



Agenda Item 2: Air Navigation Services
2.1 Air Navigation Matters

DEVELOPMENT OF ATM AUTOMATION ACTIVITIES IN THE NAM/CAR REGIONS

(Presented by the Secretariat)

SUMMARY

This working paper presents a summary of the activities carried out in the CAR and NAM Regions for the implementation of ATM automation as well as considerations and aspects taken into account by the NAM/CAR Regions regarding 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
- Report of the ATM/CNS Subgroup (Dominican Republic, 30 June to 4 July 2008)
- Report of the DGAC CAP/93 (Mexico City, 9 to 10 July 2008)

**Strategic
Objectives**

This working paper is related to Strategic Objectives A and D.

1. Initial Considerations

1.1 The current regional guidelines agreed by GREPECAS to guide and support States/Territories/International Organizations with the implementation of ATM automation in ATS Centres are:

- 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.

- GREPECAS Conclusion 14/43 – *Agreements for ATM Automated System Interface*, urges States/Territories/International Organizations to take into account technical feasibility studies and operational benefits 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.”
- 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.

1.2 ICAO has developed several guidance documents on the implementation of ATM automation for use by States and Territories within each of the elements and components that contribute to ATM automation implementation, such as the technical aspects of surveillance and communications as well as the functional and operational aspects. One of these documents is the PANS-ATM (Doc 4444) - *Air Traffic Management*, which contains procedures concerning coordination to be effected between air traffic services units, between control positions of said units, and between said units and the corresponding aeronautical telecommunications stations, types of message and its contents for operational communications between computer systems of ATS units, known as ATS interfacility data communication (AIDC), etc.

2. Regional Considerations for the Implementation of ATM Automation

2.1 During the NAM/CAR Regional working group meetings known as CAR/WG and NACC/WG, the regional references and guidelines for ATM automation implementation were analysed and progress was achieved in States/Territories implementation:

CAR/WG/1 Meeting

- a) 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. The format was incorporated into the NAM/CAR Regional Implementation Plan in accordance with the agreements of the NACC/WG/2 Meeting.

NACC/WG/2 Meeting

- b) The availability of several 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 regional nature, and that active participation of all parties involved and greater ATM automation will reduce the problem. Likewise, the Meeting deemed appropriate that ATS providers ensure the application of provisions related to the submission of ATC clearances contained in Doc 4444 for flights operating from one FIR to an adjacent FIR.

- c) It was considered that messages in current flight plan (CPL) format may be used for effective exchange of flight plan updating, and that implementation and use do not result 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.
- d) It was acknowledged that a high percentage of control centres and ATS units in the NAM/CAR Regions have been upgraded, thus allowing greater data processing capacity with the implementation of flight data processing systems (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 enhances safety. This system automation is in line with the guidelines indicated in the table agreed at GREPECAS concerning airspace classification and future use.
- e) In accordance with the provided analysis and data on surveillance systems contained in the CAR/SAM Surveillance Systems Plan, FASID Table CNS 4A, corresponding to the CAR/SAM Regions, as well as the implementation of new surveillance systems such as ADS-B, Mode S and Multilateration, it was concluded that several States / Territories / International Organizations are performing surveillance/radar data exchange through bilateral agreements. Through these agreements, traffic situational awareness in the Region is improved and homologated thereby allowing 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; these agreements are detailed as follows:
 - Mexico and COCESNA have signed a technical co-operation agreement for radar data exchange, particularly of their Belize and Cancun radar systems.
 - Radar 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.

2.2 The existing communications infrastructure in the NAM/CAR Regions has improved with the implementation of digital networks prone to the implementation of new communication services as is the case for surveillance data sharing/exchange. This digital network implementation has led to improvements in the performance of the Aeronautical Fixed Services Network (AFTN) both on a voice and a ground communications basis.

2.3 The purpose of the ICD is to provide a common model for data exchange among ATS units providing air traffic services in the CAR/SAM Regions and to provide a tool to coordinate changes to this model in a centralized manner. The ICD proposes the use of messages for coordination among ATS units, especially flight plan coordination and radar transfer, based on Doc 4444 and several particular messages that may be adjusted to the identified needs of each automated system. This 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.

2.4 The results and progress achieved in ATM automation were also presented at the recent 93rd Meeting of Directors of Civil Aviation of Central America and Panama (DGCAS/CAP/93), which took note of the progress of this issue.

4. Suggested Action

4.1 The Meeting is invited to:

- a) note the information contained in this working paper;
- b) support the use of CPL for the exchange of updated flight plan data;
- c) recommend the study and analysis of the capacities/functionalities installed in the new control centres in the NAM and CAR Regions for implementation to meet ATM automation requirements;
- d) foster national plan implementation for ATM automation, considering the NAM/CAR Regional Implementation Plan; and
- e) consider and recommend other actions deemed relevant.

APPENDIX A

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

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

- 1) 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) analyse the operational environment scenarios of the air traffic services currently provided and those that are planned;
- c) determine the scope, architecture, characteristics and attributes of the operational requirements for short-term integration of current automated systems of 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	<ul style="list-style-type: none"> • Flight plan processing (FDPS/Flight Data Processing System)
Stage II	<ul style="list-style-type: none"> • Radar data processing and ATS surveillance (RDPS/Radar Data Processing System, ADS and exchange of radar information); • Monoradar; • Multiradar; • Radar data sharing.
Stage III	<ul style="list-style-type: none"> • Automated digital communications (radar control transfer/automated traffic hand off, AIDC/CPDLC, etc.).

Stage	Function
Stage IV	<ul style="list-style-type: none"> 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 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 functional decompositions for all the ATM components highest to lowest level;
 - v) successively determine the different operational applications from the functional level or lowest interface to the upper interface;
 - vi) define current and future operational applications needs;
 - vii) determine short-term operational requirements; and
 - viii) determine future operational requirements.
- d) determine the existing facilities and technological equipments in the CAR/SAM Regions, especially in adjacent States/Territories/Organizations, 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 airspaces 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 to facilitate 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 REQUIREMENTS	ATS Airspace Classification						
	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 current and future operational applications needs; and
- c) determine short-term and future operational requirements.

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	GREPCAS 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		

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