



**INTERNATIONAL CIVIL AVIATION ORGANIZATION  
EASTERN AND SOUTHERN OFFICE**

**First Meeting of the AFI VSAT Networks Managers (AFI VSAT/1)**  
(Kwa-Zulu Natal, South Africa, 13 to 15 June 2011)

**Agenda Item 6: Need for a regional project**

**DEVELOPMENT OF A REGIONAL PROJECT TO ENHANCE AERONAUTICAL  
TELECOMMUNICATIONS INFRASTRUCTURE IN THE AFI REGION**

*(Presented by the Secretariat)*

**SUMMARY**

This paper identifies the need to develop a regional project in order to enhance the aeronautical telecommunications infrastructure in the AFI Region, based on the status of implementation status the AFI aeronautical fixed services (AFS) as discussed under Agenda Items 2 and 3.

**Action by the meeting is at para 3 to this working paper.**

**REFERENCES**

Annex 10- Aeronautical Telecommunications (Volumes 2 and 3)  
Annex 11- Air Traffic Services  
Doc 8259 - Manual on the Planning and Engineering of the Aeronautical Fixed  
Telecommunication Network  
Doc 9702 - Report of the Seventh Africa-Indian-Ocean Regional Air Navigation  
Meeting (RAN/AFI/7)  
APIRG - Meeting Reports

**1. INTRODUCTION**

1.1 The aeronautical fixed service – AFS - comprises 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:

- 1) ATS direct speech circuits and networks;
- 2) meteorological operational circuits, networks and broadcast systems;
- 3) the aeronautical fixed telecommunications network (AFTN);
- 4) the common ICAO data interchange network (CIDIN)<sup>1</sup>;
- 5) the air traffic services (ATS) message handling services (AMHS); and
- 6) the inter-centre communications (ICC).

1.2 This paper analyses 1, 3 and 5 above from the perspective of the migration to the Aeronautical Telecommunication Network (ATN) ground-ground applications.

<sup>1</sup> CIDIN is operated by Egypt (Cairo) and Morocco (Casablanca).

## 2 DISCUSSION

### AFS deficiencies in the AFI Region

2.1. APIRG/17 Meeting Report contains the list of AFS deficiencies reported in the AFI Region, in respect of international standards and recommended practices (SARPs) and requirements in the air navigation plan (ANP). These deficiencies could be summarized as follows:

- partial implementation of ANP requirements for AFTN and ATS/DS circuits;
- low availability of some AFS circuits;
- inadequate transit times (AFTN messages);
- disparities between sub-regional satellite telecommunication networks; and
- inadequate staffing and lack of or insufficient training on aeronautical equipment and associated technologies (satellites, networking, digital data processing and transmission, automation, distributed systems, etc.).

### AFS implementation status and performance

2.2 The requirements for AFS communications are contained in the AFI Air Navigation Plan (ANP), FASID Tables CNS 1A (AFTN Rationalized Plan), CNS 1B (ATN Router Plan), CNS 1C (AMHS Routing Plan) and CNS 1D (ATS/DS Plan). AFTN main circuits have been implemented in accordance with the AFI Rationalized Plan, with digital circuits. Some AFTN circuits (such as Addis-Ababa/Asmara, Addis-Ababa/Djibouti) and ATS/DS circuits (such as Addis-Ababa/Asmara, Bujumbura/Kinshasa, Djibouti/Hargeisa, Kigali /Kinshasa) have not yet been implemented<sup>2</sup>.

#### *AFTN circuit availability*

2.3 Though significant improvements are noted, notably with the implementation of aeronautical satellite telecommunications networks (as discussed under Agenda Item 2 of this meeting), the *minimum specification of 97% stated in the AFI Air Navigation Plan (AFI/7 Recommendation 9/3) is not met* by a number of AFTN circuits. This adversely affects flight coordination between ATS units as well as AIS, OPMET and SAR messages, which in turn has negative impact on air transport operations safety and efficiency.

2.4 The non-availability of AFTN circuits is one of most concern insofar as communications to/from tributary centres or stations cannot be routed by alternative circuits due to the star configuration. However, the existence of VSAT networks and the meshed configuration of AFTN in some areas, increase availability and flexibility.

#### *AFTN Transit Time Statistics*

2.5 *The transit time of a message is defined as the elapsed time between instant of filing of a message with an AFTN station for transmission on the network, and the instant that is made available to the addressee. It can also be considered as the sum of relay times of AFTN stations through which it passes.* AFTN users establish their requirement for transit-time performance as a criterion to be achieved between two AFTN stations in the average peak hour in the peak season for at least 95% of messages of higher priority classifications (SS, DD and FF), as opposed to lesser priority classifications (KK, GG). ICAO Annex 11 prescribes a maximum transit time of 5 minutes for written message, while the AFI Region introduces a distinction between a high priority message (5 minutes) and a low priority message (10 minutes).

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<sup>2</sup> As defined by ICAO, implementation of a facility, service or procedure required in the Air Navigation Plan has been established or acquired, installed and operated satisfactorily in accordance with agreed performance criteria.

2.6 As per established procedures, the States responsible for the operation of AFTN circuits are expected to record transit time statistics on the 23<sup>rd</sup> day of each third month (January, April, July and October) of each year, and exchange the recorded information directly with their correspondents, with copies to Administrations concerned and to the ICAO Regional Office. These established procedures are not complied with by many States. However, available reports received from States by ICAO Regional Offices show that the prescribed transit times for AFTN messages are not always met.

#### *AFTN Circuit Loading*

2.7 There is a significant benefit in carrying out performance evaluation of AFTN circuits on the basis of statistics collected for a period of minimum three days at the interval of six months from 23 to 25 April and October. It is recommended that the AFTN centres and stations experiencing difficulties in taking character count due to system limitations should continue to record circuits loading in accordance with the criteria specified in ICAO Doc. 8259 - *Manual on the Planning and Engineering of AFTN*. These reports do not provide indications on traffic volume, traffic statistics and circuit occupancy, which are needed to assess the suitability of the modulation rate of AFTN circuits.

#### *Transmission speed*

2.8 In order to meet transit-time requirements, a minimum modulation rate of 1200 bauds has been specified for AFI AFTN main circuits (*APIRG Conclusion 12/13 refers*). All AFTN main circuits currently operate at 9.6 kb/second or 19.2 kb/second and meet this minimum requirement. Some links have 64 kb/second capability required for ATN backbone circuits.

#### *Interconnection of VSAT networks*

2.9 The joint use of satellites, digital and data processing techniques is an effective means of compliance with ANP requirements for CNS systems, as well as the requirements of the Aeronautical Telecommunication Network (ATN) concept and related applications.

2.10 The existing networks were designed independently and at different epochs, with similarities and dissimilarities (as discussed under Agenda Items 2 and 3 of this meeting), and later interconnected in order to improve AFS connectivity, and pave the way for the migration from the AFTN to the ATN.

#### *Application of bit-oriented protocols*

2.11 Pursuant to AFI/7 Recommendation 9/6, APIRG adopted *Conclusion 13/10* requesting all AFI AFTN main centres to gradually introduce bit-oriented protocols (BOPs) based on provisions contained in *Annex 10, Volume III* with a view to upgrading the integrity of data transmission and paving the way to the migration to the ATN. Accordingly, AFI VSAT networks utilize X.25<sup>3</sup>, Frame Relay or Internet Protocol Suite (IPS).

### **AMHS implementation status and performance**

2.12 Indications are that at least five (5) AFI States<sup>4</sup> have implemented AMHS initially on national basis. An AFI AMHS Strategy and Plan is under development by APIRG CNS Sub-group in order to ensure an internationally coordinated, harmonized and cost-effective implementation of AMHS in the AFI Region. Two levels of service are defined within the ATS Message Handling Service:

- 1) *The Basic ATS Message Handling Service*. Compared to the service of the AFTN, it offers some significant improvements such as:

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<sup>3</sup> APIRG/16 Conclusion 16/3 discourages the use of X.25 in the AFI Region.

<sup>4</sup> Algeria, Ethiopia, South Africa, Tunisia and Zimbabwe.

- practically unlimited message length;
  - virtually no limit on the number of addressees of a message;
  - provision of non-delivery reports;
  - indication of the subject of a message.
- 2) *The Extended ATS Message Handling Service*. It provides functionality in addition to those of the Basic ATS Message Handling Service such as the introduction of directory services and security mechanisms. Furthermore, in addition to IA-5 text, the extended service allows for the transfer of binary coded data, files, etc.

### **AIDC implementation status and performance**

2.13 Some States situated at the interface between AFI and EUR Regions have implemented on-line data information exchange procedures (OLDI). Proper AIDC procedures are yet to be implemented by AFI States.

### **Human factors**

2.14 Considering the critical role of communications facilities in air navigation operations safety and efficiency AFI States should ensure that:

- a sufficient number of well trained and skilled personnel is available;
- comprehensive training programmes for communication personnel to remain proficient in the skills necessary to operate and maintain facilities. The development of a human resource programme should be addressed as a regional project; and
- co-operation arrangements are concluded between States in order to optimise the expertise available in the Region.

## **3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) take note of the information provided in this working paper;
- b) exchange views on ways and means of improving/upgrading AFTN performance and procedures (including monitoring procedures) in the AFI Region;
- c) recommend the pursuit of co-operation agreements between States/Organizations for CNS operations and maintenance, including the exchange of personnel;
- d) recommend the establishment of a training/qualification plan for a sufficient number of staff in conventional and new communication techniques and technologies used in the aviation industry, based on regional requirements; and
- e) agree to develop an AFI regional project aimed to:
  - 1) achieve an integrated and interoperable telecommunications infrastructure based on a common regional CNS Technology Roadmap; and
  - 2) facilitate gradual migration to the ATN.

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