INTERNATIONAL CIVIL AVIATION ORGANIZATION
SOUTH AMERICAN REGIONAL OFFICE

Second Meeting of the Informal Coordination Group of the East Caribbean and North Eastern South American

(Caracas, Venezuela, 1 to 5 December 2003)

Agenda Item 2: Review of CNS matters

c) Review of matters related with AMS (Aeronautical Mobile Service) System
d) Review of matters related with navigation systems
e) Review of surveillance plans

(Presented by the Secretariat)

Summary

This working paper analyzes aspects related with the modernization of national communications systems, VHF coverage for area control and flight information services, the implementation of navaid systems, as well as the surveillance systems, with the aim that States of the Subregión under analysis inform the meeting on the actions taken in this respect.

References:

Doc 8733, Volumes I and II;
ATM/CNS/SG/2 Report;
GREPECAS/11 Report; and
AIS/ATM/CNS CAR/SAM CNS 02/00 Report.

1. Background

1.1 For the provision of ATM services in the Subregion, the implementation of communications, navigation and surveillance systems recommended in the CAR/SAM Air Navigation Plan (Volume II - FASID) are required.

1.2 The implementation of regional digital networks for aeronautical applications (REDDIG, MEVA, E-CAR), as well as the rapid progress in the implementation of modern digital networks in the States of the Subregion, has forced States to implement digital communications networks for applications to the air traffic control service, which will increment their availability and efficiency.

1.3 Even though the speech channels for VHF ground/air communications specified in the ANP FASID for the E-CAR/SAM-NE Subregion have been totally implemented, it becomes necessary to analyze the coverage of these systems with the aim to determine that enroute ground/air speech control can be guaranteed up to the minimum levels established.

1.4 A review of the navaid systems in the Subregion as per the ANP FASID, reveals that most of the navaid systems have been installed, pending some to be implemented which are possibly unnecessary since more complete navaid facilities have been installed at the same sites.

1.5 The implementation of surveillance systems in the Subregion would considerably increase the safety and efficiency of air traffic control. Given the high cost of these systems, its implementation is very difficult for many States of the Subregion. A solution that would help in having a visual control of the respective airspaces would be to establish bilateral or multilateral agreements for the sharing of radar data.

2. Analysis

Modernization of States national communications systems in support to CNS requirements

2.1 To face the new voice and data communications requirements for the provision of the air traffic services, as well as facilitate the introduction to the ATN, the States of the Subregion would have to begin the process of implementing modern digital communications networks.

2.2 In this respect, GREPECAS has developed general guidelines for the design of national digital networks that take into account technical and operational aspects. **Appendix A** includes the general principles examined and approved during GREPECAS/10 meeting.

2.3 It is expected that during the meeting, States of the Subregion inform on the plans or status of implementation of the digital networks.

Review of VHF coverage for the area control and flight information services

2.4 The planning principles of the AM(R)S, the geographical separation criterion and the assignment table of the VHF Sub-band are found in the Basic ANP (Volume I).

2.5 Information related with the quantity of voice and data channels by VHF, satellite for the corresponding ATS services and the respective implementation dates are indicated in Table CNS 2A, Volume II (FASID), CAR/SAM ANP.

2.6 In accordance with the information in Table CNS 2A, some of the VHF channels for speech communications for the various ATS services indicated therein have yet to be implemented.

2.7 The meeting is invited to inform on its installation plans, indicating the date of implementation of the VHF speech communications channels that have not yet been implemented. Likewise, the meeting is invited to inform on the ground/air VHF coverage at each of the FIRs and if these cover all enroute flight levels.

2.8 To determine the enroute coverage for minimum level routes 7600 m (25000 ft) and maximum 13700 m (45000 ft) level routes, Appendix B to this paper presents a table indicating the ACCs of the Subregión, the VHF stations, and respective frequencies and coordinates. To complete the information in the table, the meeting should establish a target date for its carrying out.

Review of the implementation of the navigation systems

2.9 The navigation aid systems recommended in the CAR/SAM regions are in Table CNS 3, Volume II (FASID), CAR/SAM ANP. For the Subregion under analysis, the situation is the following:

Netherlands Antilles

2.10 All navigation aid equipment recommended in FASID Table CNS 3 have been installed at Curacao.

Brazil

2.11 Brazil has installed all navigation aid equipment recommended in FASID Table CNS 3.

Guyana

2.12 NDB installation is pending in Kato. In accordance with information provided by the Guyana aeronautical administration, this NDB was installed, but is currently out of service and will not be reactivated. Since this NDB is recommended in the FASID, Guyana would have to notify this, through a letter to the ICAO South American Regional Office, in order that the respective amendment to FASID Table CNS 3 is carried out, and this NDB is removed from the Plan.

French Guiana (France)

2.13 France has installed all navigation aid equipment recommended in FASID Table CNS 3.

Suriname

2.14 The installation of an NDB in Paramaribo/Zorg en Hoop and of another in Zandery/Johann Adolf Pengel airport are pending.

Trinidad & Tobago

2.15 An NDB installation is pending in Port of Spain/Piarco international airport.

Venezuela

2.16 NDB installation is pending in Cabo Codera, Los Roques, Carúpano, Maracaibo and Porlamar. The Venezuelan aeronautical administration has informed at various ICAO meetings that these navigation aids would not be installed since each of these locations is covered by VOR. To carry out amendments to the FASID, it is recommended that the Venezuelan administration send a letter to the ICAO South American Office requesting the corresponding amendment.

2.17 It is expected that during the meeting States of the Subregion inform on the actions taken and to be taken in this respect, establishing dates for their execution.

Radio navigation aids flight testing

2.18 **Appendix C** to this paper shows a chart specifying information related to the manner flight tests are carried out in the Subregion under analysis. Many of these States, upon not counting with a national flight test unit, have to rely on foreign entities to carry out these tasks. Therefore, many of the navigation aids are evaluated over long periods of time, exceeding the intervals recommended in ICAO Document 8071, Volume I. As per the CAR/SAM Regional Air Navigation Plan, Volume I – Basic ANP, Section IV, States have to make all efforts to permanently maintain operational the navigation aids, being evaluated and tried periodically through flight tests, in compliance with Annex 10, and at the intervals indicated in ICAO Doc 8071.

2.19 With the aim of sharing the flight testing capacity in the Subregion with the States not having flight test units, it would be of great help that States being able to carry out flight tests agree to bilateral or multilateral agreements for the holding of such an important activity.

2.20 States of the Subregion are invited to update and complete the table in Appendix C and, also, study the possibility of initiating possible bilateral or multilateral agreements for the holding of flight tests, so important to maintain air navigation safety. Likewise, it is important to take into account that the current navigation aid equipment will have, in accordance with the progress in the new satellite based navigation systems, many more years of existence and, therefore, it is important to maintain them permanently operational.

Review of the surveillance plans

2.21 For the provision of ATM services in the Subregion, surveillance systems are required to be implemented due to the scarce coverage of these systems in the area and to face ATM evolution as specified in the CAR/SAM Air Navigation Plan ATM Evolution Tables (ANP, Volume II - FASID).

2.22 Aeronautical surveillance in the Subregion is mostly carried out through speech position reports through ground/air VHF and HF communications systems.

2.23 Due to the high cost of radar systems and with the aim of facilitating the implementation or radar surveillance services in a safe, efficient and advantageous manner with regard to cost, States of the Subregion should consider, where practicable, the possibility of carrying out bilateral or multilateral arrangements to share radar data between ATS centres of neighbouring States. To this effect, and to standardize the sharing, a common radar format and a common communications protocol for exchange of radar data becomes necessary. Conclusion 11/47 (regional guidelines for the exchange of SSR radar data) was formulated at GREPECAS/11 meeting, which establishes that the protocol to be used shall be Asterix. **Appendix D** to this paper presents the referred conclusion and guidelines.

2.24 It would be interesting that in the Subregion under analysis, the possibility of sending radar data to the new Georgetown, Guyana, ACC from Brazil or Trinidad & Tobago be analyzed, as well as others that the meeting could consider.

3. **Action suggested**

3.1 The meeting is invited to:

a) Take note of the information provided in this working paper;

b) Examine the following aspects formulated in section 2 of the working paper:

- Study or implementation of modern national communications systems at States of the Subregion, in support to CNS requirements.

- VHF communications coverage for area control and flight information services.

- Study or implementation of navigation systems.

- Surveillance plans.

- - - -

APPENDIX A

GENERAL PRINCIPLES FOR THE DESIGN OF NATIONAL DIGITAL NETWORKS

a) Network design should be based on a cost-benefit analysis of the implementation of communication requirements;

b) Network design should be aimed at an efficient integration of voice and data communications through an appropriate network protocol;

c) The design should consider the implementation of existing communication requirements, as well as additional capacity for future services, such as those contemplated in the CNS/ATM system concept;

d) The design should be based on the application of communication standards developed by recognised international organisations and should offer, for data, an open network environment compatible with ATN inter-network services;

e) Network operation should provide for fast amortisation of the investment within the term of its expected lifetime;

f) The network should offer the possibility of technological updating throughout its useful life;

g) The network should allow for easy expansion of its topology and service capacity;

h) A high level of service availability and communication integrity should be achieved through the implementation of:

   i. an efficient network management system;

   ii. an adequate network capacity to meet the requirements;

   iii. an adequate level of facility redundancy; and

   iv. effective and efficient alternate media.

i) The quality of communications should meet aeronautical operational requirements;

j) The network should give priority to aeronautical safety communications over administrative communications and other non-safety-related services; and

k) Consider the possibility of implementing the network through the expansion of existing sub-regional virtual networks.

- - - -

APPENDIX B

ESTACIONES REMOTAS VHF DE ACC DE LA SUBREGIÓN E-CAR /SAM- NE

ESTADO/ TERRITORIO STATE/ TERRITORY	NOMBRE ACC/ ACC NAME	NOMBRE ESTACIÓN REMOTA VHF/ NAME OF REMOTE VHF STATION	COORDENADAS ESTACIÓN VHF/ COORDINATES OF VHF STATION	FRECUENCIA/ FREQUENCY	OBSERVACIONES/ REMARKS
Antillas Holandesas/ Netherlands Antilles	Curacao			124.10 124.70 127.10	
Brasil/Brazil	Belem	Amapa		128.30 133.15	
		Araguaia		128.70	
		Belem		126.15 128.20 128.30 133.15 133.35	
		Carajas		133.70	
		Imperatriz		135.55 126.15	
		Sao Luis		134.70	
		Santarem		125.20	
	Manaus	Bracélos		133.00	
		Boa Vista		124.40	
		Cachoeira		133.90	
		Itacotiara		123.85	
		Manaus		123.80 124.30 124.50 125.50 126.30 124.70	
		Tabatinga		125.40	
		Tefe		125.00	

ESTADO/ TERRITORIO STATE/ TERRITORY	NOMBRE ACC/ACC NAME	NOMBRE ESTACIÓN REMOTA VHF/ REMOTE VHF STATION NAME	COORDENADAS ESTACIÓN VHF/ VHF STATION COORDINATES	FREQ.	OBSERVACIONES/ REMARKS
Guyana	Georgetown	Timehri		128.60 124.20	
Guyana Francesa/ French Guiana	Rochambeau				
Surinam/Suriname	Paramaribo	Paramaribo		123.90 128.30	
Trinidad & Tobago	Port of Spain	Port of Spain		123.70 124.20 125.40	
Venezuela	Maiquetía	Lagunazo		123.80 125.20 125.90 126.00 126.60 127.95 128.10 128.20 128.30 128.50 128.70	
		Palma Real Las Palmas Cerro Catire CerroColorado Santa Elena de Uairén PuertoAyacucho San Carlos de Rio Negro			

- - - -

APPENDIX/APENDICE C

ENSAYO DE RADIO AYUDA A LA NAVEGACIÓN EN LA SUBREGION E-CAR/SAM-NE / TESTING OF RADIO NAVIGATION AIDS IN THE E-CAR/SAM-NE REGION

ESTADO/ TERRITORIO STATE/ TERRITORY	ORGANISMO ENCARGADO PARA LOS ENSAYOS EN VUELO/ ORGANISM RESPONSIBLE OF FLIGHT TEST	FRECUENCIA DE ENSAYOS EN VUELO/ FLIGHT TEST FREQUENCY	NORMA UTILIZADA/ USED REGULATION	PUEDEN SUMINISTRAR ENSAYO EN VUELO A OTROS ESTADOS/ POSSIBILITY TO MAKE FLIGHT TEST AT OTHER STATES
Netherlands Antilles				
Brazil	GEIV	VOR Class A every 12 months VOR Class B every 8 months VOR Class C every 4 months ILS Class A every 6 months ILS Class B every 4 months ILS Class C every 2 months	Propia	Yes
Guyana	FAA	VOR every 18 months ILS every nine months	FAA	No
French Guiana	ASECNA	Every six months		No
Suriname	FAA	Sporadically every year	FAA	No
Trinidad & Tobago				
Venezuela	CAD Flight Inspection Unit	ILS every six months VOR every year	ICAO Doc 8071	Yes

- - - - -

APPENDIX D

CONCLUSION 11/47 REGIONAL GUIDELINES FOR THE EXCHANGE OF SSR RADAR DATA

That CAR/SAM States/International Organizations be urged to:

a) use the Asterix protocol as a common regional protocol for the exchange of SSR radar data;

b) take into account the revised regional guidelines on the exchange of radar data contained in Appendices N, O and P to this part of the Report; and

c) establish bilateral/multilateral agreements for the exchange of radar data.

INITIAL REGIONAL GUIDELINES ON RADAR DATA SHARING IN THE CAR/SAM REGIONS

A. General planning

1. Based on the CAR/SAM regional surveillance radar systems plan contained in FASID Table CNS 4A and on the regional radar data sharing plan developed by GREPECAS, those ATC units that might derive major operational and economic benefits by sharing their radar data should be identified, as well as those ATC units lacking radar facilities and which could benefit from the availability of data provided by radar systems of neighbouring ATC units.

2. It should be avoided, to the extent possible, redundancy of close radar facilities in FIRs boundary areas or other airspaces, so as to reduce facility investment and maintenance costs by using the signal from a single radar for both airspaces.

3. The installation of close radars, one on each side of a boundary should only be justified when a radar signal is needed as backup for another due to air traffic complexity, improved coverage and ATC requirements,.

4. In order to facilitate radar data sharing/acquisition, it is necessary to achieve compatibility of radar systems already installed and/or envisaged for the short-, medium- and long-term, with a view to future connection with other surveillance systems, in this way, surveillance systems interoperability among the States/International Organisations of the Region would be ensured.

5. States/International Organisations could also consider sharing military radar facilities for the benefit of civil air navigation as a valid alternative.

6. Shared radar data could originate in a PSR (radar primary data) or SSR (radar secondary data) station, and in accordance with the technical possibilities of the system and the arrangements established between civil aviation authorities and/or the corresponding military authorities.

B. Radar coverage and service in ATS unit airspace

7. Identify those areas near FIR boundaries that have coverage at/above 10,000 feet, for use in the control of aircraft operating in TMAs and/or en-route flight.

8. Identify those areas near FIR boundaries that have coverage below 10,000 feet, for use in the control of aircraft operating in TMAs of one or more border airports.

9. In order to display the coverage described in 7 and 8 above, it is necessary to determine the operational levels of coverage, at the operation site.

C. Radar data exchange format and transmission protocol and transmission means for the radar data signals

10. Use the common radar data format/protocol recommended by GREPECAS for radar data sharing, which is ASTERIX protocol.

11. Establish cooperation agreements between the States, in which the standardisation of surveillance radar system interfaces is foreseen.

12. Establish the appropriate and feasible communication means for the transfer of radar data signals among the ATS units.

13. It is advisable that States/International Organisations, once ATN sub-networks are implemented, use the protocols set forth in the ATN SARPs already issued by ICAO, in view that it would be possible to share and standardise the regional surveillance network, with a view to implementing the CNS/ATM plan also developed by ICAO.

D. **Radar data display and processing at the ATS units**

14. Determine and establish the particular elements of advanced technology necessary for visualisation, such as automated systems with capability of data exchange among ATS (AIDC) units, separating radar information from other information.

15. Study the capacity of current radar data processing and display systems at ATC centres, suggesting, if necessary, short- and medium-term solutions to accommodate the signals of neighbouring radars.

16. Agree on the site where the digital data radar signal will be processed, be it at the transmission site, the reception site, or both.

E. **Bilateral and multilateral arrangements**

17. Consider the possibility of establishing bilateral or multilateral agreements between States/International Organisations in order to obtain operational and economic benefits from radar data sharing.

18. The bilateral or multilateral agreement format models developed by GREPECAS should be used as a guide, including the operational, technical, financial, administrative and legal aspects.

19. Within the agreements referred to in the previous paragraph, it is important to consider the suitability of radar data (availability, reliability and integrity) and service continuity (offered service period of time), according to air traffic service requirements.

20. The agreements should envisage the fact of maintaining a dynamic interaction for the assessment and exchange of detailed information on specific systems coverage, so that States may develop a common regional plan. Such information could include:

- Installation site(s).
- Type of radar facility (PSR, SSR, SSR Mode S, etc.).
- Transmission media and protocols used to this end.
- Certified coverage.
- Planned facilities and implementation times.
- Availability and reliability parameters.
- Life-span.

TABLE A – INFORMATION REQUIRED ON SECONDARY SURVEILLANCE RADAR (SSR) FOR RADAR DATA SHARING

RADAR FACILITY

EXPLANATION OF THE TABLE

Column:

1 The name of the State from which the radar service is provided.
2 The name of the radar facility from which the radar service is provided.
3 Identification of the radar facility from which the radar service is provided.
4 WGS-84 Coordinates - latitude (degrees/minutes/seconds).
Note: If the WGS-84 coordinates are not available, please provide the geographical coordinates.
5 WGS-84 Coordinates - longitude (degrees/minutes/seconds).
Note: If the WGS-84 coordinates are not available, please provide the geographical coordinates.
6 Elevation of the terrain in meters.
7 Focal height of radar antenna in meters.
8 SSR equipment manufacturer.
9 SSR equipment model.
10 Mechanical tilt of SSR antenna (elevation degrees).
11 Electrical tilt of SSR antenna (elevation degrees).
12 Certified SSR coverage in Nautical Miles (NM).
13 SSR coverage outside FIR area
14 SSR coverage (column 13) certified
15 SSR data protocol and categories
16 SSR data time stamping
17 SSR modes used.
Example: A and C (A/C).
18 Type of antenna (standard – monopulse)
19 Type of SSR service or functions (en-route/terminal) as listed below:
ACC-SR-I *Area radar control service up to FL250.*
ACC-SR-U *Area radar control service up to FL450.*
APP-SR-I *Surveillance radar approach control service up to FL250.*
APP-SR-L *Surveillance radar approach control service up to FL120.*
APP-SR-U *Surveillance radar approach control service up to FL450.*
20 Last update of SSR equipment.
21 Remarks (includes notes on. availability of graphic SSR coverage information and any other information).

Table A: Information required for SSR Radar data sharing / Tabla A: Información requerida para el intercambio de datos radar

Radar Facilty / Instalación Radar

Facility/Instalación							Secondary surveillance radar (SSR) / Radar secundario de vigilancia			
State / Estado	facility name / nombre de la instalación	facility id / identificación de la instalación	latitude [degrees/minutes/seconds] / latitud (gradosminutos/segundos)	longitude [degrees/minutes/seconds] / longitud (degrees/minutos/segundos)	elevation / elevación [m]	focal height / altura focal [m]	manufacturer / fabricante	model / modelo	mechanical tilt [elevation degrees] / inclinación mecánica (grados de elevación)	electrical tilt [elevation degrees] / inclinación eléctrica (grados de elevación)
1	2	3	4	5	6	7	8	9	10	11

certified coverage [NM] / cobertura certificada (NM)	Coverage outside FIR area / Área de cobertura fuera de la FIR	Coverage (column 13) is certified ? / Cobertura (columna 13) está certificada?	data protocol and categories/ protocolo de datos y categoria	SSR data time stamping	SSR modes / modos SSR	SSR anntena [standar - monopulse] / antena SSR (estándar-monopulso)	Type of service / Tipo de servicio	last update / última actualización	Remarks (includes notes on availability of graphic SSR coverage information, specially outside FIR) / Observaciones (incluyen notas sobre la disponibilidad de información de cobertura gráfica SSR, especialmente fuera de la FIR)
12	13	14	15	16	17	18	19	20	21

TABLE B – INFORMATION REQUIRED ON THE DATA PROCESOR FOR RADAR DATA SHARING

RADAR DATA PROCESSOR

EXPLANATION OF THE TABLE

Column:

1 The name of the State from which the radar data service is provided.
2 The name of the radar data processor from which the service is provided.
3 Identification of the radar data processor from which the radar service is provided.
4 Radar data processor manufacturer.
5 Radar data processor model
6 Radar data integrating capability
7 Type (s) of radar data protocol (s) (used and accepted)
8 SSR data inputs (how many radar SSR inputs)
9 Last update of radar data processor
10 Communication channels to another FIRs availability
11 Remarks (includes notes on availability of coverage information and any other information).

Table B - Information on the radar processor for radar data sharing
Tabla B - Información requerida sobre el procesador de datos para compartición de datos radar

Radar Data Processor

Facility/Instalación			Radar data procesor / Procesador de datos radar							
State / Estado	facility name / nombre de la instalación	facility id / identificación de la instalación	manufacturer / fabricante	model / modelo	Radar data integrate capability / Capacidad de integrar datos radar	type (s) of data protocol (s) / tipo (s) de protocolo (s) de datos	SSR inputs / entradas SSR	last update / última actualización	Comms channels another FIRs availability / Disponibilidad de canales de Comunicaciones otras FIRs	Remarks (includes notes about disponibility to share SSR information with another FIR) / Observaciones (incluyen notas sobre la disponibilidad de compartir información SSR con otra FIR)
1	2	3	4	5	6	7	8	9	10	11