



## INTERNATIONAL CIVIL AVIATION ORGANIZATION

### Twenty Sixth Meeting of the Africa-Indian Ocean Planning and Implementation Regional Group (APIRG/26)

7 - 8 November 2023

#### Agenda Item 3: Implementation of air navigation goals, targets and indicators, including the priorities set in the Regional Air Navigation Plan

##### AMHS Implementation Status at ASECNA

(Presented by ASECNA)

<b>SUMMARY</b>	
This working note presents the progress made by ASECNA in the implementation of AMHS and the IWXXM and AIXM message formats.	
The follow-up to the meeting is set out in paragraph 3.	
<b>Objectives Strategic</b>	Promote the deployment of the AMHS system, which is a component of ICAO's aeronautical telecommunications (ATN) network.

#### 1. INTRODUCTION

1. The exchange of information based on IWXXM has become a standard since 05 November 2020 as a result of Amendment 78 to ICAO Annex 3.
2. In the AFI Region, States have adopted ATN/IPS (*Intrusion Prevention System is a form of network security that is used to detect and prevent identified threats*) through the conclusion APIRG 16/14, for the implementation of the FTBP AMHS as a ground-to-ground application of the ATN.
3. In accordance with the global and regional air navigation plans as well as the Block Aviation System (ASBU) upgrade concept, ASECNA has planned in its current Service and Equipment Plan (ESP), the deployment of the AMHS FTBP system on the one hand and the weather message switches ensuring the conversion of TAC messages to IWXXM on the other, in its various COM centres on the other hand.
1. Following the audit of the AFISNET network carried out in 2015 under the aegis of ICAO, recommendations for the evolution of the network in terms of architecture and technology were recommended in order to comply with the Global Air Navigation Plan (GANP) and the associated planning (ASBU, Aviation System Block Upgrade), with a view to ensuring interoperability with other networks and to integrate the migration of existing ATC services as well as new ones services to come.
2. In order to finalise the migration of TCP/IP circuits in accordance with APIRG/24 conclusion 24/37, as required by the ATN/IPS network and in order for AMHS circuits to be deployed throughout the AFI region, it is necessary for each network operator to equip its COM centre with equipment to enable it to meet the requirements for migration of TCP/IP circuits and for Coordination between the different centres is continued.
3. Thus, several HUBs can be defined and, if necessary, specific gateways in MCPC can be maintained to route certain data flows. To do this, in line with the SNMC's conclusions on the re-engineering of

the AFISNET network, it is becoming urgent to implement this new architecture with the appropriate technologies of the latest generation in order to guarantee global interoperability.

4. This solution will solve the problems of frequency spectrum management, interoperability of AMHS systems, network extension, bandwidth, integration of new services. A new method of network administration will be put in place, globally, it is the implementation of the ATN/IPS network for the ASECNA zone with a possibility of extension to other states after good technical and operational cooperation.
5. Finally, it will also make it possible to prepare for the evolution towards SWIM thanks to the new technologies deployed by satellite service operators to ensure the convergence between dedicated IP networks and WEB services through CLOUD infrastructures in a secure manner.

## 1. ANALYSIS

### 1. AMHS Implementation Status at ASECNA

2.1.1. ASECNA implemented AMHS in all its 17 Member States from 2014 to 2022. 7 operational centers are equipped with virtualized systems, including terminals. The remaining 10 centres are in the process of being replaced.

2.1.2. The migration of the encapsulated IP links of the ASECNA COM inter-centre AFTN circuits has been completed. The transition to standard IP is currently being studied. Three links with neighbouring centres have been made, namely: Brazzaville/Nairobi (May 2022), Dakar/Banjul (August 2022) and Brazzaville/Luanda (March 2023). The continuation of this migration with the other correspondents is conditional on the prior acquisition of the appropriate means and facilities on their part.

1. As a result of the IOT and POT tests, the switchover of the AFTN circuits to AMHS between the different ASECNA centers was successful. Arrangements are being made for the switchovers of the following links to take place before the end of 2023. These are: Bissau/Dakar, Moroni/Antananarivo, Moroni/Brazzaville, Abidjan/Niamey, Libreville/Dakar and Libreville.

The implementation status of AMHS circuits is summarized in the tables below (for details, see table in Appendix 1).

ASECNA COM Centres

	<i>Labeled</i>	<i>% des circuits</i>
ASECNA Centres	Implemented and reported at the CMA level	84%
	Reporting to CMA in progress	6%
	Ongoing IOT/POT testing	10%

neighbors COM Centers

neighbors Centres	IOT/POT testing to be scheduled and awaiting deployment of the nearby center's AMHS system	51%
	Waiting for IP migration	18%
	IOT/POT tests to schedule	23%
	IOT/POT tests to be planned and awaiting the upgrade of JNB's AFISNET station	8%

1. In accordance with ICAO instructions (see letter No. AN 7/49.1-09/34 of 14 April

2009) relating to the registration of new external COM Operators with the AMC, ASECNA has applied for the registration of its COM Operators with ICAO WACAF since 2022.

As such, some COM operators were able to register properly but others did not receive a confirmation email.

#### 1. Status of implementation of the IWXXM at ASECNA

1. From 2020 to 2021, ASECNA proceeded with the replacement of all weather message switches in its member states (NOC, BCC, IROG/RODB), taking into account the conversion of OPMET (SA/SP, FT, WS, WV, WC, FK and FV) from TAC format to IWXXM 3.0 format, as recommended in the AFI region and transmission to AMHS for routing at the regional and inter-regional levels.
2. If necessary, bilateral agreements with non-ASECNA NOCs can be established for the conversion of OPMETs by ASECNA CTOs. These centres are: Banjul, Freetown, Conakry, Sal, Monrovia, Ascension, Praia, Sao Tome, Kinshasa, Luanda, Accra and Kano.

#### 1. AIXM Implementation Status at ASECNA

1. Since 2019, ASECNA has implemented the centralized database in AICM/AIXM 4.5 format that allows the management of aeronautical *data (airspace, ATS routes, airports, obstacles to air navigation and IFR and VFR flight procedure data)* with automatic dissemination of the electronic AIP online on the <https://aim.asecna.aero> site .
2. In 2022, for a better use of the said data managed in the AIXM/AIXM4.5 database for the production of aeronautical charts, ASECNA acquired in 2022 a central cartographic database in AICM/AIXM5.1 format, to interact with all ANSPs and users in the AFI region who are at the AIXM5.1 level or who would still be at the AIXM4.5 level.
3. All the servers acquired for the management of the AIXM4.5 databases on the one hand and for the AIXM5.1 databases on the other hand, allow ASECNA to interact with all users of weather (IWXXM), aeronautical (AIXM) and flight control (FIXM) data.
4. Users of AIXM data (*Aircraft Operators, Weather Organizations in IWXXM Compatibility, International Organizations, Commercial Users, Aircraft in FIXM Compatibility, AIS in ARIC424 Model Compatibility, etc.*) view and download aeronautical data or publications provided by ASECNA in accordance with ICAO PANS-AIM (10096) and Doc 8126 (*Manual of Aeronautical Information Services*).

#### 1. Difficulties.

1. In terms of the volume of data to be exchanged with the implementation of the exchange of data in IWXXM format for a maximum volume of 4 MB, the experience we have had with the implementation of the AMHS circuit between Dakar and Brasilia has shown that the various circuits concerned by this data exchange in IWXXM format, must have a minimum bitrate of 128 Kbps.
2. To this end, ASECNA has already started to migrate some links to 128 Kbps and 64 Kbps, taking into account the actual data flows to be exchanged between the different main and tributary centres respectively, with existing resources in order to meet the operational needs required at the moment (see table in Annex 3).
3. However, with the current configuration between the different ASECNA centres, the increase in throughput requires the acquisition of new bands from frequency

spectrum providers because the available capacities are no longer sufficient to meet all needs. In order to optimize the costs inherent in this increase in bandwidth, it is necessary to consider changing architecture and technology with better internet speeds.

4. To date, the routing of data exchanged at the AFTN or AMHS level is static. The operator's involvement in the diversion of failed circuits plays a huge role in the availability of circuits and data. In order to overcome this human factor problem, it is necessary to implement dynamic routing and contingency through a true ATN network.

## 1. CONCLUSION

### 1. Meeting

1. is invited to take note of the information contained in this document.
2. requests ICAO to support states in the AFI region in their registration at the AMC level.
3. encourages States and organizations to:
  1. to set up in their respective COM centres the appropriate equipment to ensure the migration to standard TCP/IP, bilateral links, the interoperability of AMHS systems in the AFI region and ultimately to guarantee the failover of the various regional circuits in full AMHS.
  2. who have not yet done so, to carry out the proper IOT/POT tests, with a view to migrating the bilateral circuits to AMHS and, if conclusive, to declare them to the AMC.
  3. to cooperate in order to adopt, where possible, a common network architecture/topology and to standardize IP networks in the region according to ATN/IPS standards for easy interconnection and interoperability of the different systems.
  4. to further strengthen cooperation for the coordinated and progressive implementation of the ATN Telecommunications network in the AFI region.

**Appendix 1 : Status of AMHS Implementation in ASECNA Centres**

COUNTRY	Site	Corresponding	Circuit	Implemented and reported at the CMA level	Reporting to CMA in progress	Ongoing IOT/POT testing	IOT/POT tests to be scheduled and/or pending from the nearby center's AMHS system	Waiting for IP migration	IOT/POT tests to schedule	IOT/POT tests to be scheduled pending the upgrade of JNB's AFISNET station
BENIN	COTONOU	ACCRA	AFTN				X			
		NIAMEY	AMHS	18/10/2016						
		LOME	AMHS	30/06/2016						
		BRAZZAVILLE	AMHS	01/11/2021						
		LAGOS	AFTN				X			
BURKINA	OUAGA	NIAMEY	AMHS	18/10/2016						
		BAMAKO	AMHS	27/04/2016						
		ACCRA	AFTN				X			
CAMEROUN	DOUALA	BRAZZAVILLE	AMHS	March 2023						
		LIBREVILLE	AMHS	Dec 2022						
		KANO	AFTN				X			
		LAGOS	AFTN				X			
		LOME	AMHS	Jan 2023						
		NDJAMENA	AMHS	Dec 2022						
		MALABO	AMHS	Dec 2022						
		BANGUI	AMHS	Jan 2023						
RCA	BANGUI	BRAZZAVILLE	AMHS	Feb 2023						
		DOUALA	AMHS	Jan 2023						
		NDJAMENA	AMHS	Jan 2022						
COMORES	MORONI	ANTANANARIVO	AFTN			X				
		BRAZZAVILLE	AFTN			X				

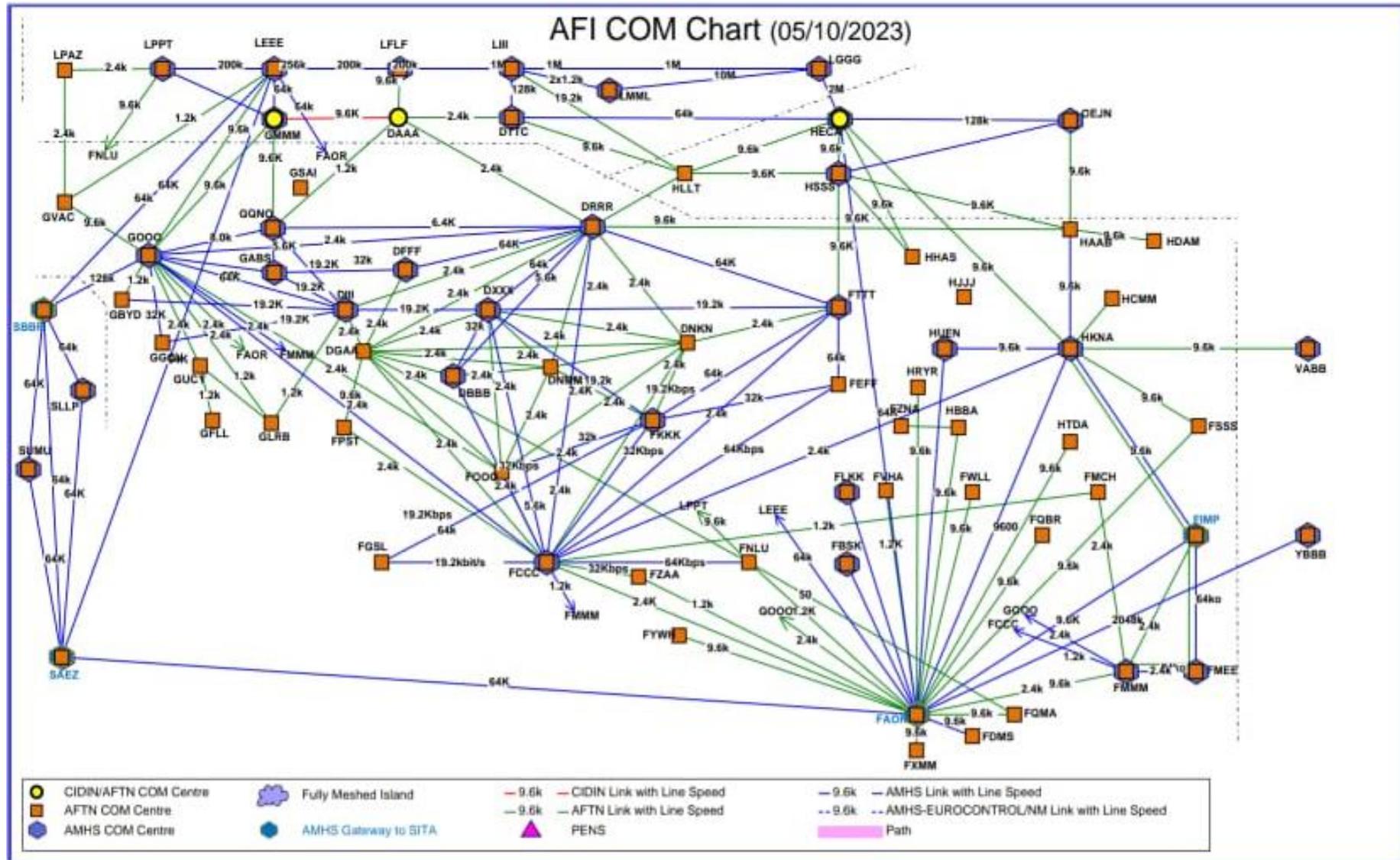
CONGO	BRAZZA	BANGUI	AMHS	Feb 2023					
		DAKAR	AMHS	03/07/2018					
		DOUALA	AMHS	March 2023					
		KINSHASA	AFTN						X
		JOHANNESBOURG	AFTN				X		
		LIBREVILLE	AMHS	March 2023					
		LUANDA	AMHS	March 2023					
		NAIROBI	AMHS	May 2022					
		N'DJAMENA	AMHS	07/07/2017					
		NIAMEY	AMHS	10/07/2017					
		SAOTOME	AFTN						X
		MALABO	AMHS	March 2023					
		KANO	AFTN				X		
		ACCRA	AFTN				X		
		TANA	AMHS	11/07/2017					
		COTONOU	AMHS	01/11/2021					
MORONI	AFTN			X					
LOME	AMHS	05/07/2017							
COTE D'IVOIRE	ABIDJAN	DAKAR	AMHS	May 2023					
		NIAMEY	AFTN					X	
		LOME	AMHS	April 2023					
		BAMAKO	AMHS	June 2023					
		ACCRA	AFTN					X	
		NOUAKCHOTT	AMHS	July 2023					
		BISSAU	AMHS	March 2023					
		BANJUL	AMHS	August 2023					
ROBERTS	AFTN						X		
GABON	LIVREVILLE	BRAZZAVILLE	AMHS	March 2023					
		DOUALA	AMHS	Dec 2022					
		ACCRA	AFTN				X		

		DAKAR	AFTN						X	
		LOME	AFTN						X	
		KANO	AFTN				X			
		LAGOS	AFTN				X			
		MALABO	AMHS	Dec 2022						
GUINEE BISSAU	BISSAU	DAKAR	AFTN			X				
		ABIDJAN	AMHS	X						
GUINEE EQUATORIALE	MALABO	BRAZZAVILLE	AMHS	March 2023						
		DOUALA	AMHS	Dec 2022						
		LIBREVILLE	AMHS	Dec 2022						
MADAGASCAR	TANA	JOHANNESBOURG	AFTN							X
		MORONI	AFTN				X			
		MAURICE	AFTN			X				
		ST DENIS	AMHS	August 2022						
		BRAZZA	AMHS	11/07/2017						
		DAKAR	AMHS	04/07/2018						
MALI	BAMA KO	DAKAR	AMHS	03/07/2018						
		OUAGA	AMHS	27/04/2016						
		ABIDJAN	AMHS	June 2023						
		NOUAKCHOTT	AMHS	15/10/2015						
MAURITANIE	NOUAKCHOTT	DAKAR	AMHS	04/07/2018						
		BAMA KO	AMHS	15/10/2015						
		CASABLANCA	AFTN						X	
		ABIDJAN	AMHS	2023						
		NIAMEY	AMHS	23/06/2016						
NIGER	NIAMEY	ALGER	AFTN				X			
		ADDIS	AFTN					X		
		N'DJAMENA	AMHS	17/03/1995						
		KANO	AFTN				X			
		BRAZZA	AMHS	10/07/2017						

		ACCRA	AFTN				X			
		OUAGA	AMHS	18/10/2016						
		DAKAR	AMHS	03/07/2018						
		COTONOU	AMHS	18/10/2016						
		LOME	AMHS	X						
		ABIDJAN	AFTN					X		
		NOUAKCHOTT	AMHS	23/06/2016						
		TRIPOLI	RSFTA	X				X		
SENEGAL	DAKAR	CASA	AFTN					X		
		NOUAKCHOTT	AMHS	04/07/2018						
		SAL	AFTN					X		
		BANJUL	AMHS	25/09/2018						
		BISSAU	AFTN		25/09/2018					
		ROBERTS	AFTN					X		
		BRAZZA	AMHS	03/07/2018						
		ABIDJAN	AMHS	05/05/2023						
		BAMAKO	AMHS	03/07/2018						
		NIAMEY	AMHS	03/07/2018						
		BRASILIA	AMHS	04/07/2018						
		JOHANNESBOURG	AFTN							X
		MADRID	AFTN						X	
		TANA	AMHS	04/07/2018						
LIBREVILLE	AFTN				X					
TCHAD	N'DJAMENA	NIAMEY	AMHS	17/03/1995						
		BRAZZA	AMHS	07/07/2017						
		MAIDUGURI	AFTN					X		
		KANO	AFTN					X		
		BANGUI	AMHS	Jan 2022						
		DOUALA	AMHS	Dec 2022						
		KHARTOUM	AFTN						X	

		TRIPOLI	AFTN					X		
		LOME	AMHS	01/12/2015						
TOGO	LOME	ACCRA	AFTN				X			
		COTONOU	AMHS	30/06/2016						
		NIAMEY	AMHS	1982						
		ABIDJAN	AMHS	April 2023						
		LIBREVILLE	AFTN						X	
		LAGOS	AFTN				X			
		KANO	AFTN				X			
		DOUALA	AMHS	Jan 2023						
		BRAZZAVILLE	AMHS	05/07/2017						
		NDJAMENA	AMHS	01/12/2015						

Annexe 2- Plan AFI COM :



**Annexe 3 – Tableau d’upgrade du débit des liaisons concernées par les échanges IWXXM**

Site1	Site2	Débit actuel [kpbs]	Débit futur [Kbps]	Observations
Malabo	Brazzaville	19,2	64	Sens NOC --> BCC de rattachement
Accra	Niamey	19,2	64	Sens NOC --> BCC de rattachement
Lagos	Niamey	19,2	64	Sens NOC --> BCC de rattachement
Libreville	Brazzaville	64,0	64	Sens NOC --> BCC de rattachement
Brazzaville	Niamey	64,0	128	Sens BCC-->BCC
Niamey	Dakar	64,0	128	Sens BCC --> BRDO
Roberts	Dakar	64,0	64	Sens NOC --> BCC de rattachement
Abidjan	Dakar	64,0	64	Sens NOC --> BCC de rattachement
Brazzaville	Dakar	64,0	128	Sens BCC --> BRDO
Antananarivo	Dakar	64,0	128	Sens BCC --> BRDO
Moroni	Antananarivo	64,0	64	Sens NOC --> BCC de rattachement
Brazzaville	Antananarivo	32,0	128	Sens BCC-->BCC
Plaisance	Antananarivo	64,0	64	Sens NOC --> BCC de rattachement
Bissau	Dakar	19,2	64	Sens NOC --> BCC de rattachement
Bamako	Dakar	32,0	64	Sens NOC --> BCC de rattachement
Banjul	Dakar	19,2	64	Sens NOC --> BCC de rattachement
Ouagadougou	Niamey	32,0	64	Sens NOC --> BCC de rattachement
Cotonou	Niamey	32,0	64	Sens NOC --> BCC de rattachement
Nouakchott	Dakar	64,0	64	Sens NOC --> BCC de rattachement
Ndjamena	Niamey	64,0	64	Sens NOC --> BCC de rattachement
Bangui	Brazzaville	64,0	64	Sens NOC --> BCC de rattachement
Sao-Tomé S.	Brazzaville	64,0	64	Sens NOC --> BCC de rattachement
Saint Denis	Antananarivo	64,0	64	Sens NOC --> BCC de rattachement
Douala	Brazzaville	19,2	64	Sens NOC --> BCC de rattachement
Lomé	Niamey	64,0	64	Sens NOC --> BCC de rattachement
Antananarivo	Johannesburg	19,2	128	Sens BCC --> BRDO (futur)
Dakar	Johannesburg		128	Sens BRDO-->BRDO (futur)

-FIN-

**Annexe 4 : Glossaire**

**AICM** : Modèle conceptuel de l'information aéronautique ou Aeronautical Information Conceptual Model

**AIXM** : Modèle d'échange d'informations aéronautiques ou Aeronautical Information eXchange Model

**AMHS** : Système de gestion des messages ATS ou ATS Message Management System

**ATN/IPS** : Réseau des Télécommunications Aéronautiques/Système Prévention Intrusions

**AMBEX**: Système d'échange des bulletins météorologiques en Région AFI ou AFI MET Bulletins Exchange (Scheme);

**IWXXM** : Modèle d'échange d'informations météorologiques de l'OACI ou ICAO Weather Information Exchange Model

**BRDO** : Banque régionale de Données OPMET ou Regional OPMET Data Bank

**BCC** : Centre de Compilation des Bulletins AMBEX ou Centres AMBEX ou BCC;

**FIXM** : Modèle d'échanges d'informations de vol

**FK** : Avis de Cyclone Tropical

**FT** : TAF 24 et 30 heures

**FV** : Avis de Cendres Volcaniques

**GANP** : Plans Mondial de la navigation aérienne

**GANP** : Plans Mondial de la Navigation Aérienne

**IOT/POT** : Test Inter opérabilité/Test Pre-opérationnel

**IROG** : Centres d'Echanges interrégionaux d'OPMET ou Inter-regional OPMET Gateway

**NOC** : Centre National de Collecte d'OPMET ou National OPMET Center

**OPMET** : Météorologie opérationnelle Operational meteorological

**SA** : METAR

**SP** : SPECI

**SWIM** : Gestion de l'Information à l'Echelle du Système ou System-Wide Information Management

**WC** : SIGMET pour TC

**WS** : SIGMET

**WV** : SIGMET pour VA