ATM/COMM/6 - WP/07
CNS/COMM/6 - WP/18

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CAR/SAM Regional Planning and Implementation Group (GREPECAS)

Sixth Meeting of the Air Traffic Management / Communications, Navigation and Surveillance Subgroup (ATM/CNS/SG/6) – CNS and ATM Committees

Boca Chica, Dominican Republic, 30 June-4 July 2008

CNS Committee

Agenda Item 3: Surveillance systems developments

3.3 Surveillance systems requirements for the integration of ATM automated systems and ATFM requirements

ATM Committee

Agenda Item 2: Report of the ATM Committee Task Forces

2.3 ATM Automation

ACTIVITIES IN THE CAR/NAM REGIONS FOR THE IMPLEMENTATION OF ATM AUTOMATION

(Presented by the Secretariat)

SUMMARY
This working paper presents a summary of the activities carried out in the CAR/SAM Regions for the implementation of ATM automation as well as considerations and aspects taken into account by the NAM/CAR Regions for the implementation of interfaces for ATM automation.
References: • Report of the CAR/WG/01 meeting (Port of Spain, Trinidad and Tobago, June 2007) • Report of the NACC/WG/02 meeting (Ocho Rios, Jamaica, 12-16 May 2008) • Reports of GREPECAS/12, 13 and 14 meetings.
Strategic Objectives — *This working paper is related with Strategic Objectives A and D.*

1. Background

1.1 Chapter 10 of PANS-ATM (Doc 4444) - *Air Traffic Management*, contains procedures concerning coordination to be made between air traffic services units, between control positions of said units, and between said units and the corresponding aeronautical telecommunications stations. Chapter 11 of the foregoing document contains procedures concerning the messages of air traffic services necessary for an efficient operation of said services. Similarly, its Appendix 6 defines the types of message, and its contents for operational communications between computer systems of ATS units, known as ATS interfacility data communication (AIDC) and will serve as a basis for data migration communications to the aeronautical telecommunication network (ATN). Under the coordination messages, reference is made to the current flight plan (CPL).

1.2 GREPECAS Conclusion 12/31 – *Regional Strategy for the Integration of ATM Automated Systems* urges States/Territories/International Organizations to define an action plan for the integration of ATM automated systems using the agreed regional strategy. **Appendix A** to this paper includes the foregoing Regional Strategy.

1.2 GREPECAS Conclusion 14/43 – *Agreements for ATM Automated System Interface*, urges States/Territories/International Organizations to take into account the technical feasibility studies and the operational benefits and to establish bilateral/multilateral agreements for interface of automated systems between adjacent ATS units and to use the *"Interface Control Document for Data Communications between ATS Units in the Caribbean and South American Regions (CAR/SAM ICD)"*. The ICD is published in the ICAO NACC Office web page under "e-Documents".

1.3 GREPECAS Conclusions 14/44 – *Establishment of An Action Plan for the Interface of ATM Automated Systems* urges States/Territories/International Organizations to formulate an action plan for the interface of ATM automated systems using the ATS Operational requirements for Automated Systems Table. This Table is shown in **Appendix B** to this working paper.

2. Regional Consideration for the Implementation of ATM Automation

2.1 During the CAR/WG/1 Meeting, the regional references and guidelines for ATM automation implementation were analysed and Conclusion 1/17 was formulated urging States/Territories/International Organizations to define their national action plan for the establishment of interfaces to achieve ATM automation between adjacent ATS units, based on a format presented during that meeting. This format is presented in **Appendix C** to this working paper.

2.2 Likewise, during the NACC/WG/2 Meeting, the availability of many aspects for ATM automation implementation was analysed. Among the main detected problems by the NACC/WG/2, it was considered that duplicity and errors in the transmission of flight plans is of a regional nature, and that active participation of all parties involved and a greater ATM automation will allow minimizing the issue. Likewise the Meeting deemed appropriate that ATS providers ensure the application of provisions related with the submission of ATC clearances contained in Doc 4444, for flights operating from one FIR to another adjacent FIR.

2.3 The Meeting considered that messages in CPL format may be used for an effective exchange of flight plans updating, and that implementation and use do not require higher communications costs, in view that the flight plans may be transmitted through the AFTN network. CPL is included in the ICD messages package approved by GREPECAS.

2.4 The Meeting recognised that a high percentage of Control Centres and ATS Units in the CAR Region has been upgraded, thus allowing a greater data processing capacity with the implementation of flight data processing system (FDPS), radar processing (RDP), support systems, and other display and message switching systems. These actions have improved the efficiency of services and operations, as well as operational prevention tools (MSAW, DAIW, MTCA, etc.) which entails an enhancement to safety. This systems automation is in line with the guidelines indicated in the table agreed upon at GREPECAS concerning airspace classification and future use.

2.5 In accordance with the provided analysis and data on Surveillance Systems contained in FASID Table CNS 4A corresponding to the CAR/SAM Regions, as well as the implementation of new surveillance systems as ADS-B, Mode S and Multilateration, it was concluded that States/Territories/International Organizations are performing several surveillance/radar data exchange through bilateral agreements improving and homologating the traffic situation in the Region and allowing a better radar and non-radar surveillance data source availability that may be useful in improving accuracy, availability and safety of services provision in the Region. **Appendix D** to this paper offers a summary of the progress in radar data exchange in the CAR/NAM Regions.

Considerations in the Development of Digital Networks and Data Processing Automated Systems

2.6 The existing communications infrastructure in the CAR/NAM Regions has improved with the implementation of digital networks, prone to the implementation of new communication services as is the case of ATN implementation, specifically the AMHS system as well as its use in surveillance data comparison/exchange. This digital network implementation has led to improvements in the performance of the Aeronautical Fixed Services Network both on a voice communications basis and on a ground communications of the AFTN network basis.

2.7 In this regard, it was informed that the Technical Management Group (TMG) of the MEVA Network, during its last meeting, has initiated the analysis of new communications services for its implementation in said network.

Considerations and guidelines in the Interface Control Document for Data Communications between ATS Units (ICD)

2.8 The purpose of this document is to provide a common model for data exchange among ATS units, providing air traffic services in the CAR/SAM Regions, as well as to provide a tool to coordinate in a centralized manner the changes to this model. The ICD proposes the use of messages for the coordination among ATS units, especially flight plans coordination and radar transfer, as has been implemented between Mexico-Canada-United States, based on Doc 4444 and several particular messages that may be adjusted to the identified needs of each automated system.

2.9 The document complies with coordination requirements of ATS messages and at the same time facilitates the development of phases I and II and the evolution of the regional automation strategy through the definition of messages required for the initial implementation of ATFM and foreseen control transfer for ADS data, identifying that interface activities should be coordinated between experts of the involved States and designated points of contact.

3. National Action Plan for the Implementation of Interfaces of ATM Automated Systems between Adjacent ATS Units – Improvement and Development of ATM Situational Awareness

3.1 Bearing in mind the foregoing considerations and the regional strategy, the NACC/WG/2 Meeting concluded that several States/Territories/International Organizations of the CAR Region may achieve ATM automation, in stages I and II, with their adjacent ATS centres, and therefore, it was urged that they reflect the necessary activities in their respective action plans in line with the format agreed upon by the CAR/WG/1 Meeting.

3.2 In addition to the follow-up of GREPECAS conclusions, and considering the current flight plans exchange scenarios, the systems capacity and communication aspects, the NACC/WG/2 Meeting formulated the following:

DRAFT
CONCLUSION 2/4 ACTIONS TO AVOID DUPLICATION OF FLIGHT PLANS

That,

a) NAM/CAR States, Territories and International Organizations take appropriate actions in the short term to:

i) publish in the AIP proper address for destination of filed flight plans;
ii) urge operators to avoid duplicity of CPL and/or RPL messages, indicating that only one should be in force for specific flight plan;
iii) establish timelines for coordination of filed flight plans and updating related changes;

iv) follow-up national provisions for FPL acceptance in accordance with ICAO Doc 4444, for flights operating from one FIR to another adjacent FIR;
v) initiate interfacing coordination between ATS automated systems in accordance with the Interface Control Document for Data Communications between ATS Units (ICD) approved by GREPECAS;
vi) ensure that dispatch offices have a sufficient number of qualified specialists for proper coordination and follow up flight plans; and

b) operators carry out proper coordination of filed flight plan to ensure that only specific one is in force.

4. Suggested Action

4.1 The Meeting is invited to:

a) note the information contained in this working paper;

b) recommend the use of CPL as an updated flight plans data exchange in order to achieve phases I and II of the Regional Strategy through ATM automation bilateral agreements between States/Territories/International Organizations;

c) adopt the conclusion included in paragraph 3.2;

d) recommend other considerations concerning ICD evolution approved by GREPECAS, if applicable, in line with the messages requirements to achieve ATM automation; and

e) consider and recommend other actions deemed relevant.

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APPENDIX A

GUIDELINES FOR STRATEGY OPERATIONAL INTEGRATION OF THE ATM AUTOMATED SYSTEMS OF THE CAR/SAM REGIONS

Objective: Through a committed participation of the States, users and ATS providers of the CAR/SAM Regions,

1) to cooperate jointly in the integration of technologies for ATM automation, in accordance with ICAO guidelines available, considering the best regional and global alternatives;

2) develop a strategy for the integration of ATM automated systems with a safe, gradual, evolutionary and interoperable vision that facilitates the information exchange and the collaborative decision-making of all the components of the ATM system for a seamless, flexible, optimum and dynamic management of airspace and international aerodromes, and at the same time that it increases the required operational safety levels.

3) take into account the data processing and network environment, taking into consideration the use of ground and space segments for an interactive ATS information process, under the criteria of integrity, quality and real time.

FRAMEWORK

a) identify homogeneous areas on the basis of traffic flows operating in the different airspace and international aerodromes;

b) analyze the operational environment scenarios of the air traffic services currently provided and those that are planned;

c) determine the scope, architecture design, characteristics and attributes of the operational requirements for the short-term integration of the current automated systems of the ATS units depending on the current provided service levels, as well as other operational requirements that respond to future expectations of the components of the ATM system, considering:

   i) arranging the requirements in logical sequence, through the following stages.

Stage	Function
Stage I	- **Flight plan processing** (FDPS/Flight Data Processing System)
Stage II	- **Radar data processing** and ATS surveillance (RDPS/Radar Data Processing System, ADS and exchange of radar information); - **Monoradar;** - **Multiradar**; - **Radar data sharing**.
Stage III	- **Automated** digital communications (radar control transfer/automated traffic hand off, AIDC/CPDLC, etc.).
Stage IV	- Implementation of CDM (Collaborative Decision Making) for other ATM requirements (AOM [Airspace Organization and Management], CM [conflict management], DCB [Demand/Capacity Balancing], AO [Aerodrome Operation], TS [Traffic Synchronization], AUO [Airspace User Operation], ASDM [ATM Service Demand Management], AIS, Meteorology, Statistics, etc.);

NOTE: SAR should be taken into consideration in all the lower airspace stages.

ii) identify the automation level required according to ATS functions defined in States´ classification of airspace and international aerodromes, as follows:

ATS Operational functions required in the automated systems (ATC, FIS, SAR)							
APPLICABLE ATS FUNCTIONS	**ATS Airspace**						
	A	**B**	**C**	**D**	**E**	**F**	**G**
Identification							
Separation							
Navigation guide							
Surveillance							
Transfer							
Coordination							
Information of flight plans in real time							
Visualization of the geographical position of the aircraft (longitude, latitude, history)							
Statistical data of flight plans (past and forecasted information).							
Radar data processing system (RDPS)							
Flight data processing system (FDPS)							
ATS inter-facility data communications (AIDC)							
Controller-pilot data link communications (CPDLC)							
Flight profile information (altitude, vertical speed, offset speed, predictive							

ATS Operational functions required in the automated systems (ATC, FIS, SAR)							
APPLICABLE ATS FUNCTIONS	**ATS Airspace**						
	A	**B**	**C**	**D**	**E**	**F**	**G**
vector, turn angle, etc.)							
Automatic alerts (STCA, MSAW, DIAW, emergency, communication failure, unlawful interference, etc.)							
AIS Interface							
Meteorological information							

iii) define the incoming and outgoing data, and functional interfaces data applicable to functions and sub-functions of the service;

iv) define from the highest to lowest level the functional decompositions for all the ATM components;

v) successively determine the different operational applications from the functional level or lowest interface to the upper interface;

vi) define the current and future operational applications needs;

vii) determine the short-term operational requirements; and

viii) determine the future operational requirements.

d) determine the existing facilities and technological equipments in the CAR/SAM Regions, especially in adjacent States/Territories/Organizaitons, as well as the inter-operability technical requirements, data bases, equipped aircraft, software tools, etc., required that ease the integration of automated systems;

e) develop a cost-benefit analysis for the integrated implementation of ATM automated systems;

f) establish bilateral and multilateral agreements as appropriate, among States/Territories/International Organizations of adjacent airspace and regions for trials and the operational implementation/integration of ATS automated systems;

g) develop standards, procedures and guidance material required (as *the Interphase Control Document (ICD) for data communications and common coordination between ATM centres, based on ICAO SARPS*) for the functional operation of ATS automated systems, including critical contingency cases, so as to serve as an aid to users;

h) take the necessary measures for human resources training on a national and regional basis and allowing the facilitation of the implementation/integration of ATS automated systems;

i) identify other potential benefits for the ATM community that may be obtained in the long-term; and

j) document an action plan permitting the interoperable implementation of ATS automated systems.

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APPENDIX B

States should develop automation architecture requirements according to the level of service required for each ATS airspace classification and international aerodrome, as follows:

ATS Operational requirements for automated systems (ATC, FIS, SAR)							
APPLICABLE /NEED	**ATS Airspace Classification**						
ATS REQUIREMENTS	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Identification of aircraft							
Separation							
Navigation guidance							
Surveillance							
Transfer							
Coordination							
Information of flight plans in real time							
Visualization of the geographical position of the aircraft (latitude, longitude, history)							
Statistical data of flight plans (past, current and future information).							
Surveillance data processing system (i.e. RDPS or ADS) a. considering future expansion capability; and b. considering format compatibility							
Flight data processing system (FDPS)							
ATS inter-facility data communications (AIDC)							
Controller-pilot data link communications (CPDLC)							
Flight track profile information (altitude, vertical speed, offset speed, predictive vector, turn angle, etc.)							
Alerting systems (STCA, MSAW, DIAW, emergency, communication failure, unlawful interference, etc.)							
Aeronautical Information Services (AIS) Interface							
Meteorological information							

a) successively determine the different operational applications from the functional level or lowest interface to the upper interface;

b) define the current and future operational applications needs; and

c) determine the short-term and future operational requirements.

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ACTION PLAN FOR THE IMPROVEMENT AND DEVELOPMENT OF ATM SITUATIONAL AWARENESS - CAR REGION

State/Organization:
Estado/Organización: _____ Date/Fecha: _____

No.	Strategic Objective/	Global Plan/ GPI	Regional Plan / FASID	GREPECAS No. Con/Dec/Pa	Target Activity	Follow-up Action	To be developed by	Deliverable	Target date	Remarks
1	2	3		4	5	6	7	8	9	10
Near term (2010)										
1	D	GPI-9		14/43 a)	Identify the feasibility to establish the bilateral/multilateral agreements for ATM automated systems.	Valid	E/T/OI	Agreements for ATS automated systems		
2	D	GPI-9		14/44	Identify the automation level required according to the ATM service provided in airspace and international aerodromes, assessing:	Valid	E/T/OI	Requirements for ATM surveillance		
					- operational architecture design, - characteristics and attributes for interoperability, - data bases and software, and - technical requirements					
3	D	GPI-7	Tables CNS1A CNS1C	12/37	Improve ATS voice and data interfacility communication.	Valid	E/T/OI	Implementation of FASID Table 1-A, and identify other ATS comms. requirements		
4	D	GPI-9		13/79	Implement flight plan data processing system and electronic transmission tools.	Valid	OACI	Improve ATM surveillance		
5	D	GPI-9	Table CNS 4A	14/48	Implement radar data sharing programs where benefits can be obtained.	Valid	E/T/OI	Improve ATM surveillance		
6	D	GPI-9		14/44	Develop situational awareness training programmes for pilots and controllers.	Valid	E/T/OI	ATM situational awareness training programmes		
7	D	GPI-9	Table CNS 4A	14/44	Implement ATM surveillance systems for situational traffic information and associated procedures.	Valid	E/T/OI	Improve ATM capacity		
8	D	GPI-9		12/31	Implement ATS automated message exchanges, as required - FPL, CPL, CNL, DLA, etc.	Valid	E/T/OI	AIDC		
9	D	GPI-9		12/31	Implement automated radar handovers, where able.	Valid	E/T/OI	Improve ATM capacity		

No.	Strategic Objective/	Global Plan/ GPI	Regional Plan / FASID	GREPECAS No. Con/Dec/Pa	Target Activity	Follow-up Action	To be developed by	Deliverable	Target date	Remarks
1	2	3		4	5	6	7	8	9	10
10	A, D	GPI-16		12/31	Implement ground and air electronic warnings, as needed -Conflict prediction -Terrain proximity -MSAW -DAIW -Surveillance system for surface movement	Valid	E/T/OI	Improve ATM safety management		
11	D	GPI-17	Tables CNS4A, CNS1B	13/72	Implement data link surveillance technologies and ATN applications: ADS, CPDLC, AIDC, as required.	Valid	E/T/OI	Improve ATM surveillance		
Medium term (2015)										
12	D	GPI-18/19		12/31 14/44	Implement additional/advanced automation support tools to increase sharing of aeronautical information -ETMS or similar -MET information -AIS/NOTAM dissemination -Surveillance tools to identify airspace sector constraints. -A-SMGC in specific aerodromes, as required.	Valid	E/T/OI	Improve ATM surveillance		
13	D	GPI-6		14/44	Implement teleconferences with ATM stakeholders.	Valid	E/T/OI	Improve CDM Process		

APPENDIX D

Surveillance Data Exchange and Sharing in the NAM/CAR Region

During the NACC/WG/2 Meeting the coverage of current radar systems operating in the Region were presented to the Meeting. The Meeting was also informed of the radar data sharing activities carried out by States/Territories/International Organizations:

- Mexico and COCESNA have subscribed a technical co-operation agreement for radar data exchange, particularly of their Belize and Cancun radar systems. Likewise, information was received on coordination carried out between Cayman Islands and COCESNA on radar data sharing as part of the existing co-operation agreement between both Administrations.
- Data sharing between Bahamas, Bermuda, Canada and United States.
- Radar data exchange in Central America among the States and COCESNA: Niktun (Guatemala) radar, Managua and Bluefields (Nicaragua) radar, Monte Crudo (Honduras) radar and Mata de Caña (Costa Rica) radar, as well as radar data sharing for operational use (Radar data of Monte Crudo at the Toncontin airport in Honduras and radar data of Mata de Caña at the Juan Santa Maria airport in Costa Rica).
- Radar data sharing between COCESNA and Cayman Islands, as well as between COCESNA (Puerto Cabezas radar) and Panama.
- The beginning of a project for the exchange of radar data between Cuba, Jamaica and COCESNA.
- Coordination for radar data exchange between Trinidad and Tobago and French Antilles and Barbados.
- The modernization of the radar system installed in San Jose, Costa Rica.

The NACC/WG/2 Meeting noted the considerations for exchange and sharing of surveillance data, such as the operational considerations for ADS-B data (**Attachment** to this Appendix), a generic sample of Letter of Agreement and the current evolution status of the ASTERIX protocol, administered by EUROCONTROL, including categories for handling both radar data and ADS-B and multilateration data. Likewise, the Meeting noted the existence of communication means and capabilities for this radar data exchange through the digital networks in the Region.

ADS-B Data Sharing

The Meeting was informed that other regions have had the experience of surveillance data sharing both of radar data and ADS-B data, which is the case of Australia and Singapore, who have developed a Letter of Agreement sample, and therefore it concurred its consideration for ADS-B related activities.

ATTACHMENT

OPERATIONAL CONSIDERATIONS

1. Part VII "Automatic Dependent Surveillance Broadcast," Chapter 4 of the *Manual of Air Traffic Services Data Link Applications* (Doc 9694) describes the considerations and procedures in a radar surveillance environment, in ADS-B and mixed surveillance, as well as ADS-B use and requirements for ATS surveillance in en route, terminal and airport environments:

a) The increased accuracy, the update rate and additional parameters available with ADS-B should result in the following benefits:
- improved services in airspace not having radar coverage;
- improved airspace utilization;
- improved conflict prediction and detection;
- improved airport surface movement, guidance, and control;
- improved runway incursion prevention; and
- improved automated conformance monitoring.

Some benefits can be realized even before full aircraft equipage.

b) An operating environment with ADS-B will enhance ATC surveillance in the following ways:
- in a mixed ADS-B/radar surveillance environment, ADS-B data will complement or supplement radar data; and
- ADS-B will extend surveillance services into non-radar airspace, such as low-altitude airspace, remote airspace and coastal waters.

At such time that an airspace is fully populated with aircraft equipped with ADS-B, ATS providers may evaluate the necessity of replacing or maintaining other ground-based surveillance equipment. First results could be obtained based on the trials strategy that have commenced in the CAR Region.

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