS for such operations as appropriate; and

d) complete feasibility studies for Category II and III operations, based on GNSS technology, with such augmentations as required. If feasible, implement GNSS for Category II and III operations where operationally acceptable and economically beneficial.

GNSS Implementation strategy
[APIRG/12, Concl. 12/47]

The initial AFI GNSS implementation strategy adopted by APIRG details an evolutionary path from existing constellations through a minimal satellite-based augmentation system (SBAS) providing over the whole AFI Region a non-precision approach capability with vertical guidance at 20 m accuracy (APV-I). The initial strategy is shown at **Appendix…** of the AFI FASID.

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ATTACHMENT J

EXAMPLES OF 24-BIT AIRCRAFT ADDRESS ASSIGNMENTS

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PART V - AIR TRAFFIC MANAGEMENT (ATM)

PART V – AIR TRAFFIC MANAGEMENT (ATM)

1. INTRODUCTION

1.1 This part of the Africa-Indian Ocean (AFI) Basic Air Navigation Plan (ANP) contains elements of the existing planning processes and introduces the basic operational requirements and planning criteria related to air traffic management (ATM) as developed for the AFI Region.

1.2 As a complement to the statement of basic operational requirements and planning criteria set out in Part I of the Basic ANP, Part V constitutes the stable guidance material considered to be the minimum necessary for effective planning of ATM facilities and services in the Africa-Indian Ocean Region. This guidance material has been developed through the ICAO regional planning processes which, in the case of the AFI Region, is based largely on the work of the AFI Planning and Implementation Regional Group (APIRG) and AFI regional air navigation meetings. Background information of importance in the understanding and effective application of this part of the plan is contained in the Report of the Seventh Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9702), the Sixth Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9298) and the Report of the Limited Africa-Indian Ocean (COM/MET/RAC) Regional Air Navigation Meeting (Doc 9529).

1.3 The Standards, Recommended Practices and Procedures to be applied are contained in:

a) Annex 2 — *Rules of the Air*;

b) Annex 11 — *Air Traffic Services*;

c) *Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services* (Doc 4444);

d) *Regional Supplementary Procedures* (Doc 7030), Part 1 — *Rules of the Air, Air Traffic Services and Search and Rescue*.

1.4 The elements of the material referred to above are presented in the following paragraphs under the headings of Airspace Management (Part V.I – ASM), Air Traffic Services (Part V.II – ATS) and Air Traffic Flow Management (Part V.III – ATFM), with appropriate cross-references to AFI RAN meeting recommendations.

1.5 A detailed description/list of the facilities and/or services to be provided by States in order to fulfil the requirements of the ANP is contained in the AFI Facilities and Services Implementation Document (FASID). During the transition and pending full implementation of the future communications, navigation and surveillance/air traffic management (CNS/ATM) systems, it is expected that the existing requirements will gradually be replaced by new CNS/ATM systems-related requirements. Further, it is expected that some elements of the CNS/ATM systems will be subject to amendment, as necessary, on the basis of experience gained in their implementation.

2. OBJECTIVES OF AIR TRAFFIC MANAGEMENT

2.1 General

2.1.1 The primary objective of an integrated ATM system in the AFI Region is to enable aircraft operators to meet their planned times of departure and arrival and adhere to their preferred flight profiles with minimum constraints and with no compromise to safety. To accomplish this, the technologies afforded through new CNS systems will have to be fully exploited through international harmonization of ATM standards and procedures. From the aircraft operator's point of view, it is desirable to equip aircraft operating internationally with a minimum set of avionics usable everywhere. Additionally, many of the expected service improvements cannot be meaningfully implemented by one State, but must be implemented in contiguous regions. Therefore, the ATM regional concept of providing ATM over expanded areas must be pursued.

2.2 Elements of the air traffic management ystem

2.2.1 The envisaged ATM system in the AFI Region will consist of several sub-elements; these are: airspace management (ASM), ATS, air traffic flow management (ATFM)and the ATM-related aspects of flight operations. These sub-elements will evolve and take on different roles, mainly because they will integrate into a total system. Rather than viewing ground and air as separate functions, the ATM-related aspects of flight operations will be fully integrated as a functional part of the ATM system. Ultimately, this inter-operability and functional integration into a total system is expected to yield a synergy of operations that does not currently exist. Through the use of data link for data interchange between elements of the ATM system, this functional integration will be accomplished.

2.2.2 *Airspace management*

2.2.2.1 Airspace planning is to be carried out in close coordination between civil nd military users, with a view to achieving an efficient joint utilization of available navigable airspace to the greatest benefit of all users. Joint use policy concept of airspace should be the ultimate goal.

2.2.2.2 The objective of ASM is to maximize, within a given airspace structure, the utilization of available airspace by dynamic time-sharing and, at times, segregation of airspace among various categories of users based on short-term needs. Furthermore permanent segregation of airspace among users should be avoided.

2.2.2.3 In the emerging ATM system in the AFI Region, airspace management will encompass more than it has traditionally. Consequently, in the seamless, global ATM system, airspace management will not be limited only to tactical aspects of airspace use. Its main scope will be toward a strategic planning function of airspace infrastructure, and progressive implementation of flexible use of airspace (FVA) concept. In selected airspaces “Free Flight” concept should be pursued.

2.2.3 *Air traffic services*

2.2.3.1 ATS will continue to be the primary element of ATM in the AFI Region. The ATS are composed of several sub-elements: alerting service, flight information service (FIS) and ATC. The primary objective of ATC service is to prevent collisions between aircraft and between aircraft and obstructions on the manoeuvring area and to expedite and maintain an orderly flow of air traffic. The objective of FIS is to provide advice and information useful for the safe and efficient conduct of flights. The objective of alerting service is to notify appropriate organizations regarding aircraft in need of search and rescue service and assist such organizations as required.

2.2.3.2 Significant progress has been made on the development of provisions related to ATS in CNS/ATM systems. Standardization and harmonized implementation planning in the AFI Region will ensure that ATS systems supporting ATM are developed so as to provide integration into a regional and global network of continuous service. This requires harmonization of radar data and flight data processing systems, among others. The functional capabilities of ATS support systems such as conflict prediction, detection, advisory and resolution should be harmonized across the AFI Region.

2.2.4 *Air traffic flow management*

2.2.4.1 The objective of ATFM is to ensure an optimum flow of air traffic to or through areas during times when demand exceeds or is expected to exceed the available capacity of the ATC system. The ATFM system in the AFI Region should therefore reduce delays to aircraft both in flight and on the ground and prevent system overload. The ATFM system will assist ATC in meeting its objectives and achieving the most efficient utilization of available airspace and airport capacity. The ATFM system in the AFI Region should also ensure that safety is not compromised by the development of unacceptable levels of traffic congestion and, at the same time, to assure that traffic is managed efficiently without unnecessary flow restrictions being applied.

2.3 ATM system regional evolution and implementation timelines

2.3.1 Although changes in the ATM system in the AFI Region will be implemented in an evolutionary manner, the design of the emerging system should allow for the implementation of a series of well-planned and feasible improvements with a favourable cost-benefit ratio. The ATM system should satisfy user needs while meeting safety, capacity, efficiency, regularity and environmental protection requirements. The implementation plan should allow for incremental improvements, so that the services provided are appropriate to given applications and areas, thereby ensuring homogeneous, continuous and effective service from gate-to-gate. A well-planned implementation schedule is also essential to guarantee an interface between adjacent systems so that boundaries remain transparent to airspace users and where feasible creation of a single continum of airspace will be desirable.

2.3.2 The evolution of ATM in the AFI Region has been planned on the basis of an integrated regional infrastructure. This is accomplished through planning based on a series of homogeneous areas and major international air traffic flows. Ten areas have been identified, taking into consideration the varying degrees of complexity and diversity in the region. A high-level view of ATM system implementation is depicted in the Regional ATM System Implementation Table at Appendix B.

PART V.I – AIRSPACE MANAGEMENT (ASM)

3. OBJECTIVES OF ASM

3.1 Best use of airspace and airport capacity requires an efficient airspace structure which permits collaboration planning between the aircraft and the ground ATM system. The airspace structure should be capable of dynamically adapting to changing circumstances and also accommodating the capabilities and desires of the airspace users, utilizing all available data.

3.2 The careful monitoring and efficient coordination of airspace use is essential to ATM. Therefore, the main objective of ASM is the avoidance of permanent reservation of parts of the airspace for one particular user. This applies to all airspace, but the objective is of special importance in airspace where the ATM system is based on a less rigid track structure, as opposed to on a fixed network of ATS routes. When airspace user requirements conflict, resolution should be accomplished through coordination between all concerned parties, with a view to sharing airspace when possible and keeping the exclusive use of blocks of airspace to a minimum. Finally, close cooperation should result in information being readily available on expected and actual utilization of temporarily reserved airspace. The principles below highlight the main points of an effective ASM:

a) airspace use should be carefully coordinated and monitored in order to cater for the conflicting legitimate requirements of all users and to minimize any constraints on operations;

b) when it is unavoidable to segregate different categories of traffic, the size, shape and regulation category of airspace should be tailored to the minimum required to protect the operations concerned;

c) permanent segregation of airspace should be avoided in favour of flexible use of airspace; however, where it is necessary to cater for specific flight operations, e.g. military, reservation of airspace for such events should be limited in time and space to the minimum required; and

d) efficient communications should be provided between the entities providing services to air traffic, in order to enhance civil/military coordination in real-time.

3.3 The aim of airspace sectorization should be to develop an optimum airspace configuration, in combination with the use of other suitable methods for increasing ATM system capacity.

3.4 In order to accomplish this aim, the following functions are necessary:

a) collection and evaluation of all requests which require temporary airspace allocation;

b) planning and allocation of the required airspace to the users concerned where segregation is necessary;

c) activation and de-activation of such airspace within narrow time tolerances, in close cooperation with ATS units and civil or military units concerned; and

d) dissemination of detailed information, both in advance and in real-time, to all parties concerned.

3.5 Background information of importance in the understanding and effective application of this part of the plan is contained in the Report of the Seventh Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9702), the Sixth Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9298) and the Report of the Limited Africa-Indian Ocean (COM/MET/RAC) Regional Air Navigation Meeting (Doc 9529).

Plan of ATS airspaces (FIRs, ATS routes, TMAs and CTRs)

3.6 Regional air navigation meeting recommendations shown in brackets below a heading indicate the origin of all paragraphs following that heading. A recommendation shown in brackets below a paragraph indicates the origin of that particular paragraph.

3.7 Flight information service is to be provided on a 24-hour basis for each flight information region and upper information region depicted on Charts ATS 1 and 2 respectively. This service is to be provided either by an area control centre (ACC) providing area control service within an FIR or upper flight information region (UIR) or, where there is no ACC, by a flight information centre (FIC) established for this purpose.

3.8 *ATS routes plan*
[AFI/7, REC.5/8]

3.8.1 The plan of ATS routes shown at Appendix A should form the ATS route network for the AFI Region. The proposed additions, deletions and changes to the requirements for the ATS routes network should be coordinated through the ICAO Regional Office concerned.

PART V.II - AIR TRAFFIC SERVICES (ATS)

4. **GENERAL GUIDELINES**

4.1 *A cooperative approach to airspace management*
[AFI/7, Rec.5/1]

4.1.1 States, taking into account the need for cost-effective introduction and operation of CNS/ATM systems, should give consideration to cooperative efforts for introducing more efficiency in airspace management, particularly through globalization of upper airspace management, in order to facilitate the safe, orderly and expeditious flow of air traffic.

4.2 *Civil/military coordination*
[AFI/7, Rec.5/3]

4.2.1 In order to achieve optimum civil/military coordination and joint use of airspace with a maximum degree of safety, regularity and efficiency of international civil air traffic, States should:

a) establish appropriate civil/military coordination bodies to ensure, at all levels, the coordination of decisions relating to civil and military problems of airspace management and air traffic control;

b) make known to military authorities the existing ICAO provisions (Assembly Resolution A32-14, Appendix P, Annex 11, paragraphs 2.16 and 2.17) and guidance material [*Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations* (Doc 9554) and *Manual concerning Interception of Civil Aircraft* (Doc 9433)] related to civil/military coordination and promote familiarization visits by military personnel to air traffic services (ATS) units;

c) arrange permanent liaison and close coordination between civil ATS units and relevant military air defence units, in order to ensure the daily integration or segregation of civil and military air traffic operating within the same or immediately adjacent portions of airspace, employing civil and/or military radars as necessary, and to obviate the need for civil aircraft to obtain special "air defence" clearances; and

d) take the necessary steps to prevent, as far as possible, penetration of controlled airspace by military aircraft without coordination with the air traffic control unit concerned.

4.3 *Operational Letter of Agreement between ATS and military units*
[AFI/7, Rec. 5/6]

In order to facilitate uniformity in the application of ICAO Standards and Recommended Practices relating to the interception of civil aircraft, States, when establishing agreements between ATS units and appropriate military units, should use to the extent possible the model Letter of Agreement appearing at Appendix B in the *Manual concerning Interception of Civil Aircraft* (Doc 9433).

4.4 *Repetitive flight plans*
[AFI/7, Rec. 5/22]

States should implement the system of repetitive flight plans (RPLs) in areas where RPLs are not used at present but where such use may be beneficial to both air traffic services and aircraft operators.

4.5 *Reporting and analysis of ATS incidents*
[AFI/7, Rec. 5/26]

States which have not already done so should:

a) implement procedures for the timely reporting of air traffic incidents;

b) publish reporting procedures in their aeronautical information publication (AIP) and relevant ATS documents and make the Model Incident/Accident Report form available at ATS units, including those offices used for pre- and post-flight pilot briefing;

c) establish procedures for the investigation of causes and circumstances concerning significant air traffic incidents in line with Annex 13 requirements; and

d) emphasize, in national documentation, the need for rapid notification of the results of investigations to all parties concerned including pilots, aircraft operators, ATS units, ICAO and other affected States or agencies.

4.6 *Compliance with standard radiotelephony phraseologies and procedures*
[AFI/6, Rec. 7/11]

States, with the assistance of ICAO if necessary, should take appropriate measures to ensure that their air traffic services and communications personnel are fully conversant with standard radiotelephony phraseologies and procedures.

4.7 *Contingency planning*
[AFI/7, Rec. 5/2]

States which have not already done so should develop contingency plans for their area of responsibility in coordination with adjacent States, ICAO and interested international organizations, in order to facilitate early implementation of contingency measures should services be disrupted.

5. Flight information service
(Chart ATS 1)

5.1 *Plane of division between the lower and upper airspace*
[LIM AFI, Rec. 2/1]

If and when required to establish a division between lower and upper airspace, the plane of division should be at FL 245.

5.2 *Provision of aerodrome flight information service (AFIS)*
[AFI/6, Rec. 6/12]

Aerodrome flight information service (AFIS) should be provided at all aerodromes used by international general aviation aircraft not provided with aerodrome control.

5.3 *Publication of information in AIPs*
[AFI/7, Rec. 5/5]

a) States which have determined that there is a risk of interception in case of penetration of certain areas adjacent to air traffic services (ATS) routes should include in their aeronautical information publications (AIPs), as soon as possible, text relating to the potential risk of interception, including the navigation requirements to keep clear of the area;

b) States which have not determined the existence of interception risk, but which are affected by a situation of this nature, should adopt, as soon as possible, all measures which may be necessary to comply with the indications referred to in sub-paragraph a) above;

c) States which possess the facilities to monitor deviations from track which may involve the possibility of penetrating airspaces where interception procedures are implemented should include in their AIPs information to indicate that such deviations will be communicated to the aircraft concerned; and

d) aeronautical information services (AIS) units should prepare a separate pre-flight bulletin on dangers to air navigation, with details on activated areas, for distribution to flight crews and operations personnel.

6. **Air traffic control service**
(Table ATS 1; Charts ATS 1, ATS 2 and ATS 3)

6.1 *Plan of ATS routes*
[AFI/7, Rec. 5/8]

6.1.1 The plan of ATS routes, as shown in Table ATS 1, forms the ATS route network for the upper and lower airspace in the region.

6.1.2 States should coordinate the assignment of designators for, and any changes to, ATS routes not included in the Plan, through the appropriate ICAO Regional Office.

6.2 *Implementation of VHF radio coverage*
[AFI/7, Rec. 5/12]

a) VHF radio coverage should be provided to the extent practicable along all ATS routes shown in Table ATS-1. Remote VHF stations should be used, as appropriate, to meet this objective;

b) as a minimum, VHF radio coverage should be provided:

1) along all ATS routes serving all international airports up to a minimum distance of 150 NM from the airport(s) concerned and up to FL 245;

2) between FL 245 and FL 460 along all ATS routes used by international air transport operations; and

c) where complete VHF radio coverage cannot be provided within an FIR, bilateral agreements for use of available VHF stations located in adjacent States should be concluded.

6.3 *Air traffic advisory service*
[AFI/6, Rec. 6/15]

Where air traffic advisory service is implemented on international ATS routes, it should be provided on an interim basis only, when facilities or personnel are not yet fully adequate for permitting the immediate introduction of air traffic control service. Such service should be converted to air traffic control service at the earliest time possible.

6.4 *Establishment of standard departure and arrival routes*
[AFI/7, Rec. 5/10]

States which have not already done so should establish standard departure and arrival routes wherever necessary, taking into account relevant ICAO provisions of Annex 11, Appendix 3 and guidance material in the *Air Traffic Services Planning Manual* (Doc 9426).

6.5 *Implementation of ATS direct speech circuits*
[AFI/7, Rec. 5/13]

When air-ground radio channels are being used for communications between ATS units, States concerned should assign a high priority to the establishment of reliable direct speech communications between ATS units serving adjacent areas so as to enhance efficiency of the air traffic control service.

Note.— See also Recommendation 5/24.

6.6 Implementation of radar
[LIM AFI, Rec. 10/38]

Implementation of radar should not be given priority over essential requirements for air traffic service, such as air- ground communications and ATS direct speech circuits.

7. ATS requirements for aeronautical fixed service communications

7.1 *Implementation of ATS direct speech circuits*
[LIM AFI, Rec. 10/36]

States should accord special priority to the implementation of ATS direct speech (DS) circuits and should use the following priority criteria as a planning basis for the implementation of ATS/DS circuits:

First priority:

ATS/DS circuits between ATS units providing service in contiguous airspace where air traffic control service is being provided or is required;

Second priority:

ATS/DS circuits between an aerodrome located close to an FIR boundary and the FIC/ACC located in the adjacent FIR;

Third priority:

ATS/DS circuits between adjacent FICs/ACCs providing ATS along routes where neither air traffic control service nor air traffic advisory service is provided.

Note.—APIRG should establish and maintain detailed priority lists for implementation of individual ATS/DS circuits including target dates for the implementation of "First priority" circuits, bringing all changes to the attention of States concerned.

7.2 *Provision of area control service*
[AFI/7, Rec. 5/21]

a) Area control service should be provided on a 24-hour basis for flights along all ATS routes shown in Table ATS-1. Where it may not be possible to immediately meet this requirement in full, the following guidelines should be applied:

1) progressive stepped lower limit of controlled airspaces may be established at a maximum rate of 200 feet per nautical mile; and

2) all ATS routes used by international air transport operations should be designated airspace Class A between FL 245 and FL 460; and

b) the AFI Planning and Implementation Regional Group (APIRG) should identify those routes or route segments where, based upon traffic densities or other operational assessment factors, air traffic control should be implemented.

8. HF and VHF VOLMET broadcasts
(Tables ATS 2 and 2A)

8.1 The HF VOLMET broadcast plan is presented in Table ATS 2 and the VHF VOLMET broadcast plan in Table ATS 2A.
[AFI/6, Rec. 9/4]

8.2 Pertinent SIGMET information (or notificatin of availability of SIGMET information) or NIL SIGMET information should be included at the beginning of each broadcast.

8.3 Current aerodrome reports, with air temperature, dew point temperature and QNH (for all stations in HF broadcasts; only for the stations indicated by a Q in the VHF broadcast plan) and trend should be included as available.

8.4 The order of transmission of stations should be, as far as practicable, as shown in the tables. In cases where States find it necessary to make changes in the sequence, they should give notice of this by NOTAM.
[AFI/6, Rec. 9/12]

9. Air traffic flow management (ATFM) General concept

9.1 The objective of ATFM is to ensure an optimum flow of air traffic to or through areas during times when demand exceeds or is expected to exceed the available capacity of the ATC system. An ATFM system should therefore reduce delays to aircraft both in flight and on the ground and prevent system overload. The AFTM system assists ATC in meeting its objectives and achieving the most efficient utilization of available airspace and airport capacity. ATFM should also ensure that safety is not compromised by the development of unacceptable levels of traffic congestion and, at the same time, to assure that traffic is managed efficiently without unnecessary flow restrictions being applied.

9.2 In an integrated ATM system, real-time flow management tools will be required to assimilate the mass of information and offer flow strategies that take full advantage of changing conditions. Many aircraft have sophisticated FMSs that can adapt to changing situations and will communicate automatically with ground systems; therefore, they will be valuable partners in the flow strategy decision-making process. Comprehensive databases will describe current and projected levels of demand and capacity. Sophisticated models that accurately predict congestion and delay will be used formulate effective real-time strategies for coping with excess demand. Users will interfere with the flow management process in-flight planning to negotiate trajectories that best satisfy their needs while meeting ATM capacity constraints.

9.3 The tactical flow management process that monitors the progress of individual aircraft and intervenes in their flight paths when required to meet ATM constraints (eg. separation standards) will also make extensive use of automation. When a user determines that a flight plan amendment or update is required, a negotiation process will be established between the aircraft's flight management computer system and the ground-based tactical management process to define a new trajectory that best meets the users objective and satisfies ATM constraints. Similarly, when the ground based tactical management process recognizes a need to intervene in the cleared flight path of an aircraft, the ATM computer will negotiate with the flight management computer to determine a modification meeting ATM constraints with a minimum deviation from the user's preferred trajectory. These negotiation processes will be dialogue involving both the pilot and air traffic controller to the extent requried to permit them to exercise their management and control responsibilities. In essence, ATS and ATFM will merge into a single, seamless system.

9.4 To ensure global compatibility of regional ATFM systems as part of an integrated ATM system, standardization of functionality is required on a worldwide basis. Such standardization is being undertaken as part of the technical work programme of ICAO through the development of funtional specifications and procedures for the worldwide integration of AFTM systems, which would facilitate an optimal flow of air traffic.

Functional integration

9.5 ATM consists of a ground part and an air part, where both are needed to ensure a safe and efficient movement of aircraft during all phases of operations. The airborne and ground components of the system must have the functional capability of interfacing with one another in order to attain the general objectives of ATM. The ground part includes ATS, ATFM and ASM, where ATS is considered to be the primary component of ATM. Functional compatibility of the data exchanged between the airborne and the ground elements is essential to ensure the efficiency of the system. Furthermore, the various elements of the overall ATM system must be designed to work together effectively to ensure homogeneous, continuous and efficient service to the user from pre-flight to post-flight. International harmonization and, ultimately, integration into a seamless system, are needed to provide for consistency in operations across national boundaries.

9.6 Increasing numbers of aircraft are being equipped with new technology CNS systems that would enable an aircraft to proceed along any desired flight path. Current supporting ATS systems with varying

capabilities do not permit optimum flight trajectories in most airspaces. The capabilities of airborne and ground-based systems cannot be fully exploited in the absence of functional integration of these systems.

Application of AFTM in the AFI Region

General Principles of the ATFM Service

9.7 In airspaces of high volume of air traffic, ATFM is needed to support ATM as a planning tool by providing for an optimum flow of air traffic to or through areas during times when demand exceeds or is expected to exceed, the available capacity of the ATM system. The oceanic ATFM service should be interfaced with domestic ATFM organizations/units to provide maximum harmonization and unified ATC application.

9.8 When operationally required, the AFI Air Navigation Planning and Implementation Regional Group (APIRG) should develop appropriate procedures for the provision of the ATFM service within the AFI Region to cater for the requirements of flights to and from FIRs in the region and adjacent to it. To achieve this, the following basic principles should be covered in the future ATFM system:

a) Pro-active ATFM requires the ability to dynamically interact with the strategic planning of traffic flows. Therefore, ATFM in the AFI Region should be interfaced with the overall ATFM strategies in other regions. To this end the ATM system should also be capable of adjusting to the varying requirements; and

b) Re-active ATFM is required to take account of short-term contingencies. The ATM system should be able to react quickly and provide early information and advice to the controller and the pilot of the best tactical response necessary to achieve ATFM objective.

Appendix A

TABLE ATS 1 — BASIC ATS ROUTE NETWORK IN THE LOWER AND UPPER AIRSPACES

EXPLANATION OF THE TABLE

Table ATS 1 describes the basic ATS route network in the lower and upper airspaces of the AFI Region.

Note.— For planning purposes, FL 245 has been used as the uniform plane of division between the Lower and Upper Airspaces for the description of the ATS route networks in the table. This was done in accordance with Recommendation 5/21 of the Seventh Africa-Indian Ocean Regional Air Navigation Meeting (1997) and does not necessarily reflect the actual implementation situation in the FIRs/UIRs of the AFI Region.

Left column — Lower ATS routes
Right column — Upper ATS routes

Route description

— The new designator of each route is shown as the heading: currently published designator(s) are shown in the left margin in front of the corresponding route segment(s).

— List of significant points necessary to describe the required routes. Each significant point is identified by the name of the radio navigation aid marking it, or by a five-letter name-code designator.

— Significant points shown are those which identify:

  — a change of track;
  — a route extremity;
  — a meteorological reporting point;
  — any other point essential to be reflected in the plan, such as the boundaries of ICAO Regions.

— Additional points where facilities are provided to complete navigational guidance along a route but not otherwise marking significant points as defined above are not included. Names shown in parentheses indicate the next significant point(s) outside the AFI Region.

Notes used in the table

The notes reflect the views of States or operators with regard to a given ATS route or segment thereof. These notes do not form part of the Plan and may be updated editorially on simple notification by their originators, thus reflecting latest developments as they occur. They are therefore not subject to the procedure for the amendment of approved Regional Plans. The meaning of each of the notes used is given below, however notes without number (e.g. see ATS route A403, un-numbered “note” below “Tripoli”) need to be given one of the following appropriate numbers by the States concerned, in due course.

Note 1: “Not representing the operator’s requirements” (operator’s requirements are shown in brackets)

Note 2: “Subject to further study” (including the associated navigation aid coverage)

Note 3: “Subject to military agreement”

Note 4: “Not acceptable at present”

Note 5: “At present, implementation possible only during specific periods (e.g. weekends, night-time, etc., as published)”

Whenever reference to names of States is made in Table ATS 1 in connection with the above notes, the following abbreviations, based on those indicated in *Location Indicators* (Doc 7910), are used:

DA Algeria
DB Benin
DF Burkina Faso
DG Ghana
DI Côte d’Ivoire
DN Nigeria
DR Niger
DT Tunisia
DX Togo
FA South Africa
FB Botswana
FC Congo
FD Swaziland
FE Central African Republic
FG Equitorial Guinea
FH Ascension
FI Mauritius
FJ British Indian Ocean Territory
FK Cameroon
FL Zambia
FM Madagascar
FM Comoros
FM Reunion (France)
FN Angola
FO Gabon
FP Sao Tome and Principe
FQ Mozambique
FS Seychelles
FT Chad
FV Zimbabwe
FW Malawi
FX Lesotho
FY Namibia
FZ Democratic Republic of the Congo
GA Mali
GB Gambia
GC Canary Islands (Spain)
GF Sierra Leone
GG Guinea-Bissau
GL Liberia
GM Morocco
GO Senegal
GQ Mauritania
GS Western Sahara
GU Guinea
GV Cape Verde
HH Eritrea
HA Ethiopia
HB Burundi
HC Somalia
HD Djibouti
HE Egypt
HK Kenya
HL Libyan Arab Jamahiriya
HR Rwanda
HS Sudan
HT United Republic of Tanzania
HU Uganda
LC Cyprus
LE Spain
LF France
LG Greece
LI Italy
LL Israel
LM Malta
LP Portugal
LT Turkey
OE Saudi Arabia
OJ Jordan
OL Lebanon
OS Syrian Arab Republic
OY Yemen
SB Brazil
VO India
YA Australia

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	A145		UA145
	(Paleohora)		(Paleohora)
A145	SALUN 3400N 02427E	UA145	SALUN 3400N 02427E
	Sidi Barrani 3136N 02556E		Sidi Barrani 3136N 02556E
			UA214
		UA214	(Pekanbaru)
			BUSUX (0355S 06000E)
			GITOP (0400S 05901E)
			Praslin
			UA293
			(Ibiza)
			*Note 2 (LE)
		UA293	KIRLA 3703N 00130E
			*Note 4 (DA)
			Tiaret
			UA302
			Dakar
		UA302	(Vitoria)
	A327		UA327
	Plaisance		Plaisance
A327	KALBI 02826S 07500E	UA327	KALBI 02826S 07500E
	(Phuket)		(Phuket)
	A400		UA400
	Abidjan		Abidjan
	Sao Tome		Sao Tome
	Luanda		Luanda
	Luena		Luena
			*Note (FL) 1
A400	Kaoma	UA400	Kaoma
	*Note (FL)		EVOLU 1543S 02638E
	EVOLU 1543S 02638E		*Note 1 (FL)
	Lusaka		Lusaka
	*Note (FL)		Antananarivo
	Chileka		Moramanga
			Plaisance
	A401		UA401
			Entebbe
	Dar-es-Salaam		Dar-es-Salaam
	Moroni		Moroni
	Mahajanga		Mahajanga
A401	Ankazobe	UA401	Ankazobe
	Antananarivo		Antananarivo
	Moramanga		Moramanga
	Saint Denis		Saint Denis
	Plaisance		Plaisance

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	A402		UA402
A402	Durban		Cape Town
	Johannesburg		Durban
		UA402	*Note (FAS)
			Tolagnaro
			Plaisance
	A403		UA403
	Tripoli		Tripoli
	*-----Note (HL)		*Note (HL)
A403	Sebba	UA403	Sebha
	N'Djamena		N'Djamena
	Berberati		Berberati
	Brazzaville		Brazzaville
	A404		UA404
	Chileka		Harare
A404	Tete		Maun
	Harare		Windhoek
			Walvis Bay
	Maun		
	Windhoek		
	A405		UA405
			Hargeisa
			Mandera
			Wajir
			*Note 3 (HK)
			Nairobi
			Mbeya
	Harare		Harare
			*Note 1 (Harare Hartebeespoortdam)
			Masvingo
	Masvingo		Greefswald
A405	Greefswald	UA405	Hartebeespoortdam
	Hartebeespoortdam		Johannesburg
	Johannesburg		Cape Town
			ETOBO (233900S 0100000W)
			(Recife)
	A406		UA406
	Kinshasa		Kinshasa
	Lubumbashi		Lubumbashi
	Ndola		Ndola
A406	Mfuwe	UA406	Mfuwe
	Lilongwe		Lilongwe

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			UA407
			Lusaka
			Dar-es-Salaam
		UA407	Mombasa
			Mogadishu
	A408		UA408
	Harare		Harare
	Kalemie		Kalemie
	Bujumbura		Bujumbura
A408	Kigali	UA408	Kigali
	Entebbe		Entebbe
			Lodwar
			Addis Ababa
			Saleh
			(Hodeidah)
			UA409
			Kalemie
		UA409	Mansa
			Ndola
			Lusaka
			Gabarone
	A410		UA410
A410	Brazzaville	UA410	Brazzaville
	Bangui		Bangui
	Khartoum		Khartoum
	A411		UA411
	(NAT)		(NAT)
	Rabat		Rabat
	Fes		Fes
	Oujda		Oujda
	Oran		Oran
	Cherchell		Cherchell
	Alger		Alger
	Bejaia		Bejaia
	Annaba		Annaba
	Tunis		Tunis
	Monastir		Monastir
	Jerba		Jerba
	Tanli		Tanli
	Mitiga		Mitiga
	*Note (HL)		*Note (HL)
A411	Tripoli	UA411	Tripoli
	*Note (HL)		*Note (HL)
	Beni-Walid		Beni-Walid
	Benina		Benina
	*Note (HL)		
	GARFE 3236N 02401E		GARFE 3236N 02401E
	*Note (HL, HE)		*Note (HL, 2 HE)
	Mersa-Matruh		Mersa-Matruh
	*Note 3 (HE)		*Note 3 (HE)
	Cairo		Cairo

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores	Upper ATS routes Routes ATS supérieures Rutas ATS superiores

	Lower ATS routes		Upper ATS routes
	Sharm El Sheik		Sharm El Sheik
	(Wejh)		(Wejh)
	A451		UA451
	Sidi Barrani		Sidi Barrani
	KATAB 2925N 02905E		KATAB 2925N 02905E
	Asyut		Asyut
A451	Luxor	UA451	Luxor
	ALEBA		ALEBA
	Port Sudan		Port Sudan
	Asmara		Asmara
	PARIM, 1230N 04328E		PARIM, 1230N 04328E
	(Aden)		(Aden)
			UA452
		UA452	GOLEM (1157N 06722E)
			ELKEL (0149N 06911E)
			Diego Garcia
			UA474
		UA474	Plaisance
		-----	MURUS (0600.0S 06319.7E)
			(Bombay)
			UA557
		UA557	Cape Town

			MUNES (40 20 00S 010 00 00W)
			(La Plata)
			UA559
		UA559	Cape Town
			ITMET (34 12 00S 015 00 00E)
			ETULA (34 21 00S 010 00 00E)
			GERAM (34 03 00S 000 00 00W)
			ITGIV (32 56 00S 010 00 00W)
			Brasilia FIRB
			(Rio de Janeiro)
			UA560
			Accra
		UA560	(Vitoria)
			UA572
			Freetown
		UA572	(Vitoria)

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	A600		UA600
	Agadir		Agadir
	El Aaiun		El Aaiun
A600	Villa Cisneros	UA600	Villa Cisneros
	Nouadhibou		Nouadhibou
	Nouakchott		Nouachott
	Kayes		Bamako
	Bamako		Niamey
	Niamey		
	A601		UA601
	Dakar		Dakar
	Tambacounda		Tambacounda
A601	Bamako	UA601	Bamako
	Bobo-Dioulasso		Bobo-Dioulasso
	Tamale		Tamale
	Cotonou		Cotonou
	A602		UA602
	Sal		Sal
A602	TITOR 1300N 1800W	UA602	TITOR 1300N 1800W
	Bissau		Bissau
	A603		UA603
A603	Gao	UA603	Gao
	Accra		Accra
	A604		UA604
	Mostaganem		Mostaganem
	El Bayadh		El Bayadh
	El Golea		El Golea
	Tamanrasset		Tamanrasset
A604	Douala	UA604	Douala
	Franceville		Franceville
	Brazzaville		Brazzaville
			UA605
			(ETOIL 3944N 0710E)
			Constantine
		UA605	Djanet
			Maiduguri
	A606		UA606
	Tunis		Tunis
A606	Sidi Ben Aoun		Sidi Ben Aoun
	Tozeur		Tozeur
	A607		UA607
	Ghadames		Ghadames
	*Note 4 (DA)		*Note 4 (DA)
A607	Dirkou	UA607	Dirkou
	N'Djamena		N'Djamena
	Bangui		Bangui
			Lubumbashi
			N'Dola
			Harare
	A608		UA608/UM608
			El Bayadh

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
A608	Niamey	UA608	Niamey
			*Note 4 (DR)
	Cotonou		Cotonou
	A609		UA609
	Accra		Accra
	Lomé		Lomé
	Cotonou		Cotonou
	Lagos		Lagos
	Mamfe		Mamfe
A609	Foumban	UA609	Foumban
	Bangui		Bangui
	Buta		Buta
	Bunia		
	Entebbe		Entebbe
	Nairobi		Nairobi
	Mombasa		Mombasa
			Antsiranana
			Plaisance
	A610		DA610
			Yaoundé
			Kisangani
			Entebbe
A610	Kilimanjaro	UA610	Kilimanjaro
			*Note 2 (HT, HK)
	Mombasa		Mombasa
			Praslin
	A611		UA611
	Kinshasa		Kinshasa
A611	Luanda	UA611	Luanda
			ILGER 1727S 01000W
			(Rio de Janeiro)
	A612		UA612
	Conakry		Conakry
A612	Bamako	UA612	Bamako
	Mopti		
	Gao		
			UA613
			Kinshasa
		A613	Kindu
			Bujumbura

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			UA614
			Timimoun
		UA614	Abidjan
			UA615
			Zemmouri
			*Note 4 (DA)
		UA615	Ghardaia
			Tamanrasset
			Kano
	A616		
A616	Sao Tomé		
	Libreville		
			UA617
			Kinshasa
		UA617	Windhoek
			UA618
			Lubumbashi
			Bukavu
		UA618	SAGBU
			Malakal
	A619		UA619
	(Paleohora)		(Paleohora)
	*Note 2 (LG, HE)		*Note 2 (LG, HE)
	Alexandria		Alexandria
	*Note 2 (HE)		*Note 2 (HE)
A619	Cairo	UA619	Cairo
	*Note 3 (HE)		*Note 3 (HE)
	Ras Sudr 2936N 03241E		Ras Sudr 2936N 03241E
	*Note 3 (HE)		*Note 3 (HE)
	METSA 2924N 03458E		METSA 2924N 03458E
	*Note 2 (OE)		*Note 2 (OE)
	(Hail)		(Hail)
			UA620
			Malakal
		UA620	N'Djamena
	A621		UA621
	(Faro)		(Faro)
A621	*Note 4 (LE)		*Note 4 (LE)
	BAMBA (3550N 006 2736W)		BAMBA (3550N 006 2736W)
	Tanger		Tanger
	A623		UA623
	(Palma)		(Palma)
A623	LABRO 3717N 00108E		LABRO 3717N 00108E
	Mostaganem		Mostaganem

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	A725		UA725
	(Carbonara)		(Carbonara)
A725	OSMAR 3815N 00947E		OSMAR 3815N 00947E
	Tunis		Tunis
	A727		UA727
	(Sitia)		(Sitia)
	*Note 3 (LG, HE)		*Note 3 (LG, HE)
	Alexandria		Alexandria
	Cairo		Cairo
	Luxor		Luxor
A727	NUBAR	UA727	NUBAR
	Merowe		Merowe
	*Note 3 (HS)		*Note 3 (HS)
	Khartoum		Khartoum
	*Note 3 (HS)		*Note 3 (HS)
	Kenana		Kenana
	Lodwar		Lodwar
	*Note 4 (HK)		*Note 4 (HK)
	Nairobi		Nairobi
			Kilimanjaro
	A741		UA741
	(Palermo)		(Palermo)
A741	*Note 2 (HL)	UA741	*Note 2 (HL)
	Tripoli		Tripoli
	A743		UA743
	(Ostia)		(Ostia)
	*Note 2 (LI, DT)		*Note 2 (LI, DT)
A743	BULAR		BULAR
	Cap Bon		Cap Bon
	A745		UA745
	(Antalya)		(Antalya)
A745	Baltim	UA745	Baltim
	Cairo		Cairo
	A748		UA748
	Gozo		Gozo
A748	*Note 2 (HL)		*Note 2 (HL)
	Tripoli		Tripoli
			Mizda
	A850		UA850
			(Nice)
			*Note 5 (LF)
A850	OTARO 3900N 00441E	UA850	OTARO 3900N 00441E
	Zemmouri		Zemmouri
	A852		UA852
A852	(Palma)	UA852	(Palma)
	Alger		Alger
			UA854
			(Palma)
			SADAF 3748N 00220E
			Cherchell

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			Tiaret
			El Bayadh
			Beni Abbes
			Atar
	A856		UA856
	(Alicante)		(Alicante)
	*Notes 2 (LE, DA), 3 (LE)		*Notes 2 (LE, DA), 3 (LE)
	Alger		Alger
	Constantine		Constantine
	Tebessa		Tebessa
	Jerba		Jerba
	A857		UA857
	(Seville)		(Seville)
	KORNO (3550N 00725W)		KORNO (3550N 00725W)
A857	TERTO (300614N 0124303)	UA857	TERTO (300614N 0124303)
	Lanzarote		Lanzarote
			UA858
			Las Palmas/Gran Canaria
		UA858	Sal
			(Fernando de Noronha)
	A860		UA860
	(Alicante)		(Valencia)
A860	(MAGAL 3804N 0014W)		
	Mostaganem		Mostaganem
			UA861
		UA861	Lagos
			Garoua
	A863		UA863
	(Almeria)		(Malaga)
			*Note 1 (Malaga-El Bayadh)
	Mostaganem	UA863	Mostaganem
			UA865
		US865	(Menorca) Cherchell
	A868		UA868
	(Carbonara)		(Carbonara)
A868	NOLSI 3802N 01017E	UA868	NOLSI 3802N 01017E
	Tunis		Tunis

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	A873		UA873
	(Beja)		(Beja)
	Barok		Barok
	Samar		Samar
	Gran Canaria		Gran Ganaria
	SONKA		SONKA
			UB335
			Plaisance
		UB335	PEDPI 1317S 07500E
			(Pekanbaru)
			UB344
		B344	(Medan)
			LELED 1116.5S 07500.0E
			Plaisance
	B400		UB400
			(ODAKA 1434N 05234E)
			ALULA 1207N 05105E
			Mogadishu
		UB400	Dar-es-Salaam
B400	Lilongwe		Lilongwe
	Harare		Harare
			Bulawayo
			Francistown
			Gaborone
			UB459
		UB459	(Bombay)
			CLAVA (0134N 06000E)
			*Note 2 (FS)
			Praslin
			NESAB
			OKLAM
			Antananrivo
			UB525
			ITGEV
		UB525	Addis Ababa
			*Note 3 (HA)
			ALEBA
			Luxor
			UB526
			Khartoum
		UB526	Kassala
			Asmara
			(Hodeidah)

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	B527		UB527
	Kenana		Kenana
	Malakal		Malakal
	Juba		Juba
B527	Kigali	UB527	Kigali
	Bujumbura		Bujumbura
	Kalemie		Kalemie
	Lubumbashi		Lubumbashi
	B528		UB528
	Luena		Luena
B528	Livingstone	UB528	Livingstone
	Bulawayo		Bulawayo
	KURLA		KURLA
	B529		UB529
	Lusaka		Lusaka
	Fylde		Fylde
	Masvingo		Masvingo
B529	KURLA 2157S 03146E	UB529	KURLA 2157S 03146E
	*Note 1 (Masvingo-Maputo)		*Note 1 (Masvingo-Maputo)
	Maputo		Maputo
	Durban		Durban
	B531		UB531
	Kisangani		Kisangani
B531	Goma	UB531	Goma
	Kigali		Kigali
			Mwanza
			Kilimanjaro
			UB532
			Kindu
		UB532	Kigali
			Nairobi
			UB533
		UB533	Nairobi
			Dar-es-Salaam
	B534		UB534
B534	Carolina	UB534	Carolina
	Matsapha		Matsapha
	B535		UB535
	(Aden)		(Aden)
	TORBA 1210N 04402E		TORBA 1210N 04402E
	Djibouti		Djibouti
B535	Addis Ababa	UB535	Addis Ababa
	Juba		Juba
	Kisangani		Kisangani
	Kinshasa		Kinshasa

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			UB536
			Maputo
		UB536	Morandava
			Antananarivo
	B600		UB600
	Las Palmas/Gran Canaria		Las Palmas/Gran Canaria
	Villa Cisneros		Villa Cisneros
	Nouadhibou		Nouadhibou
	Dakar		Dakar
B600	Banjul	UB600	Banjul
	Bissau		Bissau
	Conakry		Conakry
	Monrovia		Monrovia
	Abidjan		Abidjan
	Accra		Accra
			Libreville
			UB601
			El Aaiun
		UB601	Nouakchott
			Dakar
			UB602
			(Espichel)
			BUREL 3613N 01056W
		UB602	*Notes 4 (GM), 2 (GC)
			El Hierro
			*Note 2 A (GV)
			(Moçoro)
	B603		UB603
	(Paleohora)		(Paleohora)
B603	Benina	UB603	Benina
	B605		UB605
	(Malaga)		(Malaga)
B605	Tetouan	UB605	Tetouan
	Rabat		Rabat
	B607		UB607
	(Sitia)		(Sitia)
	El Daba		El Daba
B607	New-Valley		New Valley
			*Note 1 (New Valley-Dongola)
	NUBAR		NUBAR
	Goma		Dongola
			*Note 3 (HS)
			El Obeid
			Goma
	Bujumbura		Bujumbura

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	B609		UB609
	(Menorca)		(Menorca)
B609	Zemmouri	UB609	Zemmouri
	B612		UB612
B612	(Gozo)	UB612	(Gozo)
---	*Note (HL)	---	*Note (HL)
	Benina		Benina
W856	Sarir	W856	Sarir
	Kufra		Kufra

		UB612	ORNAT 2000N 02500E
			El Obeid
			Malakal
			Nakuru
	B614		UB614
	Conakry		Conakry
B614	Freetown	UB614	Freetown
	Monrovia		Monrovia
	B726		UB726
	Zemmouri		Zemmouri
	Bou-Saada		Bou-Saada
B726	El Golea	UB726	El Golea
	In Salah		In Salah
	Niamey		Niamey
	Niamtougou		Niamtougou
	Accra		Accra
	B727		UB727
	Freetown		Freetown
B727	*Note 2 (GF)		*Note 2 (GF)
	Bamako	UB727	Bamako
			Tombouctou
			Tessalit
			Tamanrasset
			Zarzaitine/In-Amenas
			UB728
			Atar
		UB728	Tambacounda
			Conakry
			UB729
		UB729	Conakry
			Abidjan

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores	
B730	El Golea Bordj Omar Driss Djanet Dirkou
B732	Port Gentil Pointe Noire Brazzaville
B737	Sao Tomé Malabo Douala

Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
UB730	El Golea Bordj Omar Driss Djanet Dirkou *Note 1 (Djanet-Djamena) N'Djamena
UB731	TOBUK 2156N 00913E Agades Sokoto Gwasero Lagos
UB733	Kinshasa Luena Maun Gaborone
UB734	Bou-Saada Bejaia DOLIS 3900N 00510E (BALEN 4057N 00541E)
UB735/UM108	Timimoun Bamako
UB736	Lagos Jos Garoua Malakal Addis Ababa
UB737	Sao Tomé Douala

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores	Upper ATS routes Routes ATS supérieures Rutas ATS superiores

	UB738
UB738	Malaga
	*Note 5 (LE)
	*Note 1 (Malaga-El Bayadh)
	LIGUM 3550N 00200W
	*Note 5 (DA)
	Hamman Bon Hadjar
	El Bayadh

	UB790
UB790	St-Denis
	Dzaoudzi

	B975
	(Malaga)
B975	(PIMOS 3609N 00454W)
	BARPA (3550N 0053930W)
	Tanger

	UB975
	(Malaga)
	(PIMOS 3609N 00454W)
	BARPA (3550N 0053930W)
	Tanger

	B977
	(Palma)
B977	Zemmouri

	UB977
	(Palma)
UB977	Zemmouri

	B979
DW5	(Ostia)
----	(GIANO 3854N 01226E)
B979	Tunis

	UB979
UDW5	(Ostia)
----	(GIANO 3854N 01226E)
UB979	Tunis

	UG200
UG200	Cocos Island
	Plaisance

	UG207
UG207	Karachi
	KADER (1506N 05500W)
	*Note (HC)
	Mogadishu

	G361
	Tozeur
	SAFX
	Gozo

	UG361
	Tozeur
	SAFX
	Gozo

	G362
	Gozo
	Lampedusa
	Djerba
	El Borma

	UG362
	Gozo
	Lampedusa
	Djerba
	El Borma

	G400
	(Sitia)
G400	BALTIM

	UG400
	(Sitia)
UG400	BALTIM

	UG424
UG424	Dar-es-Salaam
	(Bombay)

	UG433
	Monrovia/Roberts
UG433	(Vitoria)

	UG450
	Luanda

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			Tshikapa
			Kananga
		UG450	Bujumbura
			Mwanza
			Nairobi
			Mogadishu
			(Bombay)
			UG454
		UG454	(Colombo)
			BOBOD (0600S 07155E)
			UG465
		UG465	(Rio de Janeiro)
			AXODA (2912S 01000W)
			Johannesburg
			Beira
			Praslin
			*Note 2 (FS)
			(Male)
	G618		UG618
G618	(Malaga)	UG618	(Malaga)
	Al-Houceima		Al-Houceima
	G621		UG621
	Las Palmas/Gran Canaria		Las Palmas/Gran Canaria
	Lanzarote		Lanzarote
G621	KORAL (294623N 0123359)	UG621	KORAL (294623N 0123359)
	Essaouira		Essaouira
	Casablanca		Casablanca
	KORIS (3550N 0061418W)		KORIS (3550N 0061418W)
	(Vejer)		(Vejer)
	G623		UG623
	(BALEN 4057N 00541E)		(BALEN 4057N 00541E)
	*Note (LF)		
G623	Annaba	UG623	Annaba
	*Note 4 (DA)		*Note 4 (DA)
	Tebessa		Tebessa
	Ghadames		Ghadames
			UG634
		UG634	Plaisance
		-----	SOLIT, 2355S 07500E

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			UG635
		UG635	Plaisance
		-----	MABAD, 2648.4S 07500E
			(Perth)
	G650		UG650
	(Jeddah)		(Jeddah)
G650	Asmara	UG650	Asmara
	Addis Ababa		Addis Ababa
	Nakuru		Nakuru
	Nairobi		Nairobi
	G653		UG653
	Windhoek		Windhoek
	Gaborone		Gaborone
	Johannesburg		Johannesburg
G653	Carolina	UG653	Carolina
	Maputo		Maputo
			Toliara
			Saint-Denis
			UG654
			Durban
		-----	*Note (FAS)
		UG654	Toliara
	G655		UG655
			Tebessa
			FARES (3210.3N 01056.9E)
			Sebha
			Faya Largeau
			Buta
			Kisangani
			Kindu
		UG655	Lubumbashi
			*Note (FZ, FL)
			Lusaka
			Bulawayo
			*Note (FAS)
	Johannesburg		Johannesburg
			*Note (FAS)
	Maseru		Maseru
	G656		UG656
	Juba		Juba
	TORNO (02330N 03158E)		TORNO (02330N 03158E)
G656	Entebbe	UG656	Entebbe
			Mbeya
			Lilongwe
			Tete
			Maputo
	G657		UG657
	Maseru		Maseru
G657	Vrede		Vrede
	Manzini		Manzini
	Maputo	UG657	Maputo

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			Beira
			Dar-es-Salaam
			Mombasa
			Mandera
			Hargeisa
			UG658
		UG658	Nairobi
			Praslin
	G659		
G659	Beni Walid		
	*Note (HL)		
	Sarir		
	G660		UG660
	Niamey		Niamey
	Sokoto		Sokoto
	Kano		Kano
	Maiduguri		Maiduguri
	N’Djamena		N’Djamena
	Geneina		Geneina
G660	El Fasher	UG660	El Fasher
	El-Obeid		El-Obeid
	Khartoum		Khartoum
	Port Sudan		Port Sudan
	*Note (HS, OE)		*Note (HS, OE)
	(Jeddah)		(Jeddah)
			UG661
		UG661	Dar es Salaam
			Mauritius
	G664		UG664
	SONSO (300353N 0120626W)		SONSO (300353N 0120626W)
	AGADIR	UG664	AGADIR
	Ouarzazate		Ouarzazate
	Errachidia		Errachidia
	Oujda		Oujda
	Almeria		Almeria

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	G727		UG727
	(GIANO 3854N 01226E)		(GIANO 3854N 01226E)
G727	*Note 2 (LI)	UG727	*Note 2 (LI)
	INDOR		INDOR
	Cap Bon		Cap Bon
	Monastir		Monastir
	Jerba		Jerba
			*Note 2 (DT)
		UG727	Nalut
			*Note (HL)
			Dirkou
			Maiduguri
			Garoua
			Ngaoundere
			Brazzaville
	G728		UG728
G728	Cap Bon	UG728	Cap Bon
---		----	
DW14	(Trapani)	UDW14	(Trapani)
			UG729
		UG729	(Carbonara)
			KAWKA 3759N 00818E
			Constantine
	G731		UG731
	(Alghero)		(Alghero)
	*Note 2 (LF)		*Note 2 (LF)
	Zemmouri		Zemmouri
G731	*Note 4 (DA)	UG731	*Note 4 (DA)
	Tiaret		Tiaret
	El Bayadh		El Bayadh
	Timimoun		Timimoun
			*Note 1 (Timimoun-Dakar)
	G733		UG733
	(Ibiza)		(Ibiza)
G733	Alger	UG733	Alger
			UG735
			Monastir
			Mitiga
			UG737 (UG82)
			GIANO
			LABEK
			Cap Bon
			Monastir
	G739		UG739
	Ghadames		Ghadames
	TAZIT		TAZIT
	G740		UG740
	Abidjan		Abidjan
	Kumasi		Kumasi
	G850		UG850

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	(Almeria)		(Almeria)
G850	BERUM (3550N 0031400W)	UG850	BERUM (3550N 0031400W)
	Al Houceima		Al Houceima
	Fes		Fes
	Marrakech		Marrakech
	Agadir		Agadir
	DELVA (2915N 0124300W)		DELVA (2915N 0124300W)
	Lanzarote		Lanzarote
	G851		UG851
	(Porto Santo)		(Porto Santo)
	Tenerife		Tenerife
	MIYEC (2342N 01259W)		MIYEC (2342N 01259W)
G851	Zouerate	UG851	Zouerate
	Bamako		Bamako
	Bouake		Bouake
	Abidjan		Abidjan
			UG852
			El Golea
		UG852	Bamako
			Monrovia/Roberts
	G853		UG853
			Las Palmas/Gran Canaria
			*Note (GC)
			AMDIB 2055N 01800W
			TITOR 1300N 01800W
			DEMAR 0539N 01100W
			DEVLI 0400N 00730W
	Luanda		Luanda
	Kuito		Kuito
G853	Cuito Cuanavale	UG853	Cuito Cuanavale
	Maun		Maun
			Hartebeespoortdam
			Johannesburg
			Durban
	G854		UG854
	Conakry		Conakry
	Bobo-Dioulasso		Bobo-Dioulasso
	Ouagadougou		Ouagadougou
G854	Niamey	UG854	Niamey
	Zinder		Zinder
	N’Djamena		N’Djamena

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	G855		UG855
G855	Tripoli	UG855	Tamanrasset
			Niamey
	Ghadames		Tamale
			Abidjan
	G856		UG856
			Lagos
G856	Libreville	UG856	Libreville
	Brazzaville		Brazzaville
	G857		UG857
	N'Djamena		N'Djamena
	Maroua		
	Garoua		
G857	Foumban	UG857	Foumban
	Douala		Douala
	Bata		
	Libreville		Libreville
	Port Gentil		
			UG858
		UG858	Kano
			Sebha
	G859		UG859
	Anaba		Annaba
	*Notes (LI), 4 (DT)		
	Constantine		Constantine
	Biskra		Biskra
G859	Ghardaia	UG859	Ghardaia
	El Golea		El Golea
	In Salah		In Salah
	Tessalit		Tessalit
	Gao		Gao
	Ouagadougou		Ouagadougou
	Abidjan		Abidjan
	G860		UG860
G860	Bamako	UG860	Bamako
	Ouagadougou		Ouagadougou
			UG861
		UG861	Douala
			Pointe Noire
			UG862
		UG862	Bunia
			ONUDA 0809N 2251E
			*Note 4 (FT)
			Dirkou

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores	
	G868
G868	SITAX
	MEGAN
	G869
G869	SARDI
	Tabarka
	Ben Aoun
	El Borma

Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	UG864
UG864	Tunis
	Tebessa
	Ghardaia
	Timimoun
	UG868
UG868	SITAX
	MEGAN
	UG869
UG869	SARDI
	Tabarka
	Ben Aoun
	El Borma
	UG979
UG979	Bordj Omar Driss
	*Note 4 (DA)
	Bou Saada
	Zemmouri
	UL102
	Errachidia
	Cherchell
	UL 607
UL607	Sitia
	Alexandria
	UL612
UL612	Goma
	El Dhaba
	(Paleohora)
	UM101
UM101	Mirabeau
	*Note 2 (LF)
	Constantine
	UM103
UM103	Ostia
	*Note 4 (LI)
	Tunis
	UM104/UA614
	Timimoun
	Abidjan
	UM105
UM105	Alghero
	*Note 2+5 France
	Zemmouri
	UM107
UM107	*Note 2 Alghero+Spain
	Zemmouri
	UM108/UB735
	Timimoun
	Bamako
	UM110

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
		UM110	Nice
			Constantine
			UM112
		UM112	Martigues
			Constantine
			UM114
		UM114	Lagos
			Ghardaia
			Alger
			UM117
		UM117	Casablanca
			Ouarzazate
			*Note 4 (DA)
			Gao
			UM122/UR977
			Agadir
			BULIS (2740N 0090854W)
			Bamako
			UM220
		UM220	Abu Simbel
			Lodwar
			UM372/UR722
			(Faro)
		UM372	Casablanca
			Marrakech
			BULIS 2740N 00915W
			Conakry
			UM608/UA608
			El Bayadh
			Niamey
	M651		UM651
M651	(Aden)		(Aden)
	Hargeisa	UM651	Hargeisa
			Praslin

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores

Upper ATS routes Routes ATS supérieures Rutas ATS superiores

	M652
	Brazzaville
	Kinshasa
	Saurimo
M652	NIDOS 1304S 02651E
	Lusaka
	Harare

	UM652
	Brazzaville
	Kinshasa
	Saurimo *Note 1 (Saurimo-Lusaka) (FL)
UM652	NIDOS 1304S 02651E
	Lusaka
	Harare
	Beira
	Toliara
	AXOTA
	(Perth)
	UM665
UM665	Plaisance
	Mandera
	Addis Ababa
	Merowe
	UM725
UM725	Sorrento
	Tunis
	Tebessa
	Ghardaia
	Timimoun
	Dakar
	UM726
UM726	Monastir
	Trapani
	Giano
	Ostia
	UM727
UM727	Tunis
	Rome
	UM731
UM731	Carbonara
	OSMAR
	Tunis
	Jerba
	FARES
	Dirkou
	N'Djamena
	Berberati
	Saurimo
	Johannesburg
	UM974
UM974	Niamey
	Dakar

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores	Upper ATS routes Routes ATS supérieures Rutas ATS superiores

	UM994
	Monastir
	Mitiga
	Ben Walid
	ORNAT
	UM997
UM997	Wajir
	Dire Dawa
	Djibouti
	UM998
UM998	(Martigues)
	BALEN
	Constantine
	Bordj Omar Driss
	Tobuk
	INISA (1733.5N 01130.0E)
	Maiduguri
	Garoua
	Kinshasa
	Luena
	Maun
	Gaborone
	UM999
UM999	Casablanca
	Errachidia
	*Note 4 (DA)
	El Golea
	Zarzaitine
	Sebha
	Sarir
	New Valley
	Luxor
	Jeddah
	UN855
UN855	Pollensa
	Alger
	UN856
UN856	Andraitx
	AKAPA
	UN857
UN857	Sevilla
	KORNO (3550N 0072500W)
	TERTO (300614N 0124303W)
	Lanzarote

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores	Upper ATS routes Routes ATS supérieures Rutas ATS superiores

	UN858
UN858	PESAS (370218N 0072318W)
	AKUDA
	SULAM (305506N 0131500W)
	Gran Canaria

	UN866
UN866	Espichel
	BEXAL (3558N 0112654W)
	KONBA (312744N 0151821W)
	GOMER (280000N 0172000W)
	SONKA

	UN869
UN869	Malaga
	GALTO
	RABAT
	Agadir

	UN871
UN871	Veger de la Frontera
	Adubi
	Essaouira
	KORAL
	Lanzarote

	UN873/UA873
UN873	Beja
	BAROK
	SAMAR
	Gran Canaria
	SONKA

	R212
R212	Praslin
	PERRY 06000.0S 06000.0E
	Diego Garcia
	GUDUG 0704.6S 07500.0E
	PIBED 0520.2S 09044.0E

	UR212
UR212	Praslin
	PERRY (0600.0S 06000.0E)
	Diego Garcia
	GUDUG (0704.6S 07500.0E)
	PIBED (0525.2S 09044.0E)

	R329
R329	Plaisance
	Diego Garcia
	(Gan)

	UR329
UR329	Plaisance
	Diego Garcia
	(Gan)

	R348
R348	KADAP (0200.0S 08409.6E)
	LATEP (0610.3S 7500.0E)
	Diego Garcia

	UR348
UR348	KADAP (0200.0S 08409.6E)
	LATEP (0610.3S 7500.0E)
	Diego Garcia
	Antananarivo

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			UR400
			Abu Simbel
			*Note 4 (HS)
		UR400	Kassala
			Bahir Dar
			*Note 4 (HA)
			Mogadishu
			Praslin
			Plaisance
			UR401
		UR401	Saint-Denis
			Praslin
			KADER (15 06 00N 055 00 00E)
			DATRA (16 42 00N 055 30 00E)
			Haima
	R409		UR409
			Eshowe
			Matsapha
	Masvingo		Masvingo
R409	Lilongwe	UR409	Lilongwe
			Dodoma
			Nairobi
			UR410
		UR410	Masvingo
			Chileka
			Lilongwe
	R525		UR525
			Kaoma
	Harare	UR525	Harare
R525	KURLA 2157S 03146E		KURLA 2157S 03146E
	Maputo		Maputo
			UR526
		UR526	Luanda
			Libreville
	R603		UR603
R603	Lagos	UR603	Lagos
	São Tomé		São Tomé
			UR609
			(Fortaleza)
		UR609	NANIK 0621N 03310W
			NELSO 3142N 01727W
			(Porto Santo)

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	R611		UR611
	(Caraffa)		(Caraffa)
	Benina		Benina
	DITAR		DITAR
	AMTUL		AMTUL
R611	Merowe	UR611	Merowe
	Khartoum		Khartoum
	Addis Ababa		Addis Ababa
			*Note 1 (Addis Ababa-Garisa-Lake Awasa)
			*Note 3 (HK)
			Wajir
			Mombasa
	R613		UR613
	(Vejer)		(Vejer)
	LINTO (3550N 0055700W)		LINTO (3550N 0055700W)
R613	Tanger	UR613	Tanger
	Arbaoua		Arbaoua
	R616		UR616
R616	(Pantelleria)	UR616	(Pantelleria)
	Lampedusa		Lampedusa
	*Note (HL)		*Note (HL)
	Tripoli		Tripoli
			UR619
			(ETOIL 3944N 00710E)
		UR619	*Note 5 (LF)
			Annaba
			METSA
			Aqaba
			UR620
		UR620	Bissau
			Atar
	R722		UR722/UM372
	(Faro)		(Faro)
R722	Casablanca	UR722	Casablanca
	Marrakech		Marrakech
			BULIS 2740N 00915W
			Conakry
	R723		UR723
	(ETOIL 3944N 00710E)		(ETOIL 3944N 00710E)
R723	*Note 5 (LF)	UR723	*Note 5 (LF)
	Cap Bon		Cap Bon
	R724		UR724
	(Faro)		(Faro)
	OSLAD (3558N 0081800W)		OSLAD (3558N 0081800W)
R724	Essaouira	UR724	Essaouira
	Agadir		Agadir
	R775		UR775
	Luxor		Luxor
	(Jeddah)		(Jeddah)
	(DANAK 1608N 04129E)		(DANAK 1608N 04129E)

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			ATBON 1543N 04134E
R775	RAGAS 1218N 04218E	UR775	RAGAS 1218N 04218E
	*Note (HF)		*Note (HF)
	Djibouti		Djibouti
	Hargeisa		Hargeisa
	Belet Ven		Belet Ven
	Mogadishu		Mogadishu
			Mahajanga
	R776		UR776
	Port Sudan		Port Sudan
R776	*Note (HS)	UR776	*Note (HS)
	(Hodeidah)		(Hodeidah)
	R778		UR778
	(VELOX 3349N 03405E)		(VELOX 3349N 03405E)
	*Note 3 (HE)		*Note 3 (HE)
	Port Said		Port Said
	*Note 3 (HE)		*Note 3 (HE)
	Cairo		Cairo
R778	Fayoum	UR778	Fayoum
	KATAB 2925N 02905E		KATAB 2925N 02905E
	*Note 3 (HE)		*Note 3 (HE)
	Kufra		Kufra
	*Note 2 (FT, DR)		*Note 2 (FT, DR)
	Kano		Kano
	Kaduna		Kaduna
	Bida		Bida
	Lagos		Lagos
	R779		UR779
			Mbeya
R779	Lusaka		Lusaka
	Livingstone		Livingstone
	Maun		Maun
			UR780
			Asmara
			Dire Dawa
		UR780	Mogadishu
			Saint-Denis
	R781		UR781
R781	Tunis	UR781	Tunis
-----	KARMA	-----	KARMA
R78	(Gozo)	UR78	(Gozo)

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
			UR782
			Lusaka
			Chipata
		UR782	Lilongwe
			Lichinga
			Moroni
			Praslin
	R783		UR783
R783	(Gozo)	UR783	(Gozo)
	Monastir		Monastir
	Tebessa		Tebessa
	R865		UR865
R865	Nouakchott	UR865	Nouakchott
	Conakry		Conakry
	R866		UR866
R866	BULIS 2740N 00915W	UR866	BULIS 2740N 00915W
	Ouagadougou		Ouagadougou
	R975		UR975
	Fes		Fes
	Casablanca		Casablanca
R975	Agadir		Agadir
	ECHED (2740N 0103100W)		ECHED (2740N 0103100W)
	Zouerate	UR975	Zouerate
	Atar		Atar
	Nouakchott		
	Saint-Louis		
	Dakar		Dakar
	R976		UR976
R976	Dakar		Dakar
	Sal	UR976	Sal
			(NAT)
			UR977/UM122
			Agadir
			BULIS (2740N 0090854W)
		UR977	Bamako
			UR978
			(BALEN 4057N 00541E)
		UR978	Constantine
			El-Oued
			Bordj Omar Driss
			Agades
			UR979
			Dakar
		UR979	Abidjan
			Libreville

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores		Upper ATS routes Routes ATS supérieures Rutas ATS superiores	
	R981		UR981
			Casablanca
		UR981	Marrakech
			BULLIS
R981	Gao		Gao
	Niamey		Niamey
	Lagos		Lagos
	R982		UR982
	Ouagadougou		Ouagadougou
R982	Tamale	UR982	Tamale
	Accra		Accra
	R983		UR983
R983	Lomé	UR983	Lomé
	PAMPA (0840N 00034E)		PAMPA (0840N 00034E)
	Ouagadougou		Ouagadougou
	R984		UR984
	Ouagadougou		Ouagadougou
	Lagos		Lagos
	Port Harcourt		Port Harcourt
R984	Douala	UR984	Douala
	Yaoundé		Yaoundé
	Berberati		Berberati
	Bangui		Bangui
	Kasama		Kasama
	Lilongwe		Lilongwe
	R985		UR985
R985	Bou-Saada	UR985	Bou-Saada
	El-Oued		El-Oued
	In Amenas		In Amenas
	R986		UR986
	Tunis		Tunis
R986	Ghadames	UR986	Ghadames
	In Amenas		In Amenas
	Djanet		Djanet
	Kano		Kano
			Foumban
			Yaoundé
			Franceville

Lower ATS routes Routes ATS inférieures Rutas ATS inferiores

Upper ATS routes Routes ATS supérieures Rutas ATS superiores

	R987
	Libreville
R987	Pointe Noire
	Cabinda
	Luanda
	Ondangwa
	Windhoek
	Kertmanshoop
	Cape Town

	R988
R988	Franceville
	Pointe Noire

	R990
R990	El Golea
	Timimoun

	UR987
	Libreville
UR987	Pointe Noire
	Cabinda
	Luanda
	Ondangwa
	Windhoek
	Kertmanshoop
	Cape Town

	UR988
	Franceville
UR988	Pointe Noire

	UR990
UR990	El Golea
	Timimoun

	UR991
	DEMAR 0539N 01100W
UR991	ARLEM 0023N 00720W
	ILDIR 1800S 01000E
	Gaborone

	UR993
	Djibouti
UR993	ASMARA

	UR995
	Addis Ababa
UR995	Merowe

	UR996
UR996	Johannesburg
	Beira
	Nampula
	Moroni
	ODAKA
	BOSKI
	Haima

PART VI - METEOROLOGY (MET)

PART VI - METEOROLOGY (MET)

1. Introduction

1.1 This part of the AFI Basic Air Navigation Plan contains elements of the existing planning system and introduces the basic planning principles, operational requirements and planning criteria, related to aeronautical Meteorology (MET) as developed for the AFI Region and considered to be the minimum necessary for effective planning of MET facilities and services. A detailed description/list of the facilities and/or services to be provided by States in order to fulfill the requirements of the Basic ANP is contained in the AFI Facilities and Services Implementation Document (FASID). During the transition and pending full implementation of the future CNS/ATM systems, it is expected that the existing requirements will gradually be replaced by new CNS/ATM related requirements. Further, it is expected that some elements of the CNS/ATM systems will be subject to amendment, as necessary, on the basis of experience gained in their implementation.

1.2 The Standards, Recommended Practices and Procedures to be applied are contained in *Annex 3 - Meteorological Service for International Air Navigation.*

1.3 Background information of importance in the understanding and effective application of the Plan is contained in the Reports of the Seventh African Indian Ocean Regional Air Navigation Meeting (Doc 9702 AFI/7, (1997), the Limited Africa-Indian Ocean (COM/MET/RAC) Regional Air Navigation Meeting (Doc.9529), LIM AFI (COM/MET/RAC) 1988 and the Sixth African-Indian Ocean Regional Air Navigation meeting (Doc. 9298, AFI/6) 1979, supplemented by information appropriate to the AFI Region which is contained in the Reports of the other Regional Air Navigation Meetings listed in the preface.

1.4 RAN Meeting recommendations or conclusions and AFI Planning and Implementation Regional Group (APIRG) conclusions shown in brackets below a heading indicate the origin of all paragraphs following that heading. RAN Meeting recommendations or conclusions and APIRG conclusions shown in brackets below a paragraph indicate the origin of that particular paragraph.

2. Meteorological Service at Aerodromes and Requirements for Meteorological Watch Offices

[FASID Tables MET 1A and MET 1B]

2.1 The service to be provided at international aerodromes listed in Table AOP1 of the basic AFI ANP is set out in FASID Table MET 1A.
[AFI/7, Rec.7/1]

2.2 The service to be provided for flight information regions (FIR), upper flight information regions (UIR), control areas (CTA) and search and rescue regions (SRRs) is set out in FASID Table MET 1B.
[AFI/7, Rec. 7/2]

2.3 The aeronautical meteorological offices should normally provide service on a 24-hour basis, except as otherwise agreed between the meteorological authority, the air traffic services authority and the operators concerned. At aerodromes at which aircraft operations take place only at certain hours of the day or on specific days of the week, the meteorological office concerned may limit its hours of service, provided that the needs of such operations can be met. When an aerodrome meteorological office is temporarily without forecasters, aerodrome forecasts for which that office is responsible should be prepared and kept up to date by another Office by arrangement of the meteorological authorities concerned.
[AFI/6, Rec.9/2]

2.4 When an MWO is temporarily not functioning or is not able to meet all its obligations, its responsibilities should be delegated to another MWO and a NOTAM Class I should be issued to indicate such a delegation and the period during which the office is unable to fulfil all its obligations.
[AFI/6, Rec.9/2]

2.5 Where necessary, greater efforts should be made to provide an adequate number of trained staff, to install suitable instruments and equipment and to make maximum use of the training facilities and services available.
[AFI/6, Rec.9/2]

2.6 FASID Tables MET 1A and 1B should be implemented as soon as possible, on the understanding that only those parts of the briefing and documentation called for in Column 7 of FASID Table MET 1A that are required for current operations need to be available, and that the implementation of a new MWO or changes to the area served by existing MWO indicated in FASID Table MET 1B columns 1 and 3 respectively, should take place coincidently with the implementation of, or changes to, the FIR/UIR/CTA/SRR concerned.
[AFI/7, Rec.7/8]

3. Meteorological Observations and Reports

3.1 Hourly observations with special reports in the SPECI code form should be made at all aeronautical meteorological stations.
[AFI/6, Rec.9/12]

3.2 Observations should be made half-hourly for VOLMET broadcasts at the stations indicated in FASID Tables ATS 2 and 2A.
[AFI/6, Rec.9/12]

3.3 Routine observations should be made throughout the 24 hours each day, except as otherwise agreed between the operators, air traffic services units and the meteorological authority concerned.
[AFI/6, Rec.9/12]

3.4 A separation signal (International Alphabet No. 2, signal 22) should be used at the end of each aerodrome report message in encapsulated AFTN format.
[AFI/6, Rec.9/12]

4. Aircraft observations and reports

4.1 The meteorological authority should adopt the approved list of ATS/MET reporting points, as it relates to points located within and on the boundaries of the FIR for which the State is responsible. Those ATS/MET reporting points should be published in the AIP, under GEN 3.5.6 - Aircraft reports, of the State concerned.
[AFI/7, Rec.7/14]

Note.- The approved list of ATS/MET reporting points is published and kept up-to-date by the ICAO Regional Offices concerned, on the basis of consultations with ATS and MET authorities in each State and the provisions of Annex 3 in this respect.

4.2 FASID Table MET 1B, Column 5 shows the meteorological watch office (MWO) designated as the collecting centre for air-reports received by voice communications within the FIR/UIR for which they are responsible.
[AFI/7, Rec. 7/14]

4.3 Each MWO should arrange for the transmission of routine air-reports received by voice communications to all meteorological offices within its associated FIR. Special air-reports which do not warrant the issuance of a SIGMET should be disseminated by MWO in the same way as SIGMET messages in accordance with FASID Table MET 2B.
[APIRG/12, Con.12/51]

Note. - Additional requirements for the dissemination of air-reports by MWOs are stipulated in Annex 3, 5.8.2, 5.8.3 and 5.8.4.

5. Forecasts

5.1 Aerodrome forecasts should normally be issued at intervals of six hours, with the period of validity beginning at one of the main synoptic hours (00, 06, 12, 18 UTC). The period of validity should be of at least 18 or of 24 hours' duration, to meet the requirements indicated in FASID Table MET 1A. The filing time of the forecasts should be approximately two hours before the start of the period of validity.
[AFI/7, Rec. 7/8]

5.1.1 In addition to the 24-hour validity aerodrome forecasts, 9-hour validity aerodrome forecasts should also be prepared for those aerodromes included in the MOTNE OPMET collection programme and VOLMET broadcasts.
[AFI/6, Rec. 9/12]

5.1.2 The 9-hour period of validity aerodrome forecasts called for in paragraph 5.1.1 should commence:

1. for those aerodromes included in the MOTNE OPMET collection programme, at times specified in the MOTNE procedures; and

2. for those aerodromes not included in the MOTNE OPMET collection programme but required for VOLMET broadcasts at the following times: 00, 03, 06, 09,12, 15 18 and 21 UTC.

[AFI/6, Rec. 9/12]

5.2 The period of validity for aerodrome forecasts given on request should commence one hour before the estimated time of arrival or earlier, if requested, and should cover a period up to the estimated time of arrival at the farthest alternate plus two hours.
[AFI/6, Rec. 9/12]

5.3 The group **T**T_FT_F/G_FG_F**Z** should be included in aerodrome forecasts for certain stations as agreed between the meteorological authorities and the operators concerned.
[AFI/7, Rec. 7/8]

5.4 Messages or bulletins containing several aerodrome forecasts should present those forecasts separately and complete for each aerodrome.
[AFI/6, Rec. 9/12]

5.5 A separation signal (International Alphabet No. 2, signal 22) should be used at the end of each aerodrome forecast message in encapsulated AFTN format.
[AFI/6, Rec. 9/12]

5.6 Trend forecasts should be provided as indicated in FASID Table MET 1A.
[AFI/7, Rec. 7/8]

6. SIGMET and AIRMET information

[FASID Tables MET 3A and MET 3B]]

6.1 The period of validity of SIGMET messages should not exceed four hours. In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, the validity period should be extended up to six hours and an outlook should be added giving information for an additional period of up to 12 hours, concerning the trajectory of the volcanic ash cloud and positions of the centre of the tropical cyclone respectively.
[AFI/7, Rec. 7/8]

6.2 In order to assist MWOs in the preparation of the outlook included in SIGMET messages for tropical cyclones, tropical cyclone advisory centre (TCAC) Réunion has been designated to prepare the required advisory information and disseminate it to the MWOs concerned in the AFI Region. Table MET 3A sets out the area of responsibility and the period of operations of the TCAC and the MWOs to which the advisory information should be sent. Advisory information should be issued for those tropical cyclones in which the surface wind speed averaged over 10 minutes is expected to equal or exceed 63 km/h (34 kt). [AFI/7, Rec. 7/8]

6.3 In order to assist MWOs in the preparation of the outlook included in SIGMET messages for volcanic ash, volcanic ash advisory centre (VAAC) Toulouse has been designated to prepare the required advisory information and disseminate it to MWOs and ACCs concerned in the AFI Region following notification/detection of the ash cloud. FASID Table MET 3B sets out the area of responsibility of the VAAC and the MWOs and ACCs to which the advisory information should be sent.
[AFI/7, Rec. 7/8]

6.4 In order for the VAAC to initiate the monitoring of volcanic ash from satellite data and the forecast of volcanic ash trajectories, MWOs should notify the relevant VAAC immediately on receipt of information that a volcanic eruption has occurred or volcanic ash has been observed in the FIR for which they are responsible. In particular, any special air-reports of pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud, received by MWOs should be transmitted without delay to the VAAC Toulouse.
[AFI/7, Rec. 7/8]

6.5 States operating MWOs in the AFI Region should review their local procedures for the issuance of SIGMETs and monitor their issuance on a regular basis so as to ensure that SIGMETs are issued only for en route weather phenomena listed in Annex 3, paragraph 7.1.1.
[LIM AFI Con.5/9]

Note - The receipt of SIGMET messages and special air-reports from other MWOs is controlled by the exchange requirements indicated in Table MET 2B which has been based on paragraph 9.4.2 of the Statement of Basic Operational Requirements.

6.6 AIRMET messages are not required to be issued by MWOs.
[AFI/7, Rec. 7/8]

7. Exchange of operational meteorological information
(FASID Tables MET 2A, 2B, 2C, 4A and 4B)

7.1 Exchange of OPMET Information in METAR, SPECI and TAF code forms

7.1.1 FASID Table MET 2A sets out the operational meteorological information which should be available at meteorological offices, area control centres and flight information centres. The table should be updated, as necessary, by the appropriate ICAO Regional Offices on the basis of changes in the pattern of aircraft operations and in accordance with the Statement of Basic Operational Requirements and Planning Criteria specified in paragraph 6.7 of the Introduction to the air navigation plan, and in consultation with those States and international organizations directly concerned.
[AFI/7, Rec. 8/6]

7.1.2 Operational meteorological information should be exchanged as indicated in FASID Table MET 2A to meet the current aircraft operations. The availability at meteorological offices of the required operational meteorological information should be reviewed continuously. Any changes in this respect (additional data needed or data no longer required) should be notified to the corresponding meteorological authority.
[AFI/7, Rec. 8/6]

7.1.3 FASID Table MET 2C sets out the operational meteorological information, additional to that contained in FASID Table MET 2A, required by States during the pilgrimage season. For its implementation, ICAO should notify meteorological offices concerned, well in advance, of the exact dates of the beginning and end of the pilgrimage season.
[AFI/7, Rec. 8/6]

7.1.4 FASID Tables MET 4A and 4B set out the AFI Meteorological Bulletin Exchange (AMBEX) Scheme for the collection of aerodrome forecasts (TAF) and air-reports (AIREP), respectively. When the designated AMBEX collection centres are not operational for any reason, the exchanges under the AMBEX Scheme should be carried out by direct-address messages.

[AFI/7, Rec. 8/6]

7.1.5 FASID Tables MET 4A and 4B should be updated, as necessary, by the appropriate ICAO Regional Offices, in accordance with the operational requirements specified in the Introduction to the plan and the criteria warranting regular exchanges of AMBEX TAF bulletins.
[AFI/7, Rec. 8/6]

Note. - Details of the AMBEX procedures, including the exchange of aerodrome forecasts and air-reports required under the scheme, are given in the AMBEX Handbook. This handbook is available from ICAO Regional Offices accredited to States in the AFI Region.

7.1.6 Operational meteorological information should be exchanged on aeronautical fixed service channels. Other channels should only be used if aeronautical fixed service channels are not available, if they ensure prompt and reliable transmissions, and if agreed by the meteorological authorities concerned.
[LIM AFI, Rec.6/6]

7.1.7 Exchange of reports in the METAR/SPECI code forms and aerodrome forecasts required exclusively for VOLMET broadcasts should be implemented simultaneously with the implementation of new VOLMET broadcasts or changes in their contents.
[LIM AFI, Rec.6/6]

7.1.8 Regular exchanges of reports in the METAR/SPECI code forms and 24-hour aerodrome forecasts and amendments thereto should be made when required by four or more flights per week; hence non-regular exchanges should be arranged bilaterally between States concerned for fewer than four flights per week. States should establish local procedures for the relay of OPMET information received from other States to their own aerodromes or locations requiring them.
[LIM AFI, Rec.6/6]

7.2 Exchange of SIGMET information ad special air-report

7.2.1 FASID Table MET 2B sets out the exchange requirements for SIGMETs. This Table should be updated, as necessary, by the appropriate ICAO Regional Offices on the basis of changes in the pattern of aircraft operations, the Statement of Basic Operational Requirements and Planning Criteria, and in consultation with those States and international organizations directly concerned.
[AFI/7, Rec. 8/6]

7.3 Interregional exchange of operational meteorological information

7.3.1 AFI data required for inclusion in MOTNE OPMET collection Programme should be addressed to the designated MOTNE/AFTN exchange centre. All AFI data required in other regions should also be addressed to Paris for AFTN predetermined distribution in the EUR Region and/or inclusion in the Bruxelles and Wien data banks and to the appropriate addresses in regions other than EUR.
[LIM AFI, Rec.6/6]

8. World area forecast system (WAFS)

[FASID Tables MET 5, MET 6 and MET 7]

8.1 FASID Table MET 5 sets out the AFI Region requirements for WAFS products: upper wind and temperature and significant weather (SIGWX) charts, and the gridded binary (GRIB) data, and abbreviated plain language SIGWX, to be provided by WAFC London.
[APIRG/12, Con. 12/32]

8.2 All the WAFS products should be prepared by WAFC London for fixed valid times of 00, 06, 12 and 18 UTC.
[APIRG/12, Con. 12/32]

8.3 The levels for which upper air and SIGWX charts are to be provided by the WAFC London and the areas to be covered by these charts and the GRIB data are indicated in FASID Table MET 5.
[APIRG/12, Con. 12/32]

8.4 FASID Table MET 6 sets out the WAFC responsibility for the production of SIGWX forecasts and upper wind and temperature charts for the areas of coverage indicated, and GRIB data. Each WAFC is responsible for the routine production, and dissemination by satellite broadcast, of charts for the areas of coverage listed. For back-up purposes, each WAFC should have the capability to produce SIGWX for all areas of coverage. [APIRG/12,Con.12/32]

Note:- *The responsibilities of RAFCs Brasilia, Buenos Aires, Dakar, Las Palmas and Nairobi will be progressively transferred to the WAFC London and WAFC Washington in accordance with AFI/7 Recommendation 7/10 and CAR/SAM Regional Planning and implementation Group (GREPECAS) Conclusion 8/24.*

8.5 The projection of the charts and their areas of coverage should be as indicated in FASID Charts MET 4, 5 and 6 associated with FASID Table MET 6; their scale should be $1:20 \times 10^6$, true at 22.5^0 in the case of charts in the Mercator projection, and true at 60^0 in the case of charts in the polar stereo graphic projection [AFI/7 (Rec. 7/12)].
[APIRG/12, Con. 12/32]

8.6 WAFS products should be disseminated by WAFC London using the satellite distribution system for information relating to air navigation (SADIS) covering the reception area shown in FASID Chart COM 2. To fulfill the requirements of long distance flights, transmission of WAFS products should be completed not later than 11 hours before validity time.
[APIRG/12, Con. 12/32]

8.7 The amendment service to the WAFS products issued by WAFC London should be by means of abbreviated plan language messages disseminated through SADIS.
[APIRG/12, Con. 12/32]

8.8 Each State should make the necessary arrangements to receive and make full operational use of WAFS products issued by WAFC London. FASID Table MET 7 provides the status of authorized access by SADIS users to the satellite broadcast and location of the operational VSATs.
[APIRG/12, Con. 12/32]

PART VII - SEARCH AND RESCUE (SAR)

PART VII – SEARCH AND RESCUE (SAR) SERVICES

1. Introduction

1.1 This part of the Africa-Indian Ocean Basic Air Navigation Plan (ANP) contains elements and procedures of the existing planning methods and systems and introduces the basic operational requirements and planning criteria (BORPC) related to search and rescue (SAR) services, as developed for the Africa and Indian Ocean (AFI) Region.

1.2 As a complement to the Statement of Basic Operational Requirements and Planning Criteria set out in Part I of the Basic ANP, Part VII constitutes the stable guidance material considered to be the minimum necessary for effective planning of SAR facilities and services in the Africa-Indian Ocean Region. This guidance material has been developed through the ICAO regional planning processes which, in the case of the AFI Region, is based largely on the work of the AFI Regional Planning and Implementation Group (APIRG) and AFI regional air navigation meetings. Background information of importance in the understanding and effective application of this part of the plan is contained in the Report of the Seventh Africa-Indian Ocean Regional Air Navigation Meeting (Doc. 9702), in the Sixth Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9298) and the Report of the Limited Africa-Indian Ocean (COM/MET/RAC) Regional Air Navigation Meeting (Doc 9529).

1.3 The Standards, Recommended Practices and Procedures to be applied and related guidance material are contained in:

a) Annex 12 ! *Search and Rescue;*

b) *Regional Supplementary Procedures* (Doc 7030), Part 1 ! Rules of the Air, Air Traffic Services and Search and Rescue; and

c) *International Aeronautical and Maritime Search and Rescue Manual (Doc 9731)*

The elements of guidance referred to above are presented in the following paragraphs with appropriate cross-references to AFI RAN meeting recommendations.

2. Plan of search and rescue regions (SRR)

2.1 The plan for search and rescue regions (SRR) is shown in FASID Chart SAR 1.

2.2 Organization and facilities

a) States should establish and/or maintain the appropriate rescue coordination centres (RCCs) listed in the Facilities and Services Implementation Document (FASID) Table SAR 1 and ensure the availability of services and facilities on a 24-hour basis.

2.3 The list of search and rescue facilities shown in FASID Table SAR 1 constitutes the plan for the search and rescue facilities in the region.

Note 1.— RSCs are not shown, except when they are located in a State different from that in which the relevant RCC is located.

Note 2.— Locations shown are not intended to signify exactly where the facility should be but merely to indicate where the range has been estimated to ensure full coverage of the region.

Note 3.— The facilities listed are the minimum requirements for search and rescue purposes, and it is recognized that in many cases States have facilities available additional to those listed.

Note 4.— The facilities listed need not be provided exclusively for SAR operations but may be suitably equipped aircraft or ships used on other assignments provided that they can be made available for SAR operations at short notice.

Note 5.— The requirement is for the type of facility listed to be within such proximity of the stated location that it can be activated within a reasonable period for action in the area. The availability of ultra-long range (ULR), extra-long range (ELR) and very long range (VLR) aircraft on a "redeployment" basis is acceptable.

2.4 *Provision of additional rescue units*
[AFI/6, Rec. 8/2]

The stated minimum requirements should whenever necessary be supplemented with additional SAR facilities that can be made available.

2.5 *Capacity of rescue units and associated facilities*
[AFI/6, Rec. 8/3]

States should take due account of the increase in size and passenger-carrying capacity of aircraft operating within their areas of SAR responsibility with a view to ensuring that necessary plans are made to activate and coordinate all available emergency services, including medical emergency services, in cases of aircraft accidents in which there is a possibility of a large number of survivors.

2.6 *Integrated emergency organization*
[AFI/6, Rec. 8/5]

States should ensure that arrangements are made for close coordination with national emergency services. Additionally, the possibility of integrating aeronautical SAR organizations with national emergency organizations where they exist should also be considered, if this would increase the efficiency of the aeronautical SAR organizations.

2.7 *Designation of land areas over which carriage of survival radio equipment is required*
[AFI/6, Rec. 8/6]

States should designate their land areas over which carriage of emergency locator transmitters will be required and include as soon as possible in their respective Aeronautical Information Publications (AIP) information regarding areas so designated.

2.8 *Publication in AIP of additional information on SAR facilities*
[AFI/6, Rec. 8/16]

Information on SAR units to show their full rescue, communication and range capabilities should be included in the AIP (Part SAR).

3. Search and rescue operations

3.1 *Carriage of 406 MHz ELTs*
[AFI/7, Rec. 6/1]

In the AFI Region, all aircraft required to carry emergency locator transmitters (ELTs) in accordance with Annex 6, should carry automatic ELTs operating on 406 MHz, and on 121.5 MHz for homing.

3.2 *Satellite-aided search and rescue*
[AFI/7, Rec. 6/2]

States should:

a) take appropriate action to reduce the number of false alarms through the COSPAS-SARSAT system on 121.5/243/406 MHz caused by inadvertent activation of emergency transmitters and eliminate unauthorized use of those frequencies;

b) establish a register of 406 MHz ELTs and make available information by publishing, in the aeronautical information publication, how ELT registration information can be obtained rapidly by rescue coordination centres (RCCs) of other States;

c) provide to ICAO a search and rescue (SAR) point of contact (SPOC) for inclusion in FASID Table SAR 1 of the respective air navigation plan (ANP); and

d) include information regarding the COSPAS-SARSAT system in the SAR plans.

3.3 *Search and rescue exercises*
[AFI/7, Rec. 6/7]

States should make arrangements for:

a) paper and communications exercises in search and rescue (SAR) and, in addition, frequent, regular SAR exercises under realistic conditions at least once a year to achieve maximum SAR capabilities;

b) joint SAR exercises between their search and rescue units and those of other States and with operators at regular intervals and, if possible, at least once a year; and

c) observers from other interested States and organizations to participate in such exercises.

3.4 *Training of SAR personnel*
[AFI/7, Rec. 6/5]

When preparing a training programme for search and rescue personnel, States should make arrangements to include all personnel, including military, involved in search and rescue.

4.1 *Cooperation between States*
[AFI/7, Rec. 6/3]

In order to promote a more effective and economic utilization of SAR facilities, States should enter into precise agreements with other States in order to pool their resources and provide mutual assistance in SAR operations when requested:

a) to assist in meeting the minimum requirements specified in Table FASID SAR 1 in cases where difficulties are experienced in fulfilling such requirements;

b) to provide complete coverage of a search and rescue region with the assistance of SAR facilities of other States;

c) to provide, if possible, SAR facilities additional to the minimum requirements in FASID Table SAR 1, while at the same time avoiding prohibitive costs; and

d) to establish common SAR procedures.

4.2 *Coordination with maritime SAR authorities and IMO*
[AFI/7, Rec. 6/4]

To ensure compatibility between aeronautical and maritime search and rescue regions (SRRs), aeronautical search and rescue (SAR) authorities in States should maintain close liaison with their maritime counterparts and the International Maritime Organization (IMO).

PART VIII - AERONAUTICAL INFORMATION SERVICES AND CHARTS (AIS/MAP)

PART VIII S AERONAUTICAL INFORMATION SERVICES AND CHARTS (AIS/MAP)

INTRODUCTION

1. This part of the Africa-Indian Ocean Basic Air Navigation Plan contains basic planning principles, operational requirements and planning criteria, implementation guidelines and stable material related to Aeronautical Information Services and Charts (AIS/MAP) considered to be the minimum necessary for effective planning of AIS and MAP facilities and services in the AFI Region.

2. A detailed description/list of the facilities and/or services to be provided by States in order to fulfil the requirements of the basic ANP is contained in the AFI, Facilities and Services Implementation Document (FASID), as agreed between the provider and the user States concerned. During the transition and pending full implementation of the future CNS/ATM system, it is expected that the existing requirements would gradually be replaced by new CNS/ATM related requirements. Subsequently, it is expected that some elements of the CNS/ATM systems will be subject to amendment, as necessary, on the basis of experience gained in their implementation.

3. The Standards, Recommended Practices and Procedures to be applied, and related guidance material are contained in the following ICAO documentation:

a) Annex 4 - *Aeronautical Charts*;

b) Annex 15 - *Aeronautical Information Services*;

c) Annex 11 - *Air Traffic Services;*

d) Annex 14 - *Aerodromes, Volume I - Aerodrome Design and Operations* and *Volume II - Heliports*;

1. *Aeronautical Information Services Manual* (Doc 8126);
2. *Aeronautical Charts Manual* (Doc 8697);
3. *ICAO Abbreviations and Codes* (PANS-ABC, Doc 8400); and
4. *World Geodetic System - 1984* (WGS-84), Doc 9674).

4. Background information of importance in the understanding and effective application of this part of the plan is contained in the Report of the Seventh Africa-Indian Ocean Regional Air Navigation Meeting (Doc 9702).

5. Regional air navigation meeting recommendations shown in brackets below a heading indicate the origin of all paragraphs following that heading. A recommendation shown in brackets below a paragraph indicates the origin of that particular paragraph.

GENERAL PROCEDURES

Introduction

6. The major objective of an AIS is to ensure the flow of information necessary for the safety, regularity and efficiency of International Civil Aviation. To support the CNS/ATM systems, the aeronautical information services and charts (AIS/MAP) should be directed towards the real-time provision of electronic aeronautical information/data that would ensure quality and integrity of the information provided.

7. In the CNS/ATM systems, the future users' requirement will be to access globally quality aeronautical information by all users at all times. To achieve this high-level requirement, aeronautical information must be provided electronically, based on a commonly agreed and standardized data model. Strict quality assurance principles should be put in place in order to ensure that aeronautical data is of the required quality (accuracy, resolution and integrity), verified and validated before it is provided to the users. This will give users the required confidence in the quality of information that is critical to flight safety.

8. To support the CNS/ATM systems, the following basic AIS/MAP requirements should be satisfied in the future:

a) real-time provision and exchange of electronic aeronautical information/data, through a system that guarantees the quality and integrity of the information provided;

b) provision and exchange of aeronautical information/data through modern communication means including data link that would allow interrogation of aeronautical data bases on the ground from the aircraft; and

c) harmonization of AIS and MET information/data to support combined automated pre-flight and in-flight briefing facilities.

Quality System

9. The aeronautical services involved in the provision and maintenance of aeronautical data should be organized in such a manner that the quality system be introduced in all the functional stages of the aeronautical data process, from the data origination to the distribution/provision of data. The established quality system should be in conformity with the International Organization for Standardization (ISO) 9000 series of quality assurance standards and the system should be certified by an approved organization.

Support for the AIS and MAP services

10. To enable the AIS/MAP services to function efficiently and in accordance with the defined requirements, sufficient funds should be allocated by States in their budgets that will ensure that all the administrative and operational requirements of AIS/MAP are met including the availability of sufficient and properly qualified personnel with all the required facilities, equipment and material.

11. The highest priority should be established and ascertained to the requirements for printing of AIS documentation including charts. Where practicable, printing facilities should be placed under the direct control of the AIS Headquarters.

12. The personnel working for aeronautical information and charts services should possess the skills and competence required to perform specific assigned functions. The required skills and competencies should be demonstrated by the AIS/MAP personnel through initial and periodic assessments on which basis the corresponding certificate of competence equal to an AIS licence may be accorded.

13. AIS and MAP personnel should be accorded the status comparable to that assigned to technical personnel of other air navigation services.

Coordination between AIS and other technical services

14. Coordination/liaison on a permanent basis should be established between AIS/MAP and other technical services responsible for planning and operating air navigation facilities and services. At least one person from those services should be assigned and be responsible for maintaining continuous liaison with AIS/MAP and providing it with "raw" information as and when required.

15. Technical services responsible for origination of the "raw" aeronautical information should be acquainted with the requirements for promulgation and advance notification of changes that are operationally significant as established in Annexes 11 and 14 and other relevant ICAO documentation.

16. Appropriate AIS/MAP personnel should be included in the air navigation planning processes. This should ensure the timely preparation of appropriate AIS documentation and that the effective dates for changes to the air navigation system and procedures are satisfied.

Training of AIS and MAP personnel

17. Within the context of the quality system implemented, the AIS and MAP training programme should ensure that the AIS and MAP personnel is appropriately trained according to the skills and competences required to perform specific assigned functions.

18. AIS personnel should receive professional training commensurate with the most recent technological developments requiring high level of knowledge and skills. AIS personnel should have, as an essential part of their training, sufficient knowledge of aeronautical cartography to permit them to verify information that is published on charts. In addition, AIS personnel should possess sufficient background in automation and knowledge of English language, necessary for the performance of their duties.

19. In addition to the conventional cartographic and geography training programme, knowledge of the following elements should also be taken into account when developing training programme for the MAP personnel:

1) hardware-scanners, plotters, computers, soft proofing devices (CRTs), image setters, and digital memory systems;

2) local area networks and world wide area networks;

3) software - programming familiarity, flow chart usage and creation, operating systems, communication formats, digital code systems, and documentation skills; and

4) cartographic equipment and software operations skills (developed through "hands on" experience).

20. AIS and MAP personnel should be able to demonstrate that they possess the skills and competencies required to perform assigned specific functions. Periodical checks should be undertaken to ensure that the personnel

continue to meet the required standards and if shortfalls in knowledge, skills or competence are detected, corrective measures should be taken.

ORGANIZATION OF AERONAUTICAL INFORMATION SERVICES

Aerodrome AIS Units

(FASID Table AIS-1)

21. The aerodrome AIS units to be provided at international aerodromes listed in Table AOP 1 of the basic AFI ANP is set out in FASID Table AIS-1.

22. The aeronautical information to be made available at international aerodromes listed in Table AOP 1 of the basic AFI ANP is set out in FASID Table AIS-2.

23. The exchange of aeronautical information documentation and availability of such documentation at international aerodromes listed in Table AOP 1 of the basic AFI ANP is set out in FASID Table AIS-4.

24. Aeronautical information service at aerodromes should be provided on a 24-hours basis, except as otherwise agreed between the AIS authority, the air traffic services authority and the operators concerned. Agreed operational hours of the aerodrome AIS units and details of the service provided should be indicated in Aeronautical Information Publication in accordance with Annex 15.

25. English should be among the languages used in aeronautical information briefings and consultations.

26. The aerodrome AIS unit should provide full pre-flight information/briefing service to flight operations personnel and aircrew, for the entire coverage zone. The coverage zone for pre-flight information service at each aerodrome AIS unit should be determined taking into account the final destination of aircraft departing from the aerodrome concerned. This should be done in consultation with aircraft operators and be reviewed from time to time and/or when the air traffic pattern is expected to change.

27. The aerodrome AIS units should be adequately staffed and properly equipped for the provision of effective pre-flight information service. Installation of systems for the automated processing [storage, retrieval and preparation of pre-flight information bulletins (PIB)] should be considered at an early stage.

28. Aerodrome AIS unit that provides pre-flight information services should be established at locations conveniently accessible to flight operations personnel at the airports, preferably on the ground floor (apron level) of airport terminal buildings.

29. Arrangements should be made between aerodrome AIS unit, airline operations personnel (including flight crews) and air traffic services for an effective co-operation, coordination and reporting of post-flight information on inadequacies in the status and operation of air navigation facilities. To ensure submission of post-flight reports to aerodrome AIS units without delay, arrangements should be made at airports that a suitable form like the one provided at Appendix B of the ICAO AIS Manual (Doc 8126) be made available to ATS, airline operations offices and aerodrome AIS units.

30. FASID Tables AIS-1 and AIS-2 should be implemented as soon as possible.

International NOTAM Offices (NOFs)

(FASID Table AIS-3)

31. The International NOTAM Offices to be provided in the AFI Region is set out in FASID TableAIS- 3.

32. International NOTAM Office should be adequately staffed and properly equipped for the provision of effective 24-hours service.

33. FASID Table AIS-3 should be implemented as soon as possible.

INTEGRATED AERONAUTICAL INFORMATION PACKAGE

Aeronautical Information Publication (AIP)

34. States which have not already done so, should as a matter of urgency prepare and publish in the new, restructured format their Aeronautical Information Publication (AIP), either individually or collectively. The format is prescribed by ICAO Annex 15 and the guidance material is provided in the AIS Manual (Doc 8126), Appendix H.

35. Information contained in the AIP should be complete and thoroughly checked for correctness before it is provided to the users. To ensure consistency throughout the AIP, changes to the AIP should be made in such a way that information of the same facility, service, procedure, etc. affecting one part be changed in the other part(s), if applicable.

36. The differences between the national regulations and practices and the corresponding ICAO SARPs should be provided in the appropriate part of the AIP.

AIP Amendments

37. In view of the vital importance of the aeronautical information contained in the AIP for the safety of air navigation, information in the AIP should be kept up to date. This should be done by publishing AIP Amendments on specific publication dates or in accordance with a publication schedule based on regular intervals.

38. AIP amendments should be issued at least once every 6 months.

39. The AIRAC AIP Amendment should be used to promulgate operationally significant changes to the AIP .

AIP Supplements

40. Any temporary changes of long duration (three months or longer) affecting the contents of an AIP, should be promulgated as AIP Supplements and that a checklist of all AIP supplements currently in force be issued at intervals of not more than one month

41. Where applicable, aeronautical information of operational significance, requiring substantive amendments to flight documentation (e.g. promulgation of new and/or revised instrument approach procedures) promulgated by an AIRAC AIP Supplement, should be accompanied by charts or diagrams, as appropriate, to aid interpretation.

42. AIRAC AIP Supplement be used to promulgate operationally significant temporary changes to the AIP.

43. Information in the AIP Supplement appropriate for inclusion in the AIP, should be incorporated therein with the minimum of delay.

44. Information in the AIP Supplement that is still valid at the end of six months, should be re-issued with a new number indicating clearly that the new Supplement is a replacement and that the information it contains remained unchanged from the one previously issued.

45. To enable users of aeronautical information to keep record of current information, check-list of AIP Supplements in force should be provided regularly through the monthly printed summary of NOTAM.

Aeronautical Information Circulars (AIC)

46. Aeronautical Information Service should establish contact with the relevant services providing AIS with "raw" aeronautical information to coordinate the preparation and production of Aeronautical Information Circulars (AIC) strictly in accordance with Chapter 7 of Annex 15 and the AIS Manual (Doc 8126).

47. Checklists of current Aeronautical Information Circulars have to be issued at least once a year, irrespective of the number of circulars in force

Use and validity of NOTAM

48. States should ensure that:

a) aeronautical information to be distributed by NOTAM is originated strictly in accordance with the Guidance for the completion of the NOTAM Format contained in Annex 15;

b) the duration of aeronautical information promulgated by NOTAM does not exceed three months and if the information is to remain valid after that period, an appropriate AIP Supplement/Amendment be issued;

c) strict compliance with the requirement to provide at least seven days advance notice of the activation of established danger, restricted or prohibited areas and of activities requiring temporary airspace restrictions, other than for emergency operations, is observed;

d) a "trigger" NOTAM is originated, whenever an AIRAC AIP Amendment or Supplement is published, giving brief description of the contents, the effective date and the reference number to the amendment and or supplement. Such a NOTAM must come into force on the same effective date as the amendment to the supplement;

e) monthly printed plain-language summary of NOTAM in force contains also the information of the latest AIP Amendments, AIP Supplements and AICs issued, and that it is distributed to the recipients with the minimum of delay by the most expeditious means.

49. AIS should exercise proper selectivity in the origination and distribution of NOTAM by use of Flight Information Service or whenever possible ATIS (Automatic Terminal Information Service) for distribution of information which is valid for only a few hours.

50. States, capable of introducing the pre-determined distribution system for NOTAM are encouraged to do so.

51. NOTAM should be used mainly for promulgation of information of a temporary nature and of short duration. Temporary information promulgated by NOTAM should not remain in force longer than three months. In exceptional cases, if temporary information promulgated by NOTAM exceeds three months period, a replacement NOTAM should be issued.

52. Use of the abbreviation WIE (with immediate effect) and abbreviation UFN (until further notice) in the NOTAM Format, Items B and C, respectively must be avoided and instead, a ten-figure group giving year, month, day, hours and minutes in UTC should be used when originating NOTAM. When information on timing is uncertain, a ten figure date-time group should be followed by an EST to indicate the approximate duration of information.

AIRAC System

53. States that have not yet done so, should implement the AIRAC system in accordance with the requirements of Annex 15, with the minimum of delay.

54. States should ensure that adequate coordination between AIS and other air navigation services exists to permit effective implementation of the AIRAC system.

55. Successful implementation of the AIRAC system depends directly on the level of coordination established among the relevant technical services and the AIS. To ensure this, States should prepare their national regulations defining duties and responsibilities of those technical services involved with the provision of raw AIRAC information to AIS for publication. The technical services involved should be familiar with the AIRAC system and comply with it in accordance with specifications provided in Annexes 11 and 14, (both volumes) and 15.

56. A schedule of AIRAC publication dates should be issued which includes a list of latest dates for the receipt of “raw” information to be promulgated by AIRAC and print this on the reverse side of the Aeronautical Information Promulgation Advice Form.

57. AIRAC AIP Amendments should be used to promulgate operationally significant permanent changes to the AIP.

58. To ensure that the aeronautical information of the operational significance reaches users at least 28 days in advance of the AIRAC effective date, measures should be taken to ensure that:

a) information/data prepared in the hard copy format, be issued and distributed at least 56 days prior to the effective date; and

b) information/data provided in the electronic format be distributed at least 35 days in advance of the effective date. .A schedule of AIRAC effective dates, publication dates and cut-off dates for the receipt by AIS of the raw information to be promulgated through the AIRAC system should be issued once a year and distributed to all services and agencies responsible for the origination of the raw information.

59. Changes to the information promulgated by AIRAC system should be avoided by all means, especially during the period of first 28 days.

60. States should ensure that responsible AIS personnel participate in the country's administrative and technical meetings where airport and air navigation planning systems are discussed, in order that:

a) adequate consideration can be given to the AIS production, publication and advance notice of material issued by those meetings; and

b) such AIS personnel take part in the determination of applicability of changes in the air navigation facilities an procedures, taking into account the required advance notification and cut-off dates relevant to the AIRAC system.

WORLD GEODETIC SYSTEM - 1984 (WGS-84)

Introduction

61. In order to support implementation of the future CNS/ATM systems, States should make every effort to implement WGS-84 and provide geographical coordinates referenced to this system. A detailed description/list of the WGS-84 coordinate data to be provided by States in order to fulfill the requirements of the Basic ANP is contained in the AFI Facilities and Services Implementation Document (FASID).

62. The Standards, Recommended Practices and Procedures (SARPs) to be applied in respect of WGS-84 are contained in the following ICAO documents:

a) for the accuracy of the field work (surveying):

1) Annex 11 — *Air Traffic Services;* and

2) Annex 14, *Aerodromes,* Volume I — *Aerodrome Design and Operations* and Volume II — *Heliports*; and

b) for the charting and publication resolution, respectively:

1) Annex 4 — *Aeronautical Charts*; and

2) Annex 15 — *Aeronautical Information Services.*

63. To assist States in the uniform implementation of the WGS-84 related SARPs, the guidance material on the provision of geographic geographical coordinates referenced to the WGS-84 datum is provided in the *World Geodetic System - 1984 Manual* (Doc 9674).

WGS-84 Requirements
(FASID Table AIS-5)

64. FASID Table AIS-5 sets out the requirements for geographical coordinates referenced to the WGS-84 datum at international aerodromes, in flight information regions (FIR), en-route and in terminal areas.

65. States which have not already done so, should make the necessary arrangements to develop a national WGS-84 Implementation Plan and such a plan should contain a timetable for implementation. When developing a national WGS-84 plan, States should establish a committee composed of personnel from the appropriate aeronautical as well as from the geographic/geodetic departments of the State. Such a committee should be tasked with the management of the WGS-84 implementation plan.

66. States, which are in a position to do so, should provide assistance to other States which need assistance in the implementation of WGS-84.

67. Before the geographical coordinates based on WGS-84 are published in the Aeronautical Information Publication (AIP) and on charts, every effort must be made to validate and verify them.

68. States which have common boundary points, should coordinate WGS-84 data for those points prior to publication of this information in their respective AIPs.

69. In order to ensure that quality (accuracy, resolution and integrity) and traceability requirements for the WGS-84 related geographical coordinate data are met, States must take measures to develop and introduce a quality system programme. This programme containing procedures, processes and resources should be in conformity with the International Organization for Standardization (ISO) 9000 series of quality assurance standards.

AERONAUTICAL CHARTS

Aeronautical charting programme

(FASID Table AIS-6)

70. States, individually or collectively, should include in their AIP derived from their aeronautical chart production programmes 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;
k) World Aeronautical Chart — ICAO 1:1 000 000.

Note.— In the production of Aerodrome Obstacle Charts — ICAO Type A, Aerodrome Obstacle Charts — ICAO Type C, Instrument Approach Charts — ICAO, Aerodrome/Heliport Charts — ICAO and Precision Approach Charts — ICAO, States shall take into account ICAO Annex 4 requirements and Table AOP 1

71. The detailed aeronautical chart requirements are set out in FASID Table AIS-6.

Production responsibility for sheets of the World Aeronautical Charts — ICAO 1:1 000 000 (FASID Table AIS-7)

72. States which have not yet produced the World Aeronautical Chart — ICAO 1:1 000 000, in accordance with the sheet distribution shown in FASID Table AIS-7, should take the necessary 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.

73. The production responsibility for sheets of the World Aeronautical Chart — ICAO 1:1 000 000 are set out in FASID Table AIS-7 and illustrated on FASID Chart AIS 2.

74. Where the agency producing the charts is not under the control of the aviation administration, States should ensure good liaison between them, and accord the necessary priority in their national chart production programmes to the production of the required aeronautical charts.

Aeronautical chart production

75. States which have not produced the aeronautical charts specified hereunder should produce them as soon as possible.

1) Aerodrome Obstacle Chart — ICAO Type A;

2) Aerodrome Obstacle Chart — ICAO Type C;

3) Precision Approach Terrain Chart — ICAO;

4) Enroute Chart — ICAO;

5) Instrument Approach Chart — ICAO;

6) Aerodrome/Heliport Chart — ICAO;

7) World Aeronautical Chart — ICAO 1:1 000 000.

76. When information on specific aeronautical charts is amended, all related charts, which are affected by the changes, should be amended and published.

77. State authorities should ensure that the appropriate topographical information is made available to the AIS/MAP services so that the requirements for the production of aeronautical charts can be fufilled.

AUTOMATION IN AIS

78. Automation in AIS should be introduced with the objective of improving the over-all speed, accuracy, efficiency, and cost-effectiveness of the Aeronautical Information Service in the Region.

79. AIS automation should offer a service to meet the individual requirements of the various categories of users. This goes beyond the provision of pre-processed data and the pre-flight bulletin types traditionally provided manually or by early automated systems. For reasons of cost effectiveness, such a service should strike a balance between the degrees of complexity of the system required and the sophistication of the products provided.

80. The development of automation within AIS should be based on an integrated AFI regional automated AIS system concept, in order to obtain a general standardization of procedures, products and services to users, and to avoid potential divergencies, incompatibilities and duplication of effort.

81. The implementation of such a system should permit a cost-effective evolution of the regional system, taking account of the present and future technical possibilities and should be governed by the following principles:

a) participating national automated AIS Systems should closely co-operate in adopting the different elements that will makeup the integrated AFI Region automated AIS system, taking into account their current and planned degree of development;

b) States, which have not yet done so, should initially automate NOTAM service within their own AIS while taking into account the users requirements;

c) certain national automated AIS systems should cooperate with other automated AIS systems, carrying out agreed functions to improve the efficiency and the quality of processing of basic aeronautical information and of its distribution both within an agreed area of the system and externally.

d) optimum use should be made of available communication and public networks as well as of new communication technology for the dissemination, exchange and retrieval of aeronautical information, particularly NOTAM;

e) the ICAO NOTAM format containing the necessary qualifiers to facilitate the sorting and retrieval of NOTAM information in accordance with users' requirements should exclusively be used;

f) a system interrogation capability which takes account of the different categories of systems users; should exist;

g) common "user friendly" query procedures for the interrogation of AIS or NOTAM databases should be used. These procedures should be in accordance with the different levels of users requirements;

h) States must establish quality system and procedures which will ensure that the available aeronautical information is of appropriate quality (accuracy, resolution, integrity and timeliness);

i) State, which decides not to automate its AIS may arrange, in the interest of improved efficiency, on the basis of bi-or multi-lateral agreements between States or other non-governmental organization, for the provision of automated services on its behalf. The arrangement must take into account the non-transferable responsibility of a State for the provision of aeronautical information as well as other technical and administrative aspects associated with such agreement.

82. The development of the integrated AFI Region automated AIS system should take into account provisions of Annex 15 for the use of World Geodetic System - 1984 (WGS-84), the adopted common geodetic reference system, when aeronautical geographical coordinates are provided.

ATTACHMENT A TO PART VIII - AIS/MAP

CONCEPT FOR AN INTEGRATED AUTOMATED AIS SYSTEM FOR THE AFI REGION

1. SYSTEM CONFIGURATION

1.1 The system should be based on the facilities of participating States with the following structure:

a) national automated AIS systems of States, providing national service;

b) multi-national automated AIS systems of States providing on the basis of bilateral and multilateral agreements, service to other State(s) in addition to national service; and

c) non-automated AIS.

2 AREA TO BE SERVED

2.1 The system should have the capacity of holding aeronautical information covering those parts of the world to fulfil the operational requirements for AIS pre-flight information service for flights from point of origin to final destination.

3. SYSTEM SERVICE

3.1 The system over-all should provide a service that is capable of satisfying the users operational requirements, as detailed in 11 and 12 below.

National service

3.2 The primary role of a national automated AIS system should be to provide aeronautical information to users in a given State, either in accordance with predetermined arrangements, or by computer interrogation. A national automated AIS system should collect appropriate aeronautical information from national sources, process, produce in a form of a NOTAM, store it in the national automated AIS system's data base and make it available within the State, the integrated regional system as well as world-wide in accordance with predetermined arrangements.

3.3 Conversely, the required aeronautical information relative to other States should be received in the NOTAM Format for direct input into the data base or for further processing, if required, so that specific requirements for international aeronautical information can also be carried out by the national system.

3.4 A national automated AIS system should be able to provide service to users in another participating State that does not have an automated AIS system as well as for any other State for which the service is provided in accordance with pre-arranged agreements. State, not having an automated AIS system but participating in the regional system, would have an option, resulting from bi-lateral agreement, to be linked with a national automated AIS system via an intelligent or non-intelligent remote terminal.

4. SYSTEM FUNCTIONS

4.1 A number of system functions should be performed at regional and national levels.

5. COMMUNICATION

5.1 The Aeronautical Fixed Service (AFS) should satisfy the communication requirements at an international level. Optimum use should be made of available communication networks for the dissemination, exchange and retrieval of aeronautical information, particularly NOTAM.

5.2 The selection for the various means for the retrieval of data at a national level should be at the discretion of the individual State and should be largely dependent on the availability and cost of the various services, communication links available and user requirements.

6. SYSTEM RELIABILITY AND REDUNDANCY

6.1 The system configuration should assure adequate reliability and redundancy.

7. FALL BACK PROCEDURES

7.1 In the case of a system failure, the service within the related service area should be continued in accordance with the pre-arranged and established procedure for each service area, which should also cover the necessary communications arrangements.

8. RESPONSE TIME

8.1 With the features provided by the system, the use of modern computer techniques and means of communication, short response times should be assured.

9. PLANNING AND IMPLEMENTATION

9.1 The planning and implementation of the system should be guided and adjusted by considerations related to efficiency cost-effectiveness and experience.

9.2 Relevant bilateral or multilateral agreements should aim at minimizing costs by leading to work and equipment savings beneficial to all participants.

9.3 A planning/implementation regional group should co-ordinate the general development of the system and the activities required of States and should monitor the over-all situation for the purpose of detecting in advance divergencies in developments that could lead to later incompatibilities.

10. SYSTEM MANAGEMENT

10.1 The strategic operation of the system should be closely monitored by States to permit speedy reaction to problems encountered and to shortcomings identified. An appropriate form of system management should be developed by the AFI Regional Air Navigation Planning and Implementation Group (APIRG).

11. USER REQUIREMENTS IN AN AUTOMATED AIS SYSTEM

11.1 The latest pre-flight information bulletin of the specific type needed (i.e. route, area, or aerodrome) should be available.

11.2 Information on specific items for given areas required by flight planning services, ATS, AIS or other users, should be provided.

11.3 A list of NOTAM entered into the system after a specific date-time group, to facilitate briefing, should be obtainable.

11.4 Immediate notification capability of items which are of urgent operational significance should be provided.

12. TYPE OF INFORMATION TO BE PROVIDED

12.1 The system should provide NOTAM covering the area of service.

12.2 The system should additionally provide the following pre-flight information bulletins and lists:

a) route type bulletin containing NOTAM relevant to aerodrome of departure, the planned route based on FIR crossed, aerodrome of destination, and alternate aerodromes;

b) area type bulletin containing NOTAM relevant to FIR or State;

c) aerodrome type bulletin containing NOTAM concerning any aerodrome or group of aerodromes;

d) immediate notification items;

e) checklists of NOTAM by State, FIR, aerodrome; and

f) list of NOTAM for a specific period or NOTAM entered into the system after a specific date-time group.

12.3 The updating of pre-flight information bulletins should be covered by system products listed in 12.2 d), e) and f), or by request for a new pre-flight information bulletin.

12.4 The system features described in 14 below should permit pre-flight information bulletins to be tailored to the needs of the users and should provide flexible options of information content ranging from full system data coverage to data of urgent operational significance.

12.5 Pre-flight information bulletins should be provided in a standard format and ascending sequence of information.

13. MULTI-ACCESS TERMINALS

13.1 AIS terminals should ultimately be capable of providing OPMET information relating to pre-flight bulletins.

13.2 AIS terminals should ultimately be capable of being used for the filing of a flight plan.

14. SYSTEM FEATURES

NOTAM

14.1 The NOTAM, in standard ICAO NOTAM format, should constitute the basic data exchange source in the system.

14.2 The NOTAM should be prepared only once, at the entry into the system.

14.3 The system should provide for automatic exchange of the NOTAM between national automated AIS systems.

Common set of qualifiers (Field Q)

14.4 A common set of qualifiers, forming an integral part of the ICAO NOTAM format (Field Q) should be used to assure compatibility in data exchange and to permit the production of standard system output products.

Decoded NOTAM text

14.5 The NOTAM text (Field E) of the ICAO NOTAM format should be prepared by use of the significations/uniform abbreviated phraseology assigned to the ICAO NOTAM Code, complemented by ICAO abbreviations, indicators, identifiers, designators, call signs, frequencies, figures and plain language.

NOTAM selection criteria

14.6 The NOTAM code contained in PANS-ABC (Doc. 8400) is the most comprehensive description of information requiring NOTAM promulgation and should, therefore, constitute criteria for

1. the storage and retrieval of information;
2. the decision as to whether a particular item is of operational significance;
3. the decision as to the relevance of particular items for various types of flight operations; and
4. the selection of items of operational significance which require immediate notification.

14.7 Consequently, the NOTAM code should constitute the basis for the determination of the qualifiers for TRAFFIC, PURPOSE and SCOPE.

Geographical reference qualifier

14.8 Sufficient flexibility and tailoring of information for the first set up of automation in AIS is achieved by the use of the geographical reference qualifier. This qualifier consists of latitude and longitude to one minute resolution and referenced to the World Geodetic System - 1984 (WGS-84) geodetic datum accurate to one minute and a three-digit distance figure giving radius of influence. (in nautical miles (NM)).

14.9 The provision of more flexible and referred data retrievals can be satisfied by the application of a geographical reference system which may be required for the expansion of the over-all system in order to meet future requirements. These requirements may derive from the introduction of RNAV operations, the expansion of automation within the air traffic services and the users' systems.

14.10 Consequently, in the evolution of the regional system the geographical reference system based on LAT/LONG coordinates of the World Geodetic Reference system (WGS-84) must be used as a standard.

15. SYSTEM QUERY PROCEDURES

15.1 The system should provide a common set of query procedures.

15.2 The common set of query procedures should make the best use of the database management system applied in order to give rapid response to simple and short requests.

15.3 The query procedures should also provide user friendly access to the System without assistance of AIS personnel to obtain the required information.

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Appendix

SUMMARY OF AMENDMENTS TO THE PLAN

(Approved by the President on behalf of the Council)