

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

**Informal CAR/SAM AIS/ATM/CNS 02/00 Meeting**

(Cayenne, 27-29 March 2001)

- Item 3: Review of CNS matters, taking into account:**
- a) **AFS deficiencies and shortcomings**
  - b) **AMS deficiencies and shortcomings**
  - c) **Surveillance and radar implementation plans**

**AFS and AMS deficiencies and shortcomings in the Eastern CAR/SAM Region**

(presented by the Secretariat)

**Summary**

This working paper describes the aeronautical fixed and mobile communication systems recommended for the Eastern CAR/SAM Subregion in accordance with the new CAR/SAM Air Navigation Plan. It also analyses which of these systems have already been implemented and which ones are still pending implementation. Finally, it suggests actions to improve communication services in the area concerned.

**References:**

- Report of the Third CAR/SAM Regional Air Navigation Meeting (Doc 9749);
- CAR/SAM Regional Air Navigation Plan, Volumes I and II; and
- Report of GREPECAS/8.

**1. Background**

1.1 The GREPECAS/8 meeting held in the Dominican Republic on 9-17 November, 1998, through its Conclusion 8/50, proposed the convenience of holding a meeting to study and propose measures to remedy the deficiencies in the provision of air traffic services in the Eastern CAR/SAM Subregion, that is, the Belem and Manaus (Brazil), Rochambeau (French Guiana), Paramaribo (Suriname), Georgetown (Guyana), Maiquetía (Venezuela), and Piarco (Trinidad y Tobago) FIRs.

1.2 The provision of ATM services in the aforementioned Subregion requires the implementation of the communication systems recommended in the CAR/SAM Air Navigation Plan (Volume II - FASID).

1.3 The aeronautical fixed (AFS) and mobile (AMS) communication services in the Eastern CAR/SAM Subregion have certain limitations and the non-implementation of some of the elements of the Plan prevents the provision of efficient air traffic control services.

1.4 The AFS includes the aeronautical fixed telecommunication network (AFTN) and ATS speech circuits.

1.5 In the case of the AFTN in the area in question, it is necessary, according to the new Air Navigation Plan, to implement circuits, increase signalling speeds, apply data transfer codes (IA-5), and apply new communication protocols (X.25).

1.6 With respect to ATS speech circuits, there is the need to increase their availability, to reduce access time for establishing said communications, and to implement circuits to eliminate non-recommended DID circuits.

1.7 All the aforementioned is reflected in the new CAR/SAM Air Navigation Plan. Furthermore, modern digital communication techniques need to be applied in order to improve the existing AFS (capacity, availability, safety, speed) and to facilitate the gradual introduction of the aeronautical telecommunications inter-network (ATN). To that end, plans are being made in the SAM Region to implement the REDDIG digital network covering the entire region, while in the Eastern Caribbean and the Central Caribbean (C-CAR) Subregions, respectively, the E-CAR digital network and the MEVA network are in place.

1.8 Within mobile communications, it is necessary to broaden the coverage of ground-air VHF communications for the FIRs in the Region in question, following the planning principles and the CAR/SAM AMS (R) plan specified in the ANP; change the air-air frequency; and implement and make efficient use of en-route aeronautical mobile service HF communication systems. Likewise, implementation of HF and VHF data transmission must also be planned to facilitate the new applications that are foreseen (CPDLC, ADS).

## 2. Analysis

### 2.1 Aeronautical Fixed Service

#### 2.1.1 AFTN network

2.1.1.1 The AFTN network nodes involved in the Eastern CAR/SAM Subregion are Brasilia, Cayenne, Georgetown, Maiquetía, Paramaribo, and Port of Spain. The current status of each of these nodes is as follows:

#### **Brasilia**

2.1.1.2 At present, the Brasilia AFTN message switching centre for the subregion under study is physically connected to the Maiquetía and Cayenne message switching centres. In addition to the aforementioned connections, the CAR/SAM Air Navigation Plan (CAR/SAM ANP) recommends that it be also connected to the Paramaribo AFTN centre. This latter connection has not yet been implemented, thereby affecting the exchange of AFTN messages particularly between Suriname and French Guiana and Suriname and Brazil. For example, an AFTN message from Paramaribo to Cayenne must pass through two message switching centres (Maiquetía and Brasilia).

2.1.1.3 The Brazilian and Suriname Administrations have made co-ordination efforts over the past two years to interconnect these two centres. As a result of such co-ordination efforts, the conclusion reached was to implement the connection through the SAM digital network (REDDIG) once it had been implemented, since Brazil and Suriname are both part of the network.

2.1.1.4 As regards the existing Brasilia - Maiquetía and Brasilia - Cayenne circuits, according to the AFTN traffic and in order to maintain the circuit load factor below 0.4 erlang (Doc.8259, Chapter 3 - Network Performance), the signalling speed should be increased. In the case of the Brasilia - Maiquetía circuit, which is currently operating at 300 bits/sec at present, it needs to be increased to 2,400 bits/sec. The current 50-bits/sec speed of the Brasilia - Cayenne circuit needs to be increased to 150 bits/sec. Likewise, in order to increase the availability of the Brasilia - Maiquetía circuit, use of the X.25 communication protocol is recommended. Lastly, a change in the message format is recommended for the two circuits, from international telegraph alphabet number 2 (ITA-2) to international telegraph alphabet number 5 (IA-5). All of this is specified in Table CNS1A (AFTN Plan), Volume II of the CAR/SAM ANP. All these improvements can be addressed by implementing the Manaus, Recife, Cayenne, and Maiquetía REDDIG nodes. It is also necessary for the AFTN switching centres in the aforementioned States to take the relevant measures to support the recommendations that have been formulated.

### **Cayenne**

2.1.1.5 Everything related to the improvements to be made to the interconnections with this message switching centre is specified in the section corresponding to the Brasilia node.

### **Georgetown**

2.1.1.6 The Georgetown AFTN message switching centre is composed of a teletype connected to the Port of Spain circuit. The circuit operates at a signalling speed of 75 bits/sec using an ITA-2 format. In order to increase the availability and effectiveness of the circuit and following the recommendations specified in the ANP FASID, it is recommended that the speed be increased to 2,400 bits/sec and the IA-5 format and the X.25 protocol used. It is also necessary to establish a message centre according to the capacity required by Guyana, to replace the limited functions of the teletype currently in use. It would be desirable for the new system to be able to handle AMHS message procedures and at the same time to exchange information using AFTN procedures. Therefore, it is suggested that the Meeting formulate the following conclusion:

### **Conclusion 3-1 Improvements in the Guyana AFTN centre**

That the Guyana Administration, in order to provide greater support to air traffic services, do its utmost to install a new message switching centre that allows for the exchange of information using AFTN and AMHS procedures, according to the capacity required and providing an AFTN circuit with Port of Spain with an operating capacity of 2,400 bit/sec, IA-5 format and the X.25 communication protocol.

## **Maiquetía**

2.1.1.7 The Maiquetía message switching centre in the Eastern CAR/SAM Subregion, according to the ANP, should be interconnected with Brasilia, Paramaribo, and Port of Spain. All of these connections are in place today. With respect to the existing Maiquetía - Brasilia, Maiquetía - Paramaribo, and Maiquetía - Port of Spain circuits, according to the AFTN traffic and in order to keep the circuit load factor below 0.4 erlang (Doc.8259, Chapter 3 - Network Performance), the signalling speed needs to be increased. For the Maiquetía – Port of Spain circuit, which is presently operating at 300 bits/sec, the speed must be raised to 2,400 bits/sec. The present 75-bit/sec speed of the Maiquetía - Paramaribo circuit must be increased to 150 bits/sec. In order to improve the effectiveness of these circuits, the IA-5 format should be used instead of the present ITA-2. Likewise, , the X.25 communication protocol should be used in the Maiquetía – Port of Spain circuit. The implementation of REDDIG nodes in Maiquetía and Paramaribo will permit the introduction of the improvements these require. The initial implementation of a 64 kbits/sec digital circuit between Maiquetía and Piarco would allow the necessary improvements to be made in the AFTN. The required speech services would be included in this circuit. The configuration of this circuit would be similar to that of the circuit installed between Maiquetía and San Juan, Puerto Rico. The connection between Maiquetía and Piarco must preferably be ground-based so that a REDDIG node, once implemented, can communicate efficiently with Piarco (without double hop as in the case of communications between Cayenne and Piarco). For that reason, the following draft Conclusion is set before the meeting:

### **Conclusion 3-2 Implementation of a Maiquetía - Piarco digital circuit**

That the Administrations of Venezuela and Trinidad and Tobago take the necessary measures to improve the AFTN circuit between Maiquetía and Piarco, as specified in table CNS-1A, Volume II of the ANP. To that end, it is recommended that a 64-Kbit/sec ground digital circuit be installed to support ATS speech communication requirements between the two centres.

## **Paramaribo**

2.1.1.8 Everything related to the improvements to be made to the interconnections with this message switching centre is specified in the section corresponding to the Brasilia and Maiquetía node.

## **Port of Spain**

2.1.1.9 Everything related to the improvements to be made to the interconnections with this message switching centre is specified in the section corresponding to the Guyana and Maiquetía node.

## 2.1.2 ATIS speech circuits

### **Brazil**

2.1.2.1 At present, Brazil, in the Eastern CAR/SAM Subregion, has ATIS speech communications with Guyana, French Guiana, Suriname, and Venezuela. Speech communications with French Guiana and Venezuela are carried out using dedicated circuits, while those with Guyana and Suriname use switched public network circuits with direct international dialling (DID).

### **French Guiana**

2.1.2.2 The ATIS speech circuits that have been implemented are those for Piarco, Paramaribo, and Brazil. The first two are established through DID connections and the last *via* a dedicated circuit.

### **Guyana**

2.1.2.3 The Georgetown ACC uses DID connections with Brazil and dedicated circuits with Suriname, Trinidad and Tobago, and Venezuela.

### **Suriname**

2.1.2.4 The ATIS speech circuit connections that have been implemented are those for Guyana, Trinidad and Tobago, French Guiana, and Brazil; the first two are dedicated circuits and the last two are *via* DID.

### **Trinidad and Tobago**

2.1.2.5 The Piarco ACC has implemented DID circuits with French Guiana and dedicated circuits with Guyana, Suriname, and Venezuela.

### **Venezuela**

2.1.2.6 The Maiquetía ACC has dedicated circuits implemented with Trinidad and Tobago, Guyana, and Brazil.

2.1.2.7 Circuits implemented through the public switched network and with direct international access have availability problems; the time needed to establish calls often exceeds the maximum allowed. For that reason, it is recommended that dedicated circuits replace circuits of these kinds. The aforementioned problems would be overcome with the implementation of the REDDIG, since all the States in the Eastern CAR/SAM Subregion, except for Trinidad and Tobago, are nodes of this network, and the implementation of Conclusion 3.2. The design of the REDDIG South American digital network, in addition to resolving the problems of the existing and future aeronautical fixed and mobile communication services, offers a favourable cost-benefit ratio. This means that, once the network is in operation, the investment made for its implementation will be quickly recovered within its service life. All of the SAM States have committed themselves to participate in the implementation of the network and the speed of implementation will depend upon the economic contributions of each of the participating States. It is therefore recommended that all the States in the Subregion that have not yet made their economic contribution to the RLA /98/019 project (Implementation of the SAM Digital Network (REDDIG)) do their utmost in this regard, thus enabling a quick resolution of the aforementioned problems. Consequently, the following conclusion is proposed to the meeting:

**Conclusion 3-3 Economic contribution to the REDDIG**

That the SAM States of the Eastern CAR/SAM Subregion that have not yet made their economic contributions to the RLA /98/019 project do their utmost in this regard, so that the REDDIG may be implemented in its entirety and thus permit the required improvements in AFS and AMS services to be made for a safe and efficient air traffic control based on a favourable cost-benefit analysis.

**2.2 Aeronautical mobile service****Aeronautical mobile satellite service (AM(R)S)**

2.2.1 From the point of view of en route air-ground communications, the conventional system uses VHF and HF voice communications. The AM(R)S planning principles, the geographical separation criterion, and the VHF sub-band assignment table are contained in the Basic ANP Plan (Volume I).

2.2.2 Information about the number of HF, VHF, and satellite voice and data channels for the corresponding ATS services and the implementation dates are shown in Table CNS 2A, Volume II of the ANP (FASID).

**VHF communications**

2.2.3 Table CNS 2A in Volume II (FASID) contains the present number of VHF channels for the corresponding services. Appendix A of this working paper shows the requirements for the States in the Eastern CAR/SAM Subregion.

2.2.4 According to the information given in Table CNS 2A, some of the VHF speech communication channels for the various ATS services indicated have not yet been implemented; this can be noted in column 3 of said Table, where the VHF channels that have been implemented are shown in parentheses.

2.2.5 The meeting is invited to report on installation plans, indicating implementation dates for the VHF speech communication channels that are not yet in place. The meeting is also invited to report on the ground-air VHF coverage in each of the FIRs and whether these cover all en route flight levels. In view of the above, the meeting is invited to formulate the following conclusion:

**Conclusion 3-4 Implementation of VHF speech channels and coverage analysis**

That Brazil, French Guiana, Guyana, Suriname, Trinidad and Tobago, and Venezuela do their utmost to implement the number of VHF speech communication channels specified in Table CNS-2A, column 3 of the CAR/SAM Air Navigation Plan, Volume II – FASID; moreover, when analysing the existing ground-air VHF coverage in the Eastern CAR/SAM Subregion, that they deal with any shortcomings and deficiencies that could arise.

2.2.6 The meeting is invited to take note that the new frequency for air-air VHF communications is 123.45 Mhz, as approved in Amendment 74 to ICAO Annex 10, Volume V. This frequency replaces the existing 130.55 Mhz frequency specified in Doc.7030. The 123.45 Mhz frequency is the world channel for air-air communications. Implementation started on 4 November 1999.

2.2.7 Likewise, the meeting is invited to report on any project for or installation of VHF data transmission systems for applications such as CPDLC and ADS.

**HF communications**

2.2.8 Table CNS 2B in Volume II of the ANP (FASID) lists the ICAO network frequencies and designators based on ITU Appendix S27 on assignment areas, as well as the family of en route HF frequencies for each CAR/SAM.

2.2.9 The necessary frequencies of the ITU HF families, the HF network designators specified in Appendix S27 of Radio Communications should be implemented at the aeronautical stations of the Subregion. In this connection, the recommendation is to install the corresponding HF en route frequency families for each aeronautical station to cover the sector involved and to provide for 24-hour HF coverage, as specified in Table 1 shown below. In this Table, column 1 shows the aeronautical station, column 2 the name of the HF families needed by the station, column 3 the number of family channels with the number of channels already implemented stated in parentheses, and column 4 the frequencies that have been installed.

**Table 1**

Aeronautical Station	HF Frequency Family	Number of Channels	Frequency (Khz)
Belem			
Manaus	SAM-2	6(4)	3479
			5526
			8855
			10096
Cayenne	SAM-2	6(1)	8855
	CAR-A	7(1)	
	SAT-2	5(1)	
Georgetown	CAR-A	6(2)	8855
	SAM-2		10096
Paramaribo	(SAM-2)	6(1)	8855
Piarco	CAR-A	7(3)	
	CAR-B	5(1)	
	SAM-2	6(2)	
Maiquetia	CAR-A	7(4)	5550
			6577
			8918
	SAM-2	6(3)	13297
			5526
			8855
			10096

2.2.10 The Table reveals that there are stations that have a number of frequencies installed per family that cannot guarantee 24-hour coverage, making it necessary to install additional frequencies to resolve the problem. The meeting is therefore invited to formulate the following conclusion:

**Conclusion 3-5 Implementation of HF speech channels**

That Brazil, French Guiana, Guyana, Suriname, Trinidad and Tobago, and Venezuela take appropriate measures to implement the number of HF channels required for the speech communications of en route mobile service, as specified in Table CNS - 2B of the CAR/SAM Air Navigation Plan, Volume II - FASID, so that each station can offer 24-hour coverage.

**3. Suggested action**

3.1 The meeting is invited to:

- a) take note of the information provided in this working paper about the fixed and mobile communication services installed in the Eastern CAR/SAM Region;
- b) have the participating States supply further information to complete the table presented under item a); and
- c) analyse the conclusions presented in Section 2 of this working paper and specify the measures the States will take for that purpose and, if possible and where necessary, the possible dates of implementation or on which the problems will be resolved.

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