



International Civil Aviation Organization

**MIDANPIRG Communication Navigation and Surveillance
Sub-Group (CNS SG)**

Sixth Meeting
(Tehran, Iran, 9 – 11 September 2014)

Agenda Item 5: Performance Framework for CNS Implementation in the MID Region

POPULATION OF MID eANP CNS PARTS

(Presented by the Secretariat)

<p style="text-align: center;">SUMMARY</p> <p>The aim of this paper is to initiate the development of the MID eANP parts related to CNS.</p> <p>Action by the meeting is at paragraph 3.</p>
<p style="text-align: center;">REFERENCES</p> <ul style="list-style-type: none">– CNS SG/6 WP/4– MIDANPIRG/14 Report

1. INTRODUCTION

1.1 MIDANPIRG/14, through Decision 14/24, agreed that the development of the MID eANP based on the Council-approved ANP Template, be included in the Work Programme of the different MIDANPIRG subsidiary bodies and the relevant Parts of the MID eANP be presented, as soon as available, to MSG/4 and/or MIDANPIRG/15 for endorsement.

2. DISCUSSION

2.1 The meeting may wish to recall that the details related to the developments of the eANP were presented in WP/4.

2.2 In accordance with the action plan for the developments of the eANP and MIDANPIRG/14 Conclusion 14/24 the meeting is invited to review and provide inputs to the MID eANP Parts related to CNS. The following is a non-exhausted list of the topics that should be populated in order to complete the CNS Parts of the MID eANP:

- **ANP, VOLUME I**
PART III – COMMUNICATIONS, NAVIGATION AND SURVEILLANCE (CNS) (Standard no change only the name of the Region).

- **ANP, VOLUME II**
PART III – COMMUNICATIONS, NAVIGATION AND SURVEILLANCE (CNS)
 - AFTN Plan in Table CNS II-1
 - ATN Infrastructure Routing Plan Table CNS II-2
 - ATS direct speech circuits Plan Table CNS II-3
 - HF network designators applicable for the Region Table CNS II-4
 - Specific Regional Requirements (List of assigned frequencies, MID-AMC operation, AMHS addressing, Navigation and Surveillance systems as appropriate).
- **ANP, VOLUME III**
 - Follow-up on the ASBU modules related to CNS (B0-FICE,...).

2.3 Based on the above, the meeting is invited to review the Volume I Part III as at **Appendix A**, Volume II Part III **Appendix B** and CNS tables II 1,2,3 and 4 at **Appendices C, D, E** and **F** respectively. Furthermore, **Appendix G** is showing Volume III with an initial proposed Sample for the Monitoring of Implementation Table for the ASBU Block 0 Module FICE.

2.4 The monitoring tables will be presented to the MSG/4 meeting 24-26 November 2014 that will be held in Cairo at the ICAO MID Regional Office.

2.5 Furthermore, the ASBU monitoring table will be refined by the ANP WG/2 meeting in December 2014, and agreed by MIDANPIRG/15 in May 2015.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) review and update the CNS parts and Tables in **Appendices A, B, C, D, E** and **F**;
- b) review and agree on the contents in **Appendix G** Vol III and proposed Table;
- c) agree on the specific regional requirements to be included in the eANP; and
- d) provide feedback on the eANP and participate in the work of the ANP WG/2 meeting.

APPENDIX A

(NAME) AIR NAVIGATION PLAN

VOLUME I

(*NAME*) AIR NAVIGATION PLAN

VOLUME I

(MID) ANP, VOLUME I**PART III – COMMUNICATIONS, NAVIGATION AND SURVEILLANCE (CNS)****1. INTRODUCTION**

1.1 This part of the **(MID)** ANP constitutes the agreed regional requirements considered to be the minimum necessary for effective planning and implementation of Communications, Navigation and Surveillance (CNS) facilities and services in the MID Region(s) and complements the provisions of ICAO SARPs and PANS related to CNS. It contains stable plan elements related to the assignment of responsibilities to States for the provision of CNS facilities and services within the ICAO MID region(s) in accordance with Article 28 of the *Convention on International Civil Aviation* (Doc 7300) and mandatory requirements related to the CNS facilities and services to be implemented by States in accordance with regional air navigation agreements.

1.2 The dynamic plan elements related to the assignment of responsibilities to States for the provision of CNS facilities and services and the mandatory requirements based on regional air navigation agreements related to CNS are contained in the **(MID)** ANP Volume II, Part III – CNS.

1.3 The **(MID)** ANP Volume III contains dynamic/flexible plan elements related to the implementation of air navigation systems and their modernization in line with the ICAO Aviation System Block Upgrades (ASBUs) methodology and associated technology roadmaps described in the Global Air Navigation Plan. The ASBU modules are aimed at increasing capacity and improving efficiency of the aviation system whilst maintaining or enhancing safety level, and achieving the necessary harmonization and interoperability at regional and global level. This includes the regionally agreed ASBU modules applicable to the specified ICAO region/sub-region and associated elements/enablers necessary for the monitoring of the status of implementation of these ASBU modules.

1.4 In planning for these elements, economy and efficiency should be taken into account in order to ensure that the requirements for the provision of CNS facilities and services can be kept to a minimum. CNS facilities and services should fulfil multiple functions whenever this is feasible.

Standards and Recommended Practices and Procedures for Air Navigation Services

1.5 The SARPs and PANS and related guidance material applicable to the provision of CNS are contained in:

- a) Annex 10 – *Aeronautical Telecommunications*, Volumes I, II, III, IV and V;
- b) Annex 2 – Rules of the Air;
- c) Annex 3 – Meteorological Service for international air navigation;
- d) Annex 6 – Operation of Aircraft, Parts I (Chapter 7), II (Chapter 7) and III (Chapter 5);
- e) Annex 11 – Air Traffic Services;
- f) Annex 12 – Search and Rescue;
- g) Annex 15 – Aeronautical Information Services;
- h) Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM) (Doc 4444);
- i) Regional Supplementary Procedures (Doc 7030);
- j) GNSS Manual (Doc 9849);

- k) Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols (Doc 9880);
- l) ICAO Aeronautical Telecommunication Network (ATN) Manual for the ATN using IPS Standards and Protocols (Doc 9896);
- m) *Manual of Testing of Radio Navigation Aids* (Doc 8071);
- n) *Manual on the Planning and Engineering of the Aeronautical Fixed Telecommunications Network* (Doc 8259);
- o) *Manual on Required Communication Performance (RCP)* (Doc 9869);
- p) *Training Manual* (Doc 7192);
- q) *Performance-based Navigation Manual* (Doc 9613);
- r) *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation* (Doc 9718);
- s) *ICAO Manual on the Secondary Surveillance Radar (SSR) Systems* (Doc 9684);
- t) *Manual on Airborne Surveillance Applications* (Doc 9994); and
- u) *Manual of Air Traffic Services Data Link Applications* (Doc 9694).

2. GENERAL REGIONAL REQUIREMENTS

Communications

Aeronautical Fixed Service (AFS)

2.1 The aeronautical fixed service (AFS) should satisfy the communication requirements of ATS, AIS/AIM, MET and SAR, including specific requirements in terms of system reliability, message integrity and transit times, with respect to printed as well as digital data and speech communications. If need be, it should, following agreement between individual States and aircraft operators, satisfy the requirements for airline operational control.

The Aeronautical Telecommunication Network (ATN)

2.2 The ATN of the Region(s) should have sufficient capacity to meet the minimum requirements for data communications for the services mentioned in paragraph 2.1 above.

Aeronautical Mobile Service (AMS)

2.3 Air-ground communications facilities should meet the agreed communication requirements of the air traffic services, as well as all other types of communications which are acceptable on the AMS to the extent that the latter types of communications can be accommodated.

Air-ground communications for ATS

2.4 Air-ground communications for ATS purposes should be so designed to require the least number of frequency and channel changes for aircraft in flight compatible with the provision of the required service. They should also provide for the minimum amount of coordination between ATS units and provide for optimum economy in the frequency spectrum used for this purpose.

Air-ground data link communications

2.5 Air-ground data link communications should be implemented in such a way that they are regionally and globally harmonised and make efficient use of available communication means and ensure optimum economy in frequency spectrum use and system automation.

Navigation

2.6 Planning of aeronautical radio navigation services should be done on a total system basis, taking full account of the navigation capabilities as well as cost effectiveness. The total system composed of station-referenced navigation aids, satellite-based navigation systems and airborne capabilities should meet the performance based navigation (PBN) requirements for all aircraft using the system and should form an adequate basis for the provision of positioning, guidance and air traffic services.

2.7 Account should be taken of the fact that certain aircraft may be able to meet their navigation needs by means of self-contained or satellite-based aids, thus eliminating the need for the provision of station-referenced aids along the ATS routes used by such aircraft, as well as the need to carry on board excessive redundancies.

Surveillance

2.8 Planning of aeronautical surveillance systems should be made based on a system approach concept, where collaboration and sharing of data sources should be considered in support of an efficient use of the airspace.

Frequency Management

2.9 Frequency assignment planning in the Region(s) should be carried out in accordance with the provisions of Annex 10 and *ICAO Handbook on Radio Frequency spectrum for Civil Aviation* (Doc 9718), supplemented, as necessary, by regional recommendations and technical criteria developed for this purpose.

3. SPECIFIC REGIONAL REQUIREMENTS

3.1 TBD (if necessary).

APPENDIX B

(MID) AIR NAVIGATION PLAN

VOLUME II

(MID) AIR NAVIGATION PLAN

VOLUME II

(MID) ANP, VOLUME II**PART III – COMMUNICATIONS, NAVIGATION AND SURVEILLANCE (CNS)****1. INTRODUCTION**

1.1 This part of the **(MID)** ANP, Volume II, complements the provisions in ICAO SARPs and PANS related to communication, navigation and surveillance (CNS). It contains dynamic plan elements related to the assignment of responsibilities to States for the provision of CNS facilities and services within a specified area in accordance with Article 28 of the *Convention on International Civil Aviation* (Doc 7300); and mandatory requirements related to CNS facilities and services to be implemented by States in accordance with regional air navigation agreements. Such agreement indicates a commitment on the part of the State(s) concerned to implement the requirement(s) specified.

2. GENERAL REGIONAL REQUIREMENTS**Communications***Aeronautical Fixed Service (AFS)*

2.1 The aeronautical fixed service should comprise the following systems and applications that are used for ground-ground (i.e. point-to-point and/or point-to-multipoint) communications in the international aeronautical telecommunication service:

- a) ATS direct speech circuits and networks;
- b) meteorological operational circuits, networks and broadcast systems, including World Area Forecast System – Internet File Service (WIFS) and/or Satellite Distribution System for Information Relating to Air Navigation (SADIS);
- c) the aeronautical fixed telecommunications network (AFTN);
- d) the common ICAO data interchange network (CIDIN);
- e) the air traffic services (ATS) message handling services (AMHS); and
- f) the inter-centre communications (ICC).

2.2 To meet the data communication requirements, a uniform high-grade aeronautical network should be provided, based on the aeronautical telecommunication network (ATN), taking into account the existence and continuation of current networks.

2.3 Contingency procedures should be in place to ensure that, in case of a communication centre breakdown, all the parties concerned are promptly informed of the prevailing situation. All possible arrangements should be made to ensure that, in case of breakdown of a communications centre or circuit, at least high-priority traffic continues to be handled by appropriate means.

2.4 AFS planning should permit flexibility in detailed development and implementation. The required AFTN Stations and Centres are listed in the AFTN Plan in **Table CNS II-1**.

The Aeronautical Telecommunication Network (ATN)

2.5 The ATN should be able to:

- a) support applications carried by the existing networks;
- b) support gateways enabling inter-operation with existing networks; and
- c) support ground-ground communications traffic associated with air-ground data link applications.

2.6 The ATN should make optimum use of dedicated bilateral/multilateral aeronautical links and other communication means commensurate with the operational Quality of Service (QoS) requirements.

2.7 The implementation of the ATN should take into account the need for cost-effective evolution in terms of network capacity, requirements and time-frame and allow for a progressive transition from existing communication networks and services to a uniform, harmonised and integrated communications infrastructure, capable of supporting the implementation of future aeronautical services such as Flight and Flow Information in a Collaborative Environment (F-FICE), System-Wide Information Management (SWIM) applications, etc.

2.8 In case means other than dedicated bilateral links are used by the ATN, States should ensure that service level agreements (SLA) are met in terms of implementation priority, high availability, priority in restoration of service and appropriate levels of security.

2.9 The ATN should provide for interregional connections to support data exchange and mobile routing within the global ATN.

2.10 In planning the ATN, provisions should be made, where required, for interfacing with other international networks. The Required ATN Infrastructure Routing Plan is described under **Table CNS II-2**.

Network services

2.11 The Internet Society (ISOC) communications standards for the Internet Protocol Suite (IPS) should be used for the implementation of AMHS.

2.12 The migration from legacy bit-oriented protocols such as X.25 Protocol suite to IPS should be planned.

2.13 The migration of international or sub-regional ground networks to the ATN based on Internet Protocol (IP) to support AFS communication requirements, while reducing costs, should be planned.

2.14 States should ensure that the solutions provided for the implementation of the ATN meet the air traffic management and aeronautical fixed service requirements. Such requirements should consist of:

- a) Performance requirements: availability, continuity, integrity, monitoring and alerting criteria per data flow. In the case where a required communication performance (RCP) is globally prescribed, requirements derived from RCP should be stated;
- b) Interoperability requirements;
- c) Safety and security requirements, duly derived after the identification of operational hazards and threats, and allocation of objectives; and
- d) Implementation process requirements (creation, test, migration, upgrades, priority in restoration of service, termination).

Network management

2.15 An ICAO centralised off-line network management service is provided to participating AFTN/ AMHS centres in the **(MID)** Region(s) under the ATS Messaging Centre (AMC).

2.16 In the case of integrated communications services procured and shared by several States, organizational provisions should allow for the planning and performing of the management of technical performance, network configuration, fault, security, cost division/allocation, contract, orders and payment.

Specific air traffic management (ATM) requirements

2.17 Where ATS speech and data communication links between any two points are provided, the engineering arrangements should be such as to avoid the simultaneous loss of both circuits. The required ATS direct speech circuits plan is detailed under **Table CNS II-3**.

2.18 Special provisions should be made to ensure a rapid restoration of ATS speech circuits in case of outage, as derived from the performance and safety requirements.

2.19 Data circuits between ATS systems should provide for both high capacity and message integrity.

2.20 The Inter-Centre Communication (ICC), consisting of ATS Inter-facility Data Communication (AIDC) application and the Online Data Interchange (OLDI) application, should be used for automated exchange of flight data between ATS units to enhance the overall safety of the ATM operation and increase airspace capacity.

2.21 Where Voice over IP is planned or implemented between ATS units for voice communications, it should meet the ATS requirements. When data and voice are multiplexed, particular attention should be paid to the achievement of the ATM performance and safety requirements.

Specific meteorological (MET) requirements

2.22 The increasing use of the GRIB (Gridded Binary or General Regularly-distributed Information in Binary form) and BUFR (Binary Universal Form for the Representation of meteorological data) code forms for the dissemination of the upper wind and temperature and significant weather forecasts and the planned transition to digital form using extensible markup language (XML)/geography markup language (GML) for the dissemination of OPMET data should be taken into account in the planning process of the ATN.

2.23 In planning the ATN, account should be taken of changes in the current pattern of distribution of meteorological information resulting from the increasing number of long-range direct flights and the trend towards centralized flight planning.

Specific aeronautical information management (AIM) requirements

2.24 The aeronautical fixed service should meet the requirements to support efficient provision of aeronautical information services through appropriate connections to area control centres (ACCs), flight information centres (FICs), aerodromes and heliports at which an information service is established.

Aeronautical Mobile Service (AMS)

2.25 To meet the air-ground data communication requirements, a high-grade aeronautical network should be provided based on the ATN, recognising that other technologies may be used as part of the transition. The network needs to integrate the various data links in a seamless fashion and provide for end-to-end communications between airborne and ground-based facilities.

2.26 Whenever required, use of suitable techniques on VHF or higher frequencies should be made. The required HF network designators applicable for the (MID) Region(s) are listed in **Table CNS II-4**.

2.27 Aerodromes having a significant volume of International General Aviation (IGA) traffic should also be provided with appropriate air-ground communication channels.

Air-Ground Data Link Communications

2.28 A Strategy for the harmonised implementation of the data link communications in the (MID) Region(s) should be developed based on the Global Operational Data Link Document (GOLD) adopted by ICAO Regions and the Aviation System Block Upgrade (ASBU) methodology.

2.29 Where applicable, controller-pilot data link communications (CPDLC), based on ATN VDL data link Mode 2 (VDL2) and/or FANS-1/A, should be implemented for air-ground data link communications.

2.30 Partial or divergent aircraft data link evolutions that result in excluding messages from aircraft systems should not be pursued. Interim steps or phases toward full implementation of the common technical definition in ground systems should only be pursued on a regional basis, after coordination between all States concerned.

2.31 Harmonization of operational procedures for implementation of the above packages is essential. States, Planning and Implementation Regional Groups (PIRGs) and air navigation services providers should adopt common procedures to support seamless ATS provision across FIR boundaries, rather than each State or Region developing and promulgating unique procedures for common functions.

Required Communication Performance (RCP)

2.32 The Required Communication Performance (RCP) concept characterizing the performance required for communication capabilities that support ATM functions without reference to any specific technology should be applied wherever possible.

2.33 States should determine, prescribe and monitor the implementation of the RCP in line with the provisions laid down in the *ICAO Manual on Required Communication Performance* (Doc 9869).

Navigation

Navigation Infrastructure

2.34 The navigation infrastructure should meet the requirements for all phases of flight from take-off to final approach and landing.

Note: Annex 10 to the Convention on International Civil Aviation—Aeronautical Telecommunications, Volume I — Radio Navigation Aids, Attachment B, provides the strategy for introduction and application of non-visual aids to approach and landing.

2.35 The **(MID)** PBN Regional Roadmap/Plan provides guidance to air navigation service providers, airspace operators and users, regulators, and international organizations, on the expected evolution of the regional air navigation system in order to allow planning of airspace changes, enabling ATM systems and aircraft equipage. It takes due account of the operational environment of the **(MID)** Region(s).

PBN Transition Strategy

2.36 During transition to performance-based navigation (PBN), sufficient ground infrastructure for conventional navigation systems should remain available. Before existing ground infrastructure is considered for removal, users should be given reasonable transition time to allow them to equip appropriately to attain a performance level equivalent to PBN. States should approach removal of existing ground infrastructure with caution to ensure that safety is not compromised. This should be guaranteed by conducting safety assessments and consultations with the users.

Use of specific navigation aids

2.37 Where, within a given airspace, specific groups of users have been authorized by the competent authorities to use special aids for navigation. The respective ground facilities should be located and aligned so as to provide for full compatibility of navigational guidance with that derived from the SARPs.

2.38 States should ensure and oversee that service providers take appropriate corrective measures promptly whenever required by a significant degradation in the accuracy of navigation aids (either space based or ground based or both) is detected.

Surveillance

2.40 An important element of modern air navigation infrastructure required to manage safely increasing levels and complexity of air traffic is aeronautical surveillance systems.

2.41 When operating Mode S radars, States should coordinate with their respective ICAO Regional Office the assignment of their corresponding interrogator identifier (II) codes and surveillance identifier (SI) codes, particularly where areas of overlapping coverage will occur.

Frequency Management

Aeronautical Mobile Service (AMS)

2.42 Frequencies should be assigned to all VHF aeronautical mobile service (AMS) facilities in accordance with the principles laid out in Annex 10, Volume V and *ICAO Handbook on Radio Frequency Spectrum Requirements for Civil Aviation* (Doc 9718) Volumes I and II, and take into account:

- a) agreed geographical separation criteria based on 25 kHz or 8.33 kHz interleaving between channels;
- b) agreed geographical separation criteria for the implementation of VDL services;

- c) the need for maximum economy in frequency demands and in radio spectrum utilization; and
 - d) a deployment of frequencies which ensures that international services are planned to be free of interference from other services using the same band.
- 2.43 The priority order to be followed in the assignment of frequencies to service is:
- a) ATS channels serving international services (ACC, APP, TWR, FIS);
 - b) ATS channels serving national purposes;
 - c) channels serving international VOLMET services;
 - d) channels serving ATIS and PAR; and
 - e) channels used for other than ATS purposes.
- 2.44 The criteria used for frequency assignment planning for VHF AMS facilities serving international requirements should, to the extent practicable, also be used to satisfy the need for national VHF AMS facilities.
- 2.45 Special provisions should be made, by agreement between the States concerned, for the sharing and the application of reduced protection of non-ATS frequencies in the national sub-bands, so as to obtain a more economical use of the available frequency spectrum consistent with operational requirements.
- 2.46 States should ensure that no air/ground frequency is utilized outside its designated operational coverage and that the stated operational requirements for coverage of a given frequency can be met for the transmission sites concerned, taking into account terrain configuration.

Radio navigation aids for Aeronautical Radio Navigation Services (ARNS)

2.47 Frequencies should be assigned to all radio navigation facilities taking into account agreed geographical separation criteria to ILS localizer, VOR and GBAS, X and Y channels to DME, in accordance with the principles laid out in Annex 10, Volume V and *ICAO Handbook on Radio Frequency Spectrum Requirements for Civil Aviation* (Doc 9718) Volumes I and II. Also, the need for maximum economy in frequency demands and in radio spectrum utilization and a deployment of frequencies which ensures that international services are planned to be free of interference from other services using the same band, need to be considered.

2.48 The principles used for frequency assignment planning for radio navigation aids serving international requirements should, to the extent possible, also be used to satisfy the needs for national radio aids to navigation.

Support to ICAO Positions for ITU World Radiocommunication Conferences (WRCs)

2.49 Considering the importance and continuous demand of the radio frequency spectrum and for the protection of the current aeronautical spectrum and the allocation of new spectrum for the new services and system to be implemented in civil air navigation, States and international organizations are to support ICAO's position at ITU World Radiocommunication Conferences (WRCs) and in regional and other international activities conducted in preparation for ITU WRCs.

Note: The Handbook on Radio Frequency Spectrum Requirements for Civil Aviation (Doc 9718) Volume I, 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 WRCs.

3. SPECIFIC REGIONAL REQUIREMENTS

EXAMPLES

- 3.1 The surveillance systems to be used in the (MID) Region(s) are:
- a) Secondary Surveillance Radars (SSR) Mode A, C and S in terminal and en-route continental airspace;
 - b) Primary Surveillance Radars (PSR) mainly in terminal airspace;
 - c) Automatic Dependent Surveillance – Broadcast (ADS-B) and Multilateration (MLAT) in terminal areas;
 - d) ADS-B and Wide Area Multilateration (WAM) in most of the airspace;
 - e) Automatic Dependent Surveillance – Contract (ADS-C) in some parts of the oceanic and remote continental airspace.

(as appropriate)

3.2 List of assigned frequencies...**(as appropriate)**

3.3 Where implemented, the criteria for MLS frequency planning in the **(NAME)** Region(s) should be applied, aimed at allowing the maximum number of MLS-associated DME frequencies on X and Y channels so as to minimize the possible use of W and Z channels. **(as appropriate)**

**TABLE CNS II-1 - AERONAUTICAL FIXED TELECOMMUNICATIONS NETWORK (AFTN)
PLAN
EXPLANATION OF THE TABLE**

Column

- 1 The AFTN Centres/Stations of each State are listed alphabetically. Each circuit appears twice in the table. The categories of these facilities are as follows:
M - Main AFTN COM Centre
T - Tributary AFTN COM Centre
S - AFTN Station
- 2 Category of circuit:
M - Main trunk circuit connecting Main AFTN communication centres.
T - Tributary circuit connecting Main AFTN communication centre and Tributary AFTN Communications Centre.
S - AFTN circuit connecting an AFTN Station to an AFTN Communication Centre.
- 3 Type of circuit provided:
LTT/a - Landline teletypewriter, analogue (e.g. cable, microwave)
LTT/d - Landline teletypewriter, digital (e.g. cable, microwave)
LDD/a - Landline data circuit, analogue (e.g. cable, microwave)
LDD/d - Landline data circuit, digital (e.g. cable, microwave)
SAT/a/d - Satellite link, with /a for analogue or /d for digital
- 4 Circuit signalling speed in bits/s.
- 5 Circuit protocols
- 6 Data transfer code (syntax):
ITA-2 - International Telegraph Alphabet No. 2 (5-unit Baudot code).
IA-5 - International Alphabet No. 5 (ICAO 7-unit code).
CBI - Code and Byte Independency (ATN compliant).
- 7 Remarks

State/Station	Requirement					Remarks
	Category	Type	Signalling speed	Protocol	Code	
1	2	3	4	5	6	7
ABU DHABI	M		64 – 96 bps	CIDIN	IA-5	ABU DHABI
BEIRUT	M		9600 bps	CIDIN	IA-5	BEIRUT
DOHA	T		64 -9.6			

TABLE CNS II-2 - REQUIRED ATN INFRASTRUCTURE ROUTING PLAN

Chapter 1 EXPLANATION OF THE TABLE

Column

- 1 Name of the Administration and Location of the ATN Router
- 2 Type of Router (in end systems (ES) of the Administration shown in column 1)
- 3 Type of Interconnection:
Inter Regional: Connection between different Regions/ domains
Intra Regional: Connection within a Region/ domain.
- 4 Connected Router: List of the Administration and location of the ATN routers to be connected with the router shown in column 1.
- 5 Bandwidth: Link Speed expressed in bits per second (bps)
- 6 Network Protocol: If Internet Protocol Suite is used, indicate version of IP (IPv4 or IPv6)
- 7 Via: The media used to implement the interconnection of the routers. (in case of IP service bought from a service provider, indicate VPN)
- 8 Remarks

Administration and Location	Type of Router	Type of Interconnection	Connected Router	Bandwidth	Network Protocol	Via	Remarks
1	2	3	4	5	6	7	8
BAHRAIN, Bahrain	BIS		ASIA/PAC Oman, Saudi Arabia Kuwait, Lebanon Iran, Afghanistan Qatar, UAE				
EGYPT, Cairo	BIS		AFI, EUR Israel, Jordan, Lebanon, Athena Saudi Arabia				
IRAN, Tehran	BIS		Kuwait, Bahrain Afghanistan				

TABLE CNS II-3 - ATS DIRECT SPEECH CIRCUITS PLAN
EXPLANATION OF THE TABLE

<i>Column</i>	
1 and 2	Circuit terminal stations are listed alphabetically by the Terminal I.
3	A — indicates ATS requirement for the establishment of voice communication within 15 seconds. D — indicates requirements for instantaneous communications.
4	Type of service specified: LTF — landline telephone (landline, cable, UHF, VHF, satellite). RTF — radiotelephone.
5	Type of circuits; Direct (DIR) or Switched (SW). D — indicates a direct circuit connecting Terminals I and II. S — indicates that a direct circuit does not exist and that the connection is established via switching at the switching centre(s) indicated in column 6. IDD — International direct dialling by public switch telephone network <i>Note 1.— Number of D and/or S circuits between Terminals I and II are indicated by numerical prefix, i.e. 2 D/S means 2 direct circuits and one switched circuit.</i> <i>Note 2.— Pending the implementation of proper ATS voice circuits, and provided that aeronautical operational requirements are met, IDD services may be used for the ATS voice communications in low traffic areas.</i>
6	Location of switching centre(s). Alternate routing location, if available, is indicated in brackets.
7	Remarks

ATS requirements for speech communications			Circuit			Remarks
Terminal I	Terminal II	Type	Service	D/S	To be switched via/	
1	2	3	4	5	6	7

**TABLE CNS II-4 - HF NETWORK DESIGNATORS
EXPLANATION OF THE TABLE**

Column

- 1 Name of station, preceded by its location indicator.
- 2 Network designators assigned to the facility providing HF radiotelephony en-route communications (selected from the provisions of the allotment plan in Appendix S27 to the ITU Radio Regulations).

NOTES

The ICAO designators for HF MWARA and VOLMET networks in the **(NAME)** region(s) are derived from the ITU allotment area abbreviations as contained in Appendix S27 to the ITU Radio Regulations.

ITU allotment area:

Two- and three-letter alpha entries indicate major world air route areas (MWARA): **TBD**

Four-letter alpha entries indicate VOLMET areas: **TBD**

Location Indicator and Name of location	HF en-route family
1	2

**HF FREQUENCIES AND THEIR ICAO NETWORK DESIGNATORS BASED ON ITU
APPENDIX S27 ALLOTMENT AREAS**

Frequency (kHz)	ITU allotment area	(NAME) xxx	(NAME) xyy			Remarks
1	2	3	4	5	6....	8

APPENDIX C

TABLE CNS II-1 - AERONAUTICAL FIXED TELECOMMUNICATIONS NETWORK (AFTN) PLAN

State/Station	Category	Requirement				Remarks
		Type	Signaling Speed	Protocol	Code	
1	2	3	4	5	6	
BAHRAIN						
BAHRAIN	M					
ABU DHABI	M		64 – 96 bps	CIDIN	IA-5	
BEIRUT	T		9600 bps	CIDIN	IA-5	
DOHA	M		64 – 96 bps	None	IA-5	
JEDDAH	T		64 – 96 bps		IA-5	
KABUL	M		--	None		
KUWAIT	M		64 – 96 bps	None	IA-5	
MUSCAT	M		300 baud	None	IA-5	
SINGAPORE	M		9600 bps	None	IA-5	
TEHRAN	M		64 – 96 bps		IA-5	
EGYPT						
CAIRO	M					
AMMAN	M		64/9.6	None	IA-5	
ATHENS	T		64/9.6	CIDIN	IA-5	
BEN GURION	M		64/9.6	None	IA-5	
BEIRUT	M		9600	CIDIN	IA-5	
JEDDAH	T		128/9.6	CIDIN	IA-5	
KHARTOUM	M		9600	None	IA-5	
NAIROBI	M		9600	None	IA-5	
TUNIS	M		64/9.6	None	IA-5	
TRIPOLI	M		64/19.2	None	IA-5	
TRIPOLI	M		9600	None	IA-5	
DAMASCUS	M		64/9.6	None	IA-5	

State/Station	Category	Requirement				Remarks
		Type	Signaling Speed	Protocol	Code	
1	2	3	4	5	6	
IRAN TEHRAN BAHRAIN KABUL KUWAIT ABU-DHABI	M T M		64 Kbps - 64 Kbps	None None	IA-5 IA-5	
IRAQ BAGHDAD AMMAN BEIRUT	T T		- -	None None	IA-5 IA-5	
JORDAN AMMAN BAGHDAD BEIRUT BEN GURION CAIRO DAMASCUS JEDDAH	T M T M T S T		- - 1200 64/9.6 64/9.2 64/19.2	- - None None None None	- - IA-5 IA-5 IA-5	

State/Station	Category	Requirement				Remarks
		Type	Signaling Speed	Protocol	Code	
1	2	3	4	5	6	
KUWAIT KUWAIT BAHRAIN DAMASCUS BEIRUT DOHA (EUR) KARACHI TEHRAN BAGHDAD	M T M M - M M T	LDD/d LDD/a LDD/a LDD/a LDD/d LDD/d SAT/ad	64/9.6 bps 50 BD 100 baud 64/9.6 bps 2.4 K 64/9.6 baud 9.6 bps	None None None None None None None	I A-5 ITA-2 ITA-2 IA- 5 IA-5 IA-5 IA- 5	
LEBANON BEIRUT AMMAN BAGHDAD BAHRAIN CAIRO DAMASCUS JEDDAH KUWAIT NICOSIA	M T M M M T M M M		- - 9600 9600 2 x 50 bd 9600 100 BD 9600	- None CIDIN CIDIN None CIDIN None CIDIN	- - IA-5 IA-5 ITA-2 ITA-2 ITA-2 IA-5	
OMAN MUSCAT ABU DHABI BAHRAIN MUMBAI JEDDAH SANA'A	T M M M T		9600 300 BD 9600 300 BD 100 BD	AMHS None None None None	IA-5 ITA-2 ITA-2 ITA-2	

State/Station	Category	Requirement				Remarks
		Type	Signaling Speed	Protocol	Code	
1	2	3	4	5	6	
QATAR DOHA BAHRAIN KUWAIT ABU DHABI	 M M T		 9600 100 BD 9600	 None None AMHS	 IA-5 ITA-2	
SAUDI ARABIA JEDDAH ADDIS-ABABA BAHRAIN BEIRUT CAIRO MUSCAT SANA'A AMMAN	 M M M M M T		 9600 64 /9.6 9600 128/9.6 300 9600	 None CIDIN CIDIN CIDIN None None	 IA-5 IA-5 IA-5 IA-5 ITA-2 IA-5	
SYRIA DAMASCUS ATHENS AMMAN BEIRUT CAIRO KUWAIT TEHRAN	 M T M M M T		 2 X 50 64/9.6 2 X 50 50 BD 50BD 50BD	 None None None None None None	 ITA-2 ITA-2 ITA-2 ITA-2 ITA-2	

State/Station	Category	Requirement				Remarks
		Type	Signaling Speed	Protocol	Code	
1	2	3	4	5	6	
UAE ABU DHABI BAHRAIN AMMAN MUSCAT QATAR TEHRAN	M		64 – 96 bps	CIDIN	IA-5	
	T		2 MG bps	AMHS	IA-5	
	M		9600 bps	None		
	M		64 – 96 bps	None	IA-5	
YEMEN SANA'A JEDDAH MUSCAT	M		9600	None	IA-5	
	M		9600	None	IA-5	

APPENDIX D

TABLE CNS II-2 - REQUIRED ATN INFRASTRUCTURE ROUTING PLAN

Administration and Location	Type of Router	Type of Interconnection	Connected Router	Bandwidth	Network Protocol	Via	Remarks
1	2	3	4	5	6	7	8
BAHRAIN, Bahrain	BIS		ASIA/PAC Oman, Saudi Arabia Kuwait, Lebanon Iran, Afghanistan Qatar, UAE				
EGYPT, Cairo	BIS		AFI, EUR Israel, Jordan, Lebanon, Athena Saudi Arabia				
IRAN, Tehran	BIS		Kuwait, Bahrain Afghanistan				
IRAQ, Baghdad	IS		Jordan, Lebanon				
JORDAN, Amman	BIS		Egypt, Israel Lebanon, Iraq, Syria				
KUWAIT, Kuwait	BIS		EUR, Pakistan, Iran, Qatar, Bahrain, Lebanon				
LEBANON, Beirut	BIS		EUR Jordan, Syria Iraq, Kuwait, Bahrain Saudi Arabia, Egypt				
OMAN, Muscat	BIS		ASIA/PAC Yemen, Bahrain, UAE, Saudi Arabia				
QATAR, Doha	IS		Kuwait, Bahrain				
SAUDI ARABIA, Jeddah	BIS		AFI Egypt, Lebanon Bahrain, Oman Yemen				
SYRIA, Damascus	IS		Jordan, Lebanon				
U.A.E, Abu Dhabi	BIS		Bahrain, Oman Qatar				
YEMEN, Sana'a	IS		Oman, Saudi Arabia				

APPENDIX E

ATS REQUIREMENTS FOR SPEECH COMMUNICATIONS			CIRCUIT			REMARKS
TERMINAL I	TERMINAL II	TYPE	SERVICE	DIR/SW	TO BE SWITCHED VIA	
1	2	3	4	5	6	7
BAHRAIN						
Bahrain	Emirates ACC	A	LTF	DIR		2 LINES
	Dammam	A	LTF	DIR		
	Doha	A	LTF	DIR		2 LINES
	Jeddah	A	LTF	DIR		2 LINES
	Kuwait	A	LTF	DIR		
	Muscat	A	LTF	DIR		
	Riyadh	A	LTF	DIR		
	Shiraz	A	LTF			
	Tehran	A	LTF	DIR		
EGYPT						
Cairo	Amman	A	LTF	DIR		
	Athens	A	LTF	DIR		
	Jeddah	A	LTF	DIR		
	Khartoum	A	LTF			
	Nicosia	A	LTF	DIR		
	Tel Aviv	A	LTF	DIR		
	Tripoli	A	LTF	DIR		
IRAN (ISLAMIC REPUBLIC OF)						
Abadan	Basrah	A	LTF			
	Shiraz	A	LTF	DIR		
Shiraz	Abadan	A	LTF	DIR		
	Bahrain	A	LTF	DIR		
	Basrah	A	LTF			
	Doha	A	LTF	DIR		
	Karachi	A	LTF	DIR		
	Kuwait	A	LTF	DIR		
	Tehran	A	LTF	DIR		

ATS REQUIREMENTS FOR SPEECH COMMUNICATIONS			CIRCUIT			REMARKS
TERMINAL I	TERMINAL II	TYPE	SERVICE	DIR/SW	TO BE SWITCHED VIA	
1	2	3	4	5	6	7
Tehran	Emirates ACC Ankara Ashgabat Baghdad Bahrain Baku Basrah Doha Kabul Karachi Kuwait Muscat Shiraz Yerevan/Zvartnots	A A A A A A A A A A A A A A A	LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF	DIR DIR DIR DIR DIR DIR DIR DIR DIR DIR DIR		11
IRAQ						
Baghdad	Amman Ankara Basrah Damascus Jeddah Kuwait Mosul Tehran	A A A A A A A A	LTF SAT LTF LTF LTF LTF LTF LTF			
Basrah	Abadan Baghdad Kuwait Shiraz Tehran	A A A A A	LTF LTF LTF LTF LTF			
Mosul	Baghdad	A	LTF			

TABLE CNS II-3 - ATS DIRECT SPEECH CIRCUITS PLAN

ATS REQUIREMENTS FOR SPEECH COMMUNICATIONS			CIRCUIT			REMARKS
TERMINAL I	TERMINAL II	TYPE	SERVICE	DIR/SW	TO BE SWITCHED VIA	
1	2	3	4	5	6	7
JORDAN						
Amman	Baghdad Cairo Damascus Jeddah Tel Aviv	A A A A A	LTF LTF LTF LTF LTF			
KUWAIT						
Kuwait	Baghdad Bahrain Basrah Jeddah Shiraz Tehran	A A A A A A	LTF LTF LTF LTF LTF LTF	DIR DIR DIR DIR		
LEBANON						
Beirut	Ankara Damascus Nicosia	A A A	LTF LTF LTF	DIR DIR DIR		
OMAN						
Muscat	Emirates ACC Bahrain Mumbai Jeddah Karachi Salalah Sana'a Tehran	A A A A A A A A	LTF LTF LTF LTF LTF LTF LTF LTF	DIR DIR DIR DIR DIR DIR DIR DIR		
Salalah	Muscat	A	LTF			
QATAR						
Doha	Emirates ACC Bahrain Shiraz Tehran	A A A A	LTF LTF LTF LTF	DIR DIR DIR DIR		II + 1

ATS REQUIREMENTS FOR SPEECH COMMUNICATIONS			CIRCUIT			REMARKS
TERMINAL I	TERMINAL II	TYPE	SERVICE	DIR/SW	TO BE SWITCHED VIA	
1	2	3	4	5	6	7
SAUDI ARABIA						
Dammam	Bahrain Jeddah Riyadh	A A A	LTF LTF LTF	DIR DIR DIR		
Jeddah	Addis Ababa Amman Asmara Baghdad Bahrain Cairo Dammam Khartoum Kuwait Muscat Riyadh Sana'a	A A A A A A A A A A A A	LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF LTF	DIR DIR DIR DIR DIR DIR DIR DIR SW	Via Bahrain	
Riyadh	Bahrain Jeddah Dammam	A A A	LTF LTF LTF	DIR DIR DIR		
SUDAN						
Khartoum	Cairo Jeddah	A A	LTF LTF			
SYRIAN ARAB REPUBLIC						
Damascus	Amman Ankara Baghdad Beirut Nicosia	A A A A A	LTF LTF LTF LTF LTF	DIR		

TABLE CNS II-3 - ATS DIRECT SPEECH CIRCUITS PLAN

ATS REQUIREMENTS FOR SPEECH COMMUNICATIONS			CIRCUIT			REMARKS
TERMINAL I	TERMINAL II	TYPE	SERVICE	DIR/SW	TO BE SWITCHED VIA	
1	2	3	4	5	6	7
UNITED ARAB EMIRATES						
Emirates ACC	Abu Dhabi	A	LTF	DIR		21
	Al Ain	A	LTF	SW		
	Bahrain	A	LTF	DIR		
	Doha	A	LTF	DIR		
	Dubai	A	LTF	DIR		
	Muscat	A	LTF	DIR		
	Tehran	A	LTF	DIR		
Abu Dhabi	Emirates ACC	A	LTF	SW		21
	Al Ain	A	LTF	DIR		21
	Dubai	A	LTF	SW		21
Al Ain	Emirates ACC	A	LTF	SW		21
	Abu Dhabi	A	LTF	DIR		21
	Dubai	A	LTF	SW		21
Dubai	Emirates ACC	A	LTF	DIR		2I + 1
	Abu Dhabi	A	LTF	DIR		2I
	Al Ain	A	LTF	SW		1I
	Fujairah	A	LTF	DIR		1I
	Ras Al	A	LTF	DIR		1I
	KhaimahSharjah	A	LTF	DIR		3I
	Sharjah					
Fujairah	Ras Al Khaimah	A	LTF	DIR		1I
	Emirates ACC	A	LTF	DIR		1I
Ras Al Khaimah	Dubai	A	LTF	DIR		1I
Sharjah	Dubai	A	LTF	DIR		3I

ATS REQUIREMENTS FOR SPEECH COMMUNICATIONS			CIRCUIT			REMARKS
TERMINAL I	TERMINAL II	TYPE	SERVICE	DIR/SW	TO BE SWITCHED VIA	
1	2	3	4	5	6	7
YEMEN						
Aden	Djibouti	A	LTF			
	Sana'a	A	LTF			
Mukalla	Aden	A	LTF			
	Sana'a	A	LTF			
Sana'a	Aden	A	LTF			
	Addis Ababa	A	LTF			
	Asmara	A	LTF			
	Mumbai	A	LTF			
	Djibouti	A	LTF			
	Jeddah	A	LTF			
	Mogadishu	A	LTF	DIR	Via Bahrain	
	Muscat	A	LTF			
	Riyan	A	LTF			

APPENDIX F

TABLE CNS II-4 - HF NETWORK DESIGNATORS

EXPLANATION OF THE TABLE

Column

- 1 Name of station, preceded by its location indicator.
- 2 Network designators assigned to the facility providing HF radiotelephony en-route communications (selected from the provisions of the allotment plan in Appendix S27 to the ITU Radio Regulations).

NOTES

The ICAO designators for HF MWARA and VOLMET networks in the (NAME) region(s) are derived from the ITU allotment area abbreviations as contained in Appendix S27 to the ITU Radio Regulations.

ITU allotment area:

Two- and three-letter alpha entries indicate major world air route areas (MWARA): TBD

Four-letter alpha entries indicate VOLMET areas: TBD

APPENDIX G

(MID) AIR NAVIGATION PLAN

VOLUME III

(*NAME*) AIR NAVIGATION PLAN

VOLUME III

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PART II — Air Navigation System Implementation	

(NAME) ANP, VOLUME III

PART 0 – INTRODUCTION

1. INTRODUCTION

1.1 The background to the publication of ANPs in three volumes is explained in the Introduction in Volume I. The procedure for amendment of Volume III is also described in Volume I. Volume III contains dynamic/flexible plan elements related to the implementation of the air navigation system and its modernization in line with the ICAO Aviation System Block Upgrades (ASBUs) and associated technology roadmaps described in the Global Air Navigation Plan (GANP).

1.2 The information contained in Volume III is related mainly to:

- Planning: objectives set, priorities and targets planned at regional or sub-regional levels;
- Implementation monitoring and reporting: monitoring of the progress of implementation towards targets planned. This information should be used as the basis for reporting purposes (i.e.: global and regional air navigation reports and performance dashboards); and/or
- Guidance: providing regional guidance material for the implementation of specific system/procedures in a harmonized manner.

1.3 The management of Volume III is the responsibility of the [name of PIRG].

1.4 Volume III should be used as a tool for monitoring and reporting the status of implementation of the elements planned here above, through the use of tables/databases and/or references to online monitoring tools, as endorsed by [name of PIRG]. The status of implementation is updated on a regular basis as endorsed by [name of PIRG].

2. AVIATION SYSTEM BLOCK UPGRADES (ASBUs), MODULES AND ROADMAPS

2.1. The ASBU Modules and Roadmaps form a key component to the GANP, noting that they will continue to evolve as more work is done on refining and updating their content and in subsequent development of related provisions, support material and training.

2.2. Although the GANP has a worldwide perspective, it is not intended that all Block Upgrade Modules are required to be applied in every State, sub-region and/or region. Many of the Block Upgrade Modules contained in the GANP are specialized packages that should be applied only where the specific operational requirement exists or corresponding benefits can be realistically projected. Accordingly, the Block Upgrade methodology establishes an important flexibility in the implementation of its various Modules depending on a region, sub-region and/or State's specific operational requirements. Guided by the GANP, ICAO [Region-name] regional, sub-regional and State planning should identify Modules which best provide the needed operational improvements.

(NAME) ANP, VOLUME III**PART I - GENERAL PLANNING ASPECTS (GEN)****1. PLANNING METHODOLOGY**

1.1 Guided by the GANP, the regional planning process starts by identifying the homogeneous ATM areas, major traffic flows and international aerodromes. An analysis of this data leads to the identification of opportunities for performance improvement. Modules from the Aviation System Block Upgrades (ASBUs) are evaluated to identify which of those modules best provide the needed operational improvements. Depending on the complexity of the module, additional planning steps may need to be undertaken including financing and training needs. Finally, regional plans would be developed for the deployment of modules by drawing on supporting technology requirements. This is an iterative planning process which may require repeating several steps until a final plan with specific regional targets is in place. This planning methodology requires full involvement of States, service providers, airspace users and other stakeholders, thus ensuring commitment by all for implementation.

1.2 Block 0 features Modules characterized by technologies and capabilities which have already been developed and implemented in many parts of the world today. It therefore features a near-term availability milestone, or Initial Operating Capability (IOC), of 2013 for high density based on regional, sub-regional and State operational need. Blocks 1 through 3 are characterized by both existing and projected performance area solutions, with availability milestones beginning in 2018, 2023 and 2028 respectively.

2. REVIEW AND EVALUATION OF AIR NAVIGATION PLANNING

2.1. The progress and effectiveness against the priorities set out in the regional air navigation plans should be annually reported, using a consistent reporting format, to ICAO.

2.2. Performance monitoring requires a measurement strategy. Data collection, processing, storage and reporting activities supporting the identified global/regional performance metrics are fundamental to the success of performance-based approaches.

2.3. The air navigation planning and implementation performance framework prescribes reporting, monitoring, analysis and review activities being conducted on a cyclical, annual basis. An Air Navigation Reporting Form (ANRF) reflecting selected key performance areas as defined in the Manual on Global Performance of the Air Navigation System (ICAO Doc 9883) has been developed for each ASBU Module. The ANRF is a customized tool which is recommended for the application of setting planning targets, monitoring implementation, and identifying challenges, measuring implementation/performance and reporting. If necessary, other reporting formats that provide more details may be used but should contain as a minimum the elements described in the ANRF template. A sample of the ANRF is provided in **Appendix A**. A sample Template of a planning table which may be used to show the elements planned in an ICAO region is provided in **Appendix B**.

3. REPORTING AND MONITORING RESULTS

3.1 Reporting and monitoring results will be analyzed by the PIRGs, States and ICAO Secretariat to steer the air navigation improvements, take corrective actions and review the allocated objectives, priorities and targets if needed. The results will also be used by ICAO and aviation partner stakeholders to develop the annual Global Air Navigation Report. The report results will provide an opportunity for the international civil aviation community to compare progress across different ICAO regions in the establishment of air navigation infrastructure and performance-based procedures.

3.2 The reports will also provide the ICAO Council with detailed annual results on the basis of which tactical adjustments will be made to the performance framework work programme, as well as triennial policy adjustments to the GANP and the Block Upgrade Modules.

3.3 **Table GEN III-1** contains a minimum set of Implementation Indicator(s) for each of the eighteen ASBU Block 0 Modules necessary for the monitoring of these Modules (if identified as a priority for implementation at regional or sub-regional level). These indicators are intended to enable comparison between ICAO Regions with respect to ASBU Block 0 Modules and will apply only to commonly selected ASBU Modules. All regions/PIRGs reserve the right to select the ASBU Modules relevant to their needs and to endorse additional indicators, as deemed necessary. No reporting is required for ASBU Block 0 Modules that have not been selected.

Note: The priority for implementation as well as the applicability area of each selected ASBU Block 0 Module is to be defined by the [name of PIRG]. This should be reflected in Part II – Air Navigation System Implementation.

TABLE GEN III-1 – IMPLEMENTATION INDICATOR(S) FOR EACH ASBU BLOCK 0 MODULE**Explanation of the Table**

- 1 Block 0 Module Code
 2 Block 0 Module Title
 3 High level Implementation Indicator
 4 Remarks *Additional information as deemed necessary.*

Module Code	Module Title	Implementation Indicator	Remarks
1	2	3	4
B0-APTA	Optimization of Approach Procedures including vertical guidance	% of international aerodromes having at least one runway end provided with APV Baro-VNAV or LPV procedures	
B0-WAKE	Increased Runway Throughput through Optimized Wake Turbulence Separation	% of applicable international aerodromes having implemented increased runway throughput through optimized wake turbulence separation	1. Not to be considered for the first reporting cycles due to lack of maturity. 2. List of ADs to be established through regional air navigation agreement.
B0-RSEQ	Improve Traffic flow through Runway Sequencing (AMAN/DMAN)	% of applicable international aerodromes having implemented AMAN / DMAN	1. Not to be considered for the first reporting cycles due to lack of maturity. 2. List of ADs to be established through regional air navigation agreement.
B0-SURF	Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)	% of applicable international aerodromes having implemented A-SMGCS Level 2	List of ADs to be established through regional air navigation agreement.
B0-ACDM	Improved Airport Operations through Airport-CDM	% of applicable international aerodromes having implemented improved airport operations through airport-CDM	List of ADs to be established through regional air navigation agreement.
B0-FICE	Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration	% of FIRs within which all applicable ACCs have implemented at least one interface to use AIDC / OLDI with neighbouring ACCs	
B0-DATM	Service Improvement through Digital Aeronautical Information Management	- % of States having implemented an AIXM based AIS database - % of States having implemented QMS	
B0-AMET	Meteorological information supporting enhanced operational efficiency and safety	- % of States having implemented SADIS / WIFS - % of States having implemented QMS	

Module Code	Module Title	Implementation Indicator	Remarks
1	2	3	4
B0-FRTO	Improved Operations through Enhanced En-Route Trajectories	% of FIRs in which FUA is implemented	
B0-NOPS	Improved Flow Performance through Planning based on a Network-Wide view	% of FIRs within which all ACCs utilize ATFM systems	
B0-ASUR	Initial capability for ground surveillance	% of FIRs where ADS-B OUT and/or MLAT are implemented for the provision of surveillance services in identified areas.	1. Not to be considered for the first reporting cycles due to lack of maturity.
B0-ASEP	Air Traffic Situational Awareness (ATSA)	% of States having implemented air traffic situational awareness	1. Not to be considered for the first reporting cycles due to lack of maturity.
B0-OPFL	Improved access to optimum flight levels through climb/descent procedures using ADS-B	% of FIRs having implemented in-trail procedures	1. Not to be considered for the first reporting cycles due to lack of maturity.
B0-ACAS	ACAS Improvements	% of States requiring carriage of ACAS (with TCAS 7.1 evolution)	
B0-SNET	Increased Effectiveness of Ground-Based Safety Nets	% of States having implemented ground-based safety-nets (STCA, APW, MSAW, etc.)	
B0-CDO	Improved Flexibility and Efficiency in Descent Profiles (CDO)	- % of international aerodromes / TMA's with PBN STAR implemented - % of international aerodromes/TMA where CDO is implemented	
B0-TBO	Improved Safety and Efficiency through the initial application of Data Link En-Route	% of FIRs utilising data link en-route in applicable airspace	
B0-CCO	Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)	- % of international aerodromes / TMA's with PBN SID implemented - % of international aerodromes/TMA where CCO is implemented	

Appendix A

SAMPLE TEMPLATE

1. AIR NAVIGATION REPORT FORM (ANRF)

(This template demonstrates how ANRF to be used.

The data inserted here refers to ASBU B0-05/CDO as an example only)

Regional and National planning for ASBU Modules

2. REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-05/CDO: Improved Flexibility and Efficiency in Descent Profiles Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations					
3. ASBU B0-05/CDO: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	Capacity	Efficiency	Environment	Safety
Applicable	N	N	Y	Y	Y
4. ASBU B0-05/CDO: Planning Targets and Implementation Progress					
5. Elements			6. Targets and implementation progress (Ground and Air)		
1. CDO					
2. PBN STARs					
7. ASBU B0-05/CDO: Implementation Challenges					
Elements	Implementation Area				
	Ground system Implementation	Avionics Implementation	Procedures Availability	Operational Approvals	
1. CDO					
2. PBN STARs					
8. Performance Monitoring and Measurement 8A. ASBU B0-05/CDO: Implementation Monitoring					

Elements	Performance Indicators/Supporting Metrics
1. CDO	Indicator: Percentage of international aerodromes/TMAs with CDO implemented Supporting metric: Number of international aerodromes/TMAs with CDO implemented
2. PBN STARs	Indicator: Percentage of international aerodromes/TMAs with PBN STARs implemented Supporting metric: Number of international aerodromes/TMAs with PBN STARs implemented

8. Performance Monitoring and Measurement 8 B. ASBU B0-05/CDO: Performance Monitoring	
Key Performance Areas (Out of eleven KPAs, for the present until experienced gained, only five have been selected for reporting through ANRF)	Where applicable, indicate qualitative Benefits,
Access & Equity	Not applicable
Capacity	Not applicable
Efficiency	Cost savings through reduced fuel burn. Reduction in the number of required radio transmissions.
Environment	Reduced emissions as a result of reduced fuel burn
Safety	More consistent flight paths and stabilized approach paths. Reduction in the incidence of controlled flight into terrain (CFIT).
9. Identification of performance metrics: It is not necessary that every module contributes to all of the five KPAs. Consequently, a limited number of metrics per type of KPA, serving as an example to measure the module(s)' implementation benefits, without trying to apportion these benefits between module, have been identified on page 5. For the family of ASBU modules selected for air navigation implementation, States/Region to choose the applicable performance (benefit) metrics from the list available on page 5. This approach would facilitate States in collecting data for the chosen performance metrics. States/Region, however, could add new metrics for different KPAs based on maturity of the system and ability to collect relevant data.	

AIR NAVIGATION REPORT FORM

HOW TO USE - EXPLANATORY NOTES

1. **Air Navigation Report Form (ANRF):** This form is nothing but the revised version of Performance Framework Form that was being used by Planning and Implementation Regional Groups (PIRGs)/States until now. The ANRF is a customized tool for Aviation System Block Upgrades (ASBU) Modules which is recommended for application for setting planning targets, monitoring implementation, identifying challenges, measuring implementation/performance and reporting. Also, the PIRGs and States could use this report format for any other air navigation improvement programmes such as Search and Rescue. If necessary, other reporting formats that provide more details may be used but should contain as a minimum the elements described in this ANRF template. The results will be analysed by ICAO and aviation partners and utilized in the Regional Performance Dashboards and the Annual Air Navigation Report. The conclusions from the Air Navigation Report will serve as the basis for future policy adjustments, aiding safety practicality, affordability and global harmonization, amongst other concerns.
2. **Regional/National Performance objective:** In the ASBU methodology, the performance objective will be the title of the ASBU module itself. Furthermore, indicate alongside corresponding Performance Improvement area (PIA).
3. **Impact on Main Key Performance Areas:** Key to the achievement of a globally interoperable ATM system is a clear statement of the expectations/benefits to the ATM community. The expectations/benefits are referred to eleven Key Performance Areas (KPA) and are interrelated and cannot be considered in isolation since all are necessary for the achievement of the objectives established for the system as a whole. It should be noted that while safety is the highest priority, the eleven KPAs shown below are in alphabetical order as they would appear in English. They are access/equity; capacity; cost effectiveness; efficiency; environment; flexibility; global interoperability; participation of ATM community; predictability; safety; and security. However, out of these eleven KPAs, for the present, only five have been selected for reporting through ANRF, which are Access & Equity, Capacity, Efficiency, Environment and Safety. The KPAs applicable to respective ASBU module are to be identified by marking Y (Yes) or N (No). The impact assessment could be extended to more than five KPAs mentioned above if maturity of the national system allows and the process is available within the State to collect the data.
4. **Planning Targets and Implementation Progress:** This section indicates planning targets and status of progress in the implementation of different elements of the ASBU Module for both air and ground segments.
5. **Elements related to ASBU module:** Under this section list elements that are needed to implement the respective ASBU Module. Furthermore, should there be elements that are not reflected in the ASBU Module (example: In ASBU B0-80/ACDM, Aerodrome certification and data link applications D-VOLMET, D-ATIS, D-FIS are not included; Similarly in ASBU B0-30/DAIM, note that WGS-84 and eTOD are not included) but at the same time if they are closely linked to the module, ANRF should specify those elements. As a part of guidance to PIRGs/States, every Regional ANP will have the complete list of all 18 Modules of ASBU Block 0 along with corresponding elements, equipage required on the ground and in the air as well as metrics specific to both implementation and performance (benefits).
6. **Targets and implementation progress (Ground and Air):** Planned implementation date (month/year) and the current status/responsibility for each element are to be reported in this section. Please provide as much details as possible and should cover both avionics and ground systems. This ANRF being high level document, develop necessary detailed action plan separately for each element/equipage.

7. **Implementation challenges:** Any challenges/problems that are foreseen for the implementation of elements of the Module are to be reported in this section. The purpose of the section is to identify in advance any issues that will delay the implementation and if so, corrective action is to be initiated by the concerned person/entity. The four areas, under which implementation issues, if any, for the ASBU Module to be identified, are as follows:

- Ground System Implementation:
- Avionics Implementation:
- Procedures Availability:
- Operational Approvals:

Should be there no challenges to be resolved for the implementation of ASBU Module, indicate as “NIL”.

8. **Performance Monitoring and Measurement:** Performance monitoring and measurement is done through the collection of data for the supporting metrics. In other words, metrics are quantitative measure of system performance – how well the system is functioning. The metrics fulfil three functions. They form a basis for assessing and monitoring the provision of ATM services, they define what ATM services user value and they can provide common criteria for cost benefit analysis for air navigation systems development. The Metrics are of two types:

- A. **Implementation Monitoring:** Under this section, the indicator supported by the data collected for the metric reflects the status of implementation of elements of the Module. For example- Percentage of international aerodromes with CDO implemented. This indicator requires data for the metric “number of international aerodromes with CDO”.
- B. **Performance Monitoring:** The metric in this section allows to assess benefits accrued as a result of implementation of the module. The benefits or expectations, also known as Key Performance Areas (KPA), are interrelated and cannot be considered in isolation since all are necessary for the achievement of the objectives established for the system as a whole. It should be noted that while safety is the highest priority, the eleven KPAs shown below are in alphabetical order as they would appear in English. They are access/equity; capacity; cost effectiveness; efficiency; environment; flexibility; global interoperability; participation of ATM community; predictability; safety; and security. However, out of these eleven KPAs, for the present until experienced gained, only five have been selected for reporting through ANRF, which are Access & Equity, Capacity, Efficiency, Environment and Safety. Where applicable, mention qualitative benefits under this section.

9. **Identification of performance metrics:** It is not necessary that every module contributes to all of the five KPAs. Consequently, a limited number of metrics per type of KPA, serving as an example to measure the module(s)’ implementation benefits, without trying to apportion these benefits between module, have been identified on page 6. For the family of ASBU modules selected for air navigation implementation, States/Region to choose the applicable performance (benefit) metrics from the list available on page 6. This approach would facilitate States in collecting data for the chosen performance metrics. States/Region, however, could add new metrics for different KPAs based on maturity of the system and ability to collect relevant data.
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[illegible]

(NAME) ANP, VOLUME III

PART II – AIR NAVIGATION SYSTEM IMPLEMENTATION

1. INTRODUCTION

1.1 The planning and implementation of the ICAO Aviation System Block Upgrades (ASBUs) should be undertaken within the framework of the [name of PIRG] with the participation and support of all stakeholders, including regulatory personnel.

1.2 The ASBU Blocks and Modules adopted by the [region, sub-region name] should be followed in accordance with the specific ASBU requirements to ensure global interoperability and harmonization of air traffic management. The [name of PIRG] should determine the ASBU Block Upgrade Modules, which best provide the needed operational improvements in the ICAO [Region-name].

2. ICAO [REGION-NAME] AIR NAVIGATION OBJECTIVES, PRIORITIES AND TARGETS

2.1 In accordance with Recommendation 6/1 of the Twelfth Air Navigation Conference (AN-Conf/12), PIRGs are requested to establish priorities and targets for air navigation, in line with the ASBU methodology.

2.2 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 provider and user stakeholders concerned.

2.3 Considering that some of the block upgrade modules contained in the GANP are specialized packages that may be applied where specific operational requirements or corresponding benefits exist, States and PIRGs should clarify how each Block Upgrade module would fit into the national and regional plans.

2.4 As Block 0 modules in many cases provide the foundation for future development, all Block 0 modules should be assessed, as appropriate, for early implementation by States in accordance with their operational needs.

2.5 In establishing and updating the [region-name] air navigation plan, the [name of PIRG] and States should give due consideration to the safety priorities set out in the Global Aviation Safety Plan (GASP) and [region-name] safety strategy.

2.6 States in the [region-name] through the [name of PIRG] should establish their own air navigation objectives, priorities and targets to meet their individual needs and circumstances in line with the global and regional air navigation objectives, priorities and targets.

3. MONITORING OF ASBU MODULES IMPLEMENTATION

3.1 The monitoring of air navigation performance and its enhancement should be carried out through identification of relevant air navigation Metrics and Indicators as well as the adoption and attainment of air navigation system Targets.

3.2 The monitoring of the regional implementation progress and performance metrics/indicators should be done for all elements planned by [name of PIRG]. The monitoring should allow global correlation of status and expectations, appreciation of benefits achieved for the airspace users, as well as corrective actions to be taken by the PIRG on implementation plans.

3.3 The [name of PIRG] should determine appropriate mechanisms and tools for the monitoring and the collection of necessary data at national and regional levels.

APPENDIX – ASBU BLOCK 0 MODULES APPLICABLE IN THE (NAME) REGION(S)

TO BE DEVELOPED

B0 – FICE: Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration						
	AMHS Capability	AMHS Interconnection	AIDC/OLDI Capability	AIDC/OLDI Implementation	required interconnection that are not implemented	Remarks
Bahrain-						
Egypt-						
Iran						
Iraq						
Jordan						
Kuwait						
Lebanon						
Libya						
Oman						
Qatar						
Saudi Arabia						
Sudan						
Syria						
UAE						
Yemen						