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NORTH AMERICAN, CENTRAL AMERICAN AND CARIBBEAN OFFICE
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Agenda Item 3: Activities for the development of the air navigation systems/services
3.4 CNS/ATM

FOLLOW-UP TO THE IMPLEMENTATION OF CNS/ATM SYSTEMS IN THE CENTRAL CARIBBEAN

(Presented by the Secretariat)

SUMMARY

This working paper presents the Meeting an analysis of the follow-up to the CNS/ATM matters and proposes actions to continue the implementation of these systems in a harmonised manner with GREPECAS guidelines, the Global Air Navigation Plan for CNS/ATM systems and ICAO SARPs and guidelines.

References:

- Report of the GREPECAS/11 Meeting (Manaus, Brazil, 3 to 7 December 2002).
- Report of the GREPECAS/12 Meeting (Havana, Cuba, 7-11 June 2004).
- Report of the C/CAR WG/5 Meeting (Mexico City, Mexico, 9–13 February 2005).
- Report of the NACC/DCA/2 Meeting (Tegucigalpa, Honduras, 11–14 October 2005).
- Report of the GREPECAS/13 Meeting (Santiago, Chile, 14–18 November 2005).

1. Introduction

1.1 Concerning the matters pertaining to the global air traffic management (ATM) system and to the communication, navigation and surveillance/air traffic management (CNS/ATM) systems, the Fifth Meeting of the Central Caribbean Working Group (C/CAR WG/5), noted the guidelines established in the Global Plan of air navigation for the CNS/ATM systems and the CAR/SAM Regional Plan for the implementation of the CNS/ATM systems, taking advantage of the technological developments evolution allowing to fulfill civil aviation requirements improving their efficiency, security and regularity, which requires the establishment and execution of action plans.

1.2 Likewise, the C/CAR WG/5 meeting recalled ICAO State Letter, Ref.: AN 1/63-04/96, dated 30 November 2004, pointing out to the Sates the amendments to Resolution A33-15 of the 35th Session of the ICAO General Assembly, on the Consolidated Statement of ICAO policies and practices related to CNS/ATM systems, as well as the required international collaboration to favour the evolution of the ICAO CNS/ATM systems in order to ensure that the systems become seamless and interoperable and contribute to reach a global, seamless ATM system allowing adaptation to efficiently meet regional and local needs.

1.3 Additionally, the C/CAR WG/5 meeting began the studies on ADS-C and ADS-B implementation and on the evolutionary integration of ATM automated systems. For those initial studies, the aforementioned meeting took into account the analysis of ICAO guidance material, the recommendations of the Eleventh Air Navigation Conference (AN-Conf./11), the Conclusions of the First North American, Central American and Caribbean Directors of Civil Aviation Meeting (NACC DCA/1), held in Grand Cayman, in October 2002, as well as of GREPECAS conclusions. Likewise, the C/CAR WG/5 Meeting noted that the Central Caribbean needs to foster the implementation of the Regional Plan and National Plans for the implementation o CNS/ATM Systems. Moreover, the C/CAR WG/5 meeting noted that the C/CAR needs to foster the implementation of the CNS/ATM Regional Pan and the National Plans. Likewise, it was recognized that, for the global coordinated and harmonious implementation, and the rapid obtaining of benefits for States, users and providers, international cooperation for the CNS/ATM Systems Implementation and efficient exploitation are needed. Based on this work, the C/CAR WG/5 meeting adopted the following Draft Conclusions and Decision:

C/CAR WG/5 MEETING

No.	DRAFT CONCLUSION ON CNS/ATM SYSTEMS
5/22	*Sub-Regional Action for the Study and Implementation of the ADS and ADS-B Systems*
5/24	*ATFM Points of Contact in the Central Caribbean*

DECISION ON CNS/ATM SYSTEMS	
5/23	*ADS-B Studies in the Central Caribbean*

1.4 Afterwards, the NACC/DCA/2 Meeting developed a Matrix on the CNS/ATM systems development in the NAM/CAR Regions, as well as its goals. The Matrix is aimed at providing a significant contribution to the air navigation services and systems regional development plan, helping to provide guidance on the establishment of an adequate CNS/ATM systems infrastructure in the NAM/CAR Regions in harmony with other regions development, to achieve the goal of implementing a better global air navigation system. Additionally, the Meeting considered that the Matrix should be a dynamic document requiring periodic updating of information regarding the status of development of the CNS/ATM systems in the NAM/CAR Regions. **Appendix A** to this working paper includes this Matrix.

1.5 The NACC/DCA/2 Meeting also suggested implementing regional technological solutions to facilitate the intra/inter-regional integration, harmonization and cooperation of air navigation services. Likewise, the aforementioned meeting carried out the follow-up on ATM automation and the implementation of ADS-B, and dealt with other matters pertaining to CNS/ATM systems. After the review of these subjects, the NACC/DCA/2 meeting agreed on the following Conclusions:

NACC/DCA/2 MEETING

No.	CONCLUSIONS ON CNS/ATM SYSTEMS
2/9	*Coordinated Development and Implementation of the CNS/ATM Systems in the NAM/CAR Regions*
2/10	*Application of NAM/CAR Regional Technological Solutions for Aeronautical Services*
2/11	*Interface and Operational Integration of ATM Automation Systems of the NAM/CAR Regions*
2/12	*Development of a Modernization and Implementation Plan of D-ATIS Equipment in the International airports of the CAR REGION*

1.5 GREPECAS/13 Meeting followed-up on the global, inter-regional and intra-regional CNS/ATM activities and coordination, including the revised Statement of the Basic Operational Requirements and Planning Criteria (BORPC), the status of the revision to the Global Plan of air navigation for the CNS/ATM systems, air traffic forecasts, progress in the modernization of air navigation systems; as well as follow-up actions by GREPECAS of the results of the 35th session of the ICAO Assembly, including matters regarding air navigation and other subjects. Additionally, GREPECAS/13 discussed other CNS/ATM issues concerning actions by the ATM/CNS Subgroup Committees. As a result of this review, the GREPECAS/13 Meeting adopted the main following conclusions and decisions concerning CNS/ATM systems:

GREPECAS/13 MEETING

No.	CONCLUSIONS ON CNS/ATM SYSTEMS
13/53	*Information Request on Aircraft Capability to Operate SSR in Mode S, ADS and ADS-B*

	DECISIONS ON CNS/ATM SYSTEMS
13/1	*Revised Statement of BORPC for Regional Air Navigation Planning and Implementation*
13/54	*Target Dates, Updated Strategy and Plan for ADS and ADS-B Implementation*
13/55	*FANS 1 A Interoperability Study (ADS and CPDLC)*

2. Discussion

Update of the CNS/ATM national plans

2.1 Bearing in mind the Matrix on the CNS/ATM systems development in the NAM/CAR Regions developed by the NACC/DCA/2 meeting, as well as the follow-up to the second amendment to the Global Plan of air navigation for the CNS/ATM systems and to the considerations of GREPECAS, the Central Caribbean Working Group should recommend actions so that the States/Territories/International Organizations update their respective national plans for the implementation of CNS/ATM systems, as well as other relevant related actions.

Studies on the implementation of secondary surveillance radar in Mode S

2.2 As recalled in WP/10, the GREPECAS/13 meeting considered that, for the implementation of the secondary surveillance radar (SSR) system in Mode S, it is essential to study and consider the areas in which the installation of this type of radar might be justified. Therefore, and taking into account the Global Plan of air navigation for the CNS/ATM systems, it is necessary to continue the joint analysis on SSR in Mode S operational and technical aspects with regard to the Central Caribbean.

2.3 The Global Plan sets that the use of Mode S in the secondary surveillance radar enhances the surveillance function, which is a technique using a unique direction (24 bits address) for aircraft; therefore, it allows the identification and selective interrogation of aircraft equipped with Mode S transponder, and eliminating garbling. SSR in Mode S is the surveillance system used by the States for high traffic density terminal area and en route.

2.4 Mention should be made that GREPECAS, through its 11/49 recommended considring the *"Regional Guidelines on the Planning and Implementation of Radar Surveillance Systems"*, which were presented in Appendix Q to the Report on Agenda Item 3 of the GREPECAS/11 meeting. In paragraph 10 of the foregoing guidelines, apart from recognizing that Mode S reinforces the surveillance function and provides a two-way data link capability between SSR ground stations in Mode S and Mode S transponders-equipped aircraft, it was established that "In the CAR/SAM Regions, it is not foreseen that the SSR Mode S radar surveillance be used before the year 2010; therefore, current plans within the CNS/ATM systems concept do not consider SSR Mode S requirements".

2.5 Afterwards, GREPECAS/12 and GREPECAS/13 noted that Brazil, Colombia, Dominican Republic and Mexico had installed some SSR in Mode S. Likewise, the GREPECAS/13 Meeting, among the preliminary considerations for the implementation of SSR in Mode S, indicated that high traffic density terminal and en route areas should be considered a priority.

2.6 Part of the evolution of ATS surveillance foreseen by ICAO indicates that SSR in Mode S has provided better data at a low cost. But the more recent introduction of data transmission surveillance systems, such as ADS-B provides another enhancement to the surveillance system at a lower cost. Moreover, concerning the airborne collision avoidance system (ACAS), ICAO is studying the feasibility of transmitting in downlink the resolution advisories to air traffic control, using technologies such as SSR in Mode S and automatic dependent surveillance-broadcast (ADS-B), and the feasibility of automatic indication to air traffic control that an aircraft has received a resolution advisory using conventional radar (SSR in Mode A). In the meanwhile, it is expected that States will continue using SSR in the near future, and the increasing use of data transmission surveillance systems will provide extended ATS surveillance coverage.

2.7 According to the paragraphs above, we consider that although most States/Territories/International Organizations do not have plans to implement in the short term ATS surveillance service with SSR in Mode S, also taking into account the growth of air traffic in the Central Caribbean and that most of aircraft operating in this area would be equipped with Mode S transponders, that Mode S enhances the surveillance function, and that according to the technical features prescribed in Annex 10, Volume IV, the functions that the Mode A/C transponders may perform (presently used in these regions) are integrated in Mode S transponders. And taking into account that most SSR installed in the CAR Region have mono-pulse technique with the capability of adding in the future Mode S function; it is deemed that during the useful lifespan of these radars, the implementation of Mode S might be necessary and feasible; nevertheless, it is recommended to evaluate this possibility taking into account the development produced in ADS-C and ADS-B systems.

Study of the regional ADS-C and ADS-B systems implementation

2.8 It is important to recall that the AN-Conf/11, through its Recommendations 1/6 and 1/7, approved the use of automated dependent surveillance-broadcast (ADS-B) system to support the global ATM system and to contribute to the achievement of global interoperability.

2.9 One of the objectives of the new ICAO global ATM system envisages the operational implementation of the datalink based-surveillance systems to allow that traffic information be shown in the aircraft cockpit, supporting prediction of conflicts between the flight crew and the ATM system, improving situational awareness in the cockpit through available electronic data on ground obstacles with the required quality.

2.10 In order to attain the objective expressed in the above paragraph, ICAO is proposing to introduce in the Global Plan of air navigation for the CNS/ATM systems the following strategy:

2.11 The implementation of enhanced surveillance techniques (ADS-C or ADS-B) will allow reductions in separation minima, enhancement of safety, an increase in surveillance capacity, improved flight efficiency, all on a cost-effective basis. These benefits may be achieved by bringing enhanced surveillance to areas where there is no primary or secondary radar, when cost-benefit models warrant it. In airspaces where radar is used, enhanced surveillance can bring further reductions in aircraft separation minima and improve, in high traffic density areas, the quality of surveillance information both on the ground and in the air, thereby increasing safety levels. The implementation of sets of quality assured electronic terrain and obstacle data necessary to support the ground proximity warning systems with forward looking terrain avoidance function as well as minimum safe altitude warning (MSAW) system will benefit safety substantially.

2.12 ADS implementation in surveillance systems for surface movement at aerodromes where weather conditions and capacity warrant will also improve safety and efficiency while implementation of cockpit display of traffic information and associated procedures will enable pilot participation in the ATM system and improve safety through greater environment situational awareness.

2.13 In remote and oceanic airspace where ADS-C is used, FANS capabilities exist on many air transport aircraft and could be added to business aircraft. ADS-B can be used to enhance traffic surveillance in domestic airspace. In this respect, it should be noted that the technology for Mode S (1090 ES) extended squitter is available and was accepted by the 11th Air Navigation Conference as the global choice for the ADS-B data transmission.

2.14 At terminal areas and at aerodromes surrounded by significant terrain and obstacles, the availability of quality-assured databases containing digital sets of data representing terrain surface in the form of continuous elevation values and digital sets of obstacle data of features, having vertical information in relation to adjacent and surrounding features considered hazardous to air navigation, will improve situational awareness and contribute to the overall reduction of the number of controlled flight into terrain-related accidents.

2.15 It is suggested that the C/CAR WG/6 Meeting take into account these elements that will be included in the global strategy, and follow-up and update the initiatives of the States/Territories/International Organizations of the CAR Region for planning and implementation of ADS-C and ADS-B systems, in potential implementation airspace, on the strategy and target dates, trial programmes and other aspects related with the implementation of ADS-C and ADS-B systems. The CNS Committee of the GREPECAS ATM/CNS Subgroup, in its fourth meeting, based on the initiatives of the aeronautical administrations, carried out a first approach on the potential airspace where ADS could be implemented. **Appendix B** to this working paper presents the part pertaining to the CAR Region.

2.16 Moreover, taking into account that GREPECAS/13 meeting, through its Decision 13/54, which indicated to the ATM and CNS Committees to review the preliminary regional strategy for the implementation of ADS systems, developed by the fourth meeting of the CNS Committee, gathering the works carried out by both Committees, it is suggested that the C/CAR WG/6 Meeting, taking also into account the guidelines of the global strategy, review the aforementioned regional strategy and use it as a provisional guideline for planning and implementation of ADS systems. The regional strategy developed by the CNS Committee is included in **Appendix C** to this working paper.

Integration of ATM Automated systems

2.17 The Central Caribbean Working Group should note that the GREPECAS/13 meeting considered that there is at present a high automation level in the control Centres, therefore the States/Territories/International Organizations should continue working according to the mentioned Regional Strategy including other related activities, such as: the integration of automation systems, the use of a Interface Control Document (ICD), foster the planning and development of human resources and establish coordination among the States/Territories/International Organizations.

2.18 Moreover, the ATM/CNS Subgroup reviewed the *Regional strategy for the interfacing of ATM automated systems* approved by GREPECAS/12. Nevertheless, it considered that before submitting the strategy reviewed for consideration by GREPECAS, it should be complemented with the regional Interface Control Document (ICD) and other aspects. In this respect, the ATM Automation Task Force will continue reviewing the ICD offered by Canada, Mexico and United States to obtain a uniform application material for the CAR/SAM Regions, aimed at achieving a evolutionary integration and the harmonized interoperability of the ATM automated systems in the NAM, CAR and SAM Regions.

2.19 Bearing in mind the work carried out by GREPECAS, the C/CAR WG should continue its actions to establish the integration of ATM automated systems among ATS units of the Central Caribbean.

3. Suggested actions

3.1 The Meeting is invited to:

a) note the contents of this working paper;

b) examine the possibility of proposing updates to the National CNS/ATM Implementation Plans, taking into account the considerations expressed in paragraph 2.1 of this working paper;

c) continue the studies on secondary surveillance in Mode S radar implementation, taking into account paragraphs 2.2 to 2.7;

d) follow-up on the studies on ADS-C and ADS-B implementation, considering paragraphs 2.8 to 2.16 to this paper;

e) review and propose actions on the work for the integration of ATM automated systems, taking into account paragraphs 2.17 to 2.19 to this working paper; and

f) review other matters as necessary.

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APPENDIX A
STATUS AND DEVELOPMENT GOALS OF THE CNS/ATM SYSTEMS IN THE NAM/CAR REGION REFERRED TO THE ICAO/INDUSTRY ROADMAP

AIR TRAFFIC MANAGEMENT					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
1	**Revision of ATS route structure / Dynamic and flexible route management.** The establishment of structured but flexible route systems, on the basis of RNAV and RNP capability, aimed at accommodating preferred flight trajectories.	The ATS route structure of NAM Region – Under review. To be included in updated version of the NAM ANP.	Phase II a) Implemented Phase II b) Implementation of ATS RNAV route network in CAR/SAM Regions planned by December 2005.	Implementation of ATS route structures on the basis of RNAV and RNP capability that avoid concentrations of aircraft over congested points and, eventually, implementation of a free routing environment that meets the needs of the airspace users to operate along preferred and dynamic flight trajectories.	2013
2	**RVSM /** **Implement reduced vertical separation** Increase capacity through optimized use of airspace.	RVSM was implemented 20 Jan. 2005.		Implement RVSM in all airspace. Over the long term, develop and implement new vertical separation minima.	2008
3	**Establishment of Regional airspace safety system performance monitoring structure**	NAARMO was designated for NAM Region. NAM RVSM Scrutiny Group supports NAARMO.	CARSAMMA (CAR/SAM Monitoring Agency) Implemented December 2002. CAR/SAM RVSM Scrutiny Group supports CARSAMMA.	To carry out safety assessment for any ATM implementation, as required.	- - -
4	**ACAS II Implementation** Airborne collision avoidance system (ACAS) to detect and avoid on flight conflict situations.	Implemented	Mandatory from 1 Jan,. 2003.	To achieve the goal of using ACAS II, and thus increasing flight safety.	
5	**RNAV/RNP /** **Capability performance based horizontal navigation.** The implementation of the concept of required navigation performance (RNP) so that horizontal separation can be reduced and benefits achieved by aircraft operators that equip to meet RNP requirements.	United States implemented RNP in domestic and oceanic airspace since 1998. Canada, Mexico and United States agreed on RNP implementation strategy. New RNAV and RNP harmonized implementation should be made in accordance with new ICAO provisions – (On going).	RNP 10 UL 302 and UL 780 – Implemented 22 Jan. 2004. Studies ongoing for RNAV/RNP implementation strategy for enroute, terminal and approach procedures. Interregional RNP implementation strategy for the upper airspace *a*greed Studies for interregional RNP implementation strategy in the lower airspace being carried out by other States of the CAR/SAM Regions. New RNAV and RNP harmonized implementation should be made in accordance with new ICAO provisions – (On going).	Incorporate advanced aircraft navigation capabilities as part of the air navigation system infrastructure, bringing additional efficiency benefits to the airspace users.	2011

AIR TRAFFIC MANAGEMENT					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
6	**Flexible use of airspace** The optimization and equitable balance in the use of airspace between civil and military users, facilitated through both strategic coordination and dynamic interaction.	Scheduled strategic coordination meetings for flexible use of airspace and other related improvements.	Scheduled coordination meetings for flexible use of airspace and enhancements carried out in CAR Region. Improvements are required.	The aim is for all States to evolve toward complete dynamic integration of civil and military air traffic services including real-time civil/military controller-to-controller co-ordination to the required level through adequate system support, improved operational procedures and enhanced information on civilian traffic position and intentions.	2009
7	**Alignment of upper airspace classifications**. The harmonization of Upper Airspace and associated traffic handling in each State to ensure application of a common ICAO ATS Airspace Class above a globally agreed division level.	Regional studies ongoing.	Regional studies on going.	The aim is to achieve a continuum of airspace, free from operational discontinuities, inconsistencies and disparate rules and procedures, so that transition from one segment to another is seamless to both airspace users and ATM providers. Over the long term, the ICAO classification scheme should be simplified to accommodate implementation of the Global ATM Operational Concept.	2010
8	**Enhancement of terminal operations through SIDs/STARs/IFP, etc.** The implementation of optimized standard instrument departures (SIDs), standard instrument arrivals (STARs), instrument flight procedures, holding, approach and associated procedures, taking into account improved aircraft capabilities, along with ATM decision support systems.	Interregional work between Mexico, Canada and United States ongoing.	Interregional work is ongoing. RNAV/RNP/TF (GREPECAS).	The aim is to optimize TMA capacity and efficiency and provide for more fuel efficient aircraft operations. Aircraft will gradually take on traffic synchronization activities.	2010
9	**Enhancement of traffic and capacity management through ATFM.** The implementation of air traffic flow management (ATFM) measures on a strategic and regional basis, along with reduced vertical separation minimum (RVSM) and RNP, to enhance airspace capacity and improve in operating efficiency.	Canada and United States have implemented cooperative strategic, pre-tactical and tactical measures and other improvements for traffic flows, and airspace capacity.	Some States have implemented strategic, pretactical and tactical measures to enhance traffic flows, and increase airspace capacity. Mexico has implemented strategic measures for certain airports to improve traffic flows. Planned to implement FMUs in ACCs 2008. Studies for Regional Centralized ATFM being carried out. Scheduled 2010 ATFM/TF (GREPECAS). Work to develop regional strategy implementation on going.	The overall objective is implementation of the strategic aspects of the global ATM operational concept (i.e., airspace organization and management, demand/capacity balancing, conflict management) including collaborative decision-making techniques, making use of decision support tools. Restrictions would then be largely centred on entry/exit times while tactical separation will revert to the aircraft.	2012

AIR TRAFFIC MANAGEMENT					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
10	**Enhancement of aerodrome capacity.** The ATM system should know the position and intent of all vehicles and aircraft operating on the maneuvering area so that capacity can be maintained in all weather conditions. Over the long term, aircraft design should allow enhanced ability to slow and vacate the runway.	Interregional work between Mexico, Canada and United States ongoing. Implemented procedures and improvements to increase aerodrome capacity in a*l*l weather conditions.	Some States have implemented procedures to increase aerodrome capacity in all weather conditions. Runway incursion programs, ongoing. There is a Task force on Aerodrome Capacity in the AGA/AOP/SG, which is expecting comments from States having aerodrome capacity problems. Work on regional improvements on going.	The reduction of runway occupancy times through improved runway geometry, lighting, markings and procedures, including the application of reduced runway separation minima, and improvement the ability of aircraft to maneuver on the aerodrome surface in all weather conditions.	2011
11	**Adoption of ICAO flight-level scheme to harmonize level systems.**	Implemented, 20 Jan. 2005.			
12	**Implementation of decision support systems.** **Overview Statement:** Make optimum use of currently available automation functions (e.g., automated FDPS, MSAW, STCA, URET, CTAS, MAESTRO and on-line data interchange systems) in the near and medium terms.	Interregional work between Mexico, Canada and United States ongoing for the inter*face* of ATS Automated Systems.	Several States have implemented advanced ATS automated systems. Interregional interface strategy for ATS Automated Systems ongoing Automation/TF (GREPECAS).	To implement decision support tools to assist the air traffic controller and pilot with conflict detection and resolution and traffic smoothing, making optimum use of aircraft derived data.	2012
13	**Collaborative Airspace Design** The organization of airspace, in cooperation and coordination with the ATM service provider and airspace users, so that the airspace can be flexibly and dynamically managed to accommodate the preferred trajectories of the users.	Regional improvements on going.	Work on regional improvements on going.	The aim is to standardize airspace organization and management principles applicable on a global basis, leading to a more flexible airspace design to accommodate traffic flows dynamically, initially on a sub-regional basis leading to harmonized management and allocation of airspace and route structures regionally rather than on a national basis.	2012
14	**Harmonize Level Systems** Increase capacity and improve safety through implementation of a globally harmonized and seamless airspace.	Non standard metric altitudes are used for aircraft transitioning between Alaska (NAM Region) and Russia.	Completed	Make a sustained political effort to encourage all States to adopt the ICAO Tables of Cruising Levels based on feet as contained in Appendix 3 to Annex 2 — *Rules of the Air*.	2007

COMMUNICATION					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
1	**ATN Implementation** (subnetworks, end-systems and intermediate systems and applications such as AMHS, AIDC and CPDLC).	ATN transition plan developed with focus on ground-ground applications. Test, development and validation phases completed. Operational implementation – Under review.	ATN transition plan – Under review– Considering in the short term deployment of ATN routers to implement ground-ground applications (AMHS and AIDC). The upgrade of CAR digital networks is being implement– Studies are being carried out to achieve the interoperability of CAR and SAM networks as a regional digital platform to facilitate the ATN backbone. A target date term and strategy for the deployment of ATN in the CAR/SAM regions was developed.	To implement ATN and its sub-networks ground-ground and air-ground to provide the final user an end-to-end communications system supporting air traffic services, as well as for other type of aeronautical services.	2014
2	**Air-ground communication infrastructure/ Implement Data Link Applications** Make maximum use of data link capabilities (VDL2, FANS, HF).	VHF voice provided in continental and terminal areas. HF voice provided in oceanic areas. States are implementing ACARS/FANS-1A and planning VDL Mode 2 to support CPDLC, D-ATIS and other applications. SSR Mode S data link in some airspace being planned.	VHF voice provided in continental and terminal areas. HF voice provided in oceanic areas. VHF/AMS have been improved. Several States are implementing ACARS/FANS-1A and planning VDL Mode 2 to support CPDLC and D-ATIS. SSR Mode S data link in some airspace being planned. An activities plan and the respective programme was implemented for the CAR/SAM regional strategy for the air ground data link implementation.	To implement ACARS and VDL-Mode 2 based data link services for pre-departure clearance, oceanic clearance, D-ATIS and other flight information and routine messages in the near term, as well as automatic position reporting on the part of the aircraft. Over the medium term, more complex safety related information can be exchanged, including ATC clearances. The long term use of data link will include down linking of aircraft flight parameters for use by the ATM system, and uplink of traffic data for improved situational awareness in the cockpit. Implement Data links (VDL2, FANS, HF).	2013
3	**Ground-ground digital communication infrastructure** Digital communication platforms development would allow the establishment and implementation of the inter/intra regional ATN backbone.	States have-implemented digital ground-ground networks.	Number of digital networks implemented in the Regions. Additional interconnectivity points for regional and interregional digital networks being implemented with aim of achieving interoperability of digital platform.	To achieve fully interoperability of regional/sub-regional digital networks.	2007

NAVIGATION					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
1	**GNSS Implementation** The global navigation satellite systems (GNSS), comprising satellite constellations in conjunction with appropriate augmentation systems should evolve into sole means of navigation for oceanic/remote areas, en-route continental, non-precision approach and for precision approach and landing operations.	GNSS/GPS strategy adopted for NPA and APV. SBAS based on United States-wide area augmentation system (WAAS) commissioned 10 July 2003 for initial operating capability. GNSS approach implementation programme initiated by all 3 States; GNSS augmentation system agreements completed for future expansion of GNSS concept. GNSS being used for oceanic and continental en-route operations	Strategy for implementation of GNSS adopted. SBAS test bed in cooperation with EGNOS and WAAS are being developed. Preoperational model of SBAS – Under study as a basis for the future operational system. Ionospheric model – Under study in order to apply the NPA Operation with SBAS test bed. Several CAR States have implemented GNSS/GPS NPA. GNSS being used for oceanic and continental en-route operations.	To migrate from terrestrial navigation to satellite navigation through a cooperative and cost-effective approach.	2012

SURVEILLANCE					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
1	**SSR Modes A/C and SSR Mode S**	Substantial improvements achieved in en-route area with upgrading of radar systems. In areas of Gulf of Mexico & Northern Canada, surveillance restricted to position reports sent by pilots via air-ground communications. Agreement reached between Canada, Mexico and United States to implement SSR Mode S.	Currently, SSR Modes A/C employed. Some States are introducing the Mode S. Oriented use of ASTERIX protocol for SSR data sharing. Implementation of SSR Mode S in some terminal areas and high-density en-route areas – Ongoing.	Improvements to the surveillance radar systems by implementing SSR data sharing and enhance SSR Mode S on a region-wide basis.	2011
2	**ADS-C Implementation**	ADS-C will be used in oceanic or remote areas; however, further review needed for continental domestic airspace areas.	ADS-C will be used initially for oceanic airspace and, later, in remote areas.		
3	**ADS-B Implementation** To improve surveillance in the terminal and en route environment through the implementation of ADS-A or ADS-B wherever there is presently no ATC surveillance system.	United States implementation of ADS-B in Alaska since 2001. Research and testing of ADS-B conducted in other U.S. controlled airspace. United States will use Mode S and UAT for data link. Mode S extended squitter as the data link for near-term ADS-B implementation was selected by States.	ADS-B deployment in Mexico. Trinidad and Tobago and United States planned. Trials in some other Caribbean States in progress. Implementation plan of ADS-B in CAR/SAM Regions –Under study. Mode S extended squitter as the data link for near-term ADS-B implementation was recommended by GREPECAS.	Implementation of ADS-C/ADS-B on a region-wide basis. Implement available surveillance systems for surface movement at airports where weather conditions and capacity warrant.	2011

RELATED ISSUES					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
1	**WGS-84 Implementation** The geographical coordinates used across various States in the world to determine the position of runways, obstacles, airports, navigation aids and ATS routes are based on a wide variety of local geodetic reference systems. With the introduction of area navigation (RNAV), the problem of having geographical coordinates referenced to local geodetic datums is more evident and has clearly shown the need for a universal geodetic reference system. ICAO, to address this issue, adopted in 1994 the World Geodetic System – 1984 (WGS-84) as a common horizontal geodetic reference system for air navigation with an applicability date of 1 January 1998.	Transition to WGS-84 completed in Canada and United States.	WGS-24 fully implemented in many States/Territories. Completion expected in 2006 by other States/Territories.	Total implementation of WGS-84 by all States.	2007
2	**Improvement of information exchange through Integrated AIS.** Standardize aeronautical information data exchange format and implement distributed electronic data services. Ultimately, aeronautical information management should provide quality assured information to users in real-time.	Canada and United States are providing QA aeronautical information, but United States need to adopt the ICAO Integrated AI package. The aeronautical information is processed automatically being ready for the future information exchange data model for CDM environment..	Steps to implement an automated Integrated AIS system – In progress. Regionally important steps have been taken in preparation for the data model.	To implement the global data model for the aeronautical information exchange.	2014
3	**Enhancement of Meteorological Systems (WAFS, IAVW and Automatic Air-Reporting) to support ATM** To improve the availability of meteorological information in support of a seamless global ATM system.	Migration from T4 charts to WAFS forecasts in GRIB code forms fully implemented by 31 July 2005 and in BUFR code forms~~)~~ to be fully implemented by 30 November 2006		Enhancement of WAFS in view of producing automated turbulence, icing and thunderstorm forecasts in the grid-point format, and wind and temperature forecasts with improved spatial and temporal resolution to assist ATM in tactical decision-making for aircraft surveillance, air traffic flow management and updating flight plans for flexible/dynamic aircraft routing. Enhancement of the IAVW to improve the forecast accuracy in view of the optimization of the use of airspace and to reduce the time needed for volcanic ash advisories and SIGMET to reach area control centres and aircraft-in-flight. Enhancement of automatic downlink of MET information included in ADS messages to provide accurate upper wind fields and real-time wind profiles to assist in the automatic sequencing of aircraft on approach to maximize runway capacity.	30 Nov. 2006

RELATED ISSUES					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
		A workshop on use of GRIB & BUFR-coded WAFS data was organized by WAFC Provider States, in coordination with ICAO and WMO in 2004.	A workshop on use of GRIB & BUFR-coded WAFS data for Spanish speaking States was organized by WAFC Provider States, in coordination with ICAO and WMO in 2004.		
		Two world area forecast centres (WAFC London and Washington), nine volcanic ash advisory centres (VAAC Anchorage, Buenos Aires, Darwin, London, Montreal, Tokyo, Toulouse, Washington and Wellington) and seven tropical cyclone advisory centres (TCAC Darwin, Honolulu, Miami, La Reunion, Nadi, New Delhi and Tokyo) to serve all ICAO Regions – Fully implemented.			

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APPENDIX/APÉNDICE B

POTENTIAL AIRSPACE TO IMPLEMENT ADS AND ADS-B CONSIDERED BY CAR/SAM STATES, TERRITORIES, AND INTL. ORGANIZATIONS / ESPACIOS AÉREOS POTENCIALES PARA IMPLANTAR ADS Y ADS-D CONSIDERADOS POR LOS ESTADOS/ TERRITORIOS/ORGANIZACIONES DE LAS REGIONES CAR/SAM

No.	State or Organization/ Estado u Organización/ Centre/Centro	Airspace/ Espacio aéreo	ADS Type/ Tipo	Status/ Estado	ADS-B data sharing with/ Intercambio de datos ADS-B con	Impl. Date Fecha de Impl.	Remarks/ Observaciones
1	2	3	4	5	6	7	8
	CAR						
1.	Bahamas/ **Nassau ACC**	Nassau FIR	ADS-B	S			**Studies are being carried out./ Se están realizando estudios.**
2.	Haiti/ **Port au Prince ACC**	Port-au-Prince FIR	ADS-B	S			**Studies are being carried out./ Se están realizando estudios.**
3.	Mexico/ **Mérida ACC** **Monterrey ACC**	Gulf of Mexico (Central zone between Houston Oceanic and Mexico FIRs / Zona central entre las FIRS Houston Oceanic y México)	ADS-B	P	Houston ARTCC		**Based on a Mexico - USA agreement / Basado en acuerdo México - Estados Unidos.**
4.	Trinidad and Tobago/ **Piarco ACC**	Piarco FIR (Oceanic East Sector/Sector Este oceánico)	ADS-B	P			**Further studies are being carried out./ Se están realizando más estudios.**
5.	United States/ **Houston ARTCC**	Gulf of Mexico (Central zone between Houston Oceanic and Mexico FIRs / Zona central entre las FIRS Houston Oceanic y México)	ADS-B	P			**Based on a Mexico - USA agreement / Basado en acuerdo México - Estados Unidos.**
	Miami ARTCC	Miami Oceanic FIR	ADS-B	P			
6.	COCESNA/ **Cenamer ACC**	Cenamer FIR (Caribbean and Pacific Oceanic sectors / Sectores oceánicos Caribe y Pacífico)	ADS-B	S			**Studies are being carried out./ Se están realizando estudios.**
7.		Other airspace./ Otros espacios aéreos					**Pending studies/ Pendiente de estudios.**
	SAM						
8.	Brasil/ **Atlántico ACC**	Atlántico FIR	ADS	P			**Trials have been carried out and there is an implementation plan in the EUR/SAM corridor / Se han realizado ensayos y existe un plan de implantación en el corredor EUR/SAM.**

No.	State or Oganization/ Estado u Organización/ Centre/Centro	Airspace/ Espacio aéreo	ADS Type/ Tipo	Status/ Estado	ADS-B data sharing with/ Intercambio de datos ADS-B con	Impl. Date Fecha de Impl.	Remarks/ Observaciones
1	2	3	4	5	6	7	8
9.	Chile/ **Chile´s ACC/ ACCs de Chile**	Chile FIRs (Continental and Oceanic air space./ Espacios aéreos continental y oceánicos)	ADS	S			**In 2005, tests will begin to implement ADS./ En el 2005 se comenzarán pruebas para implementar ADS.**
10.		Other airspaces/ Otros espacios aéreos					**Pending studies/ Pendiente de estudios.**

P – Planned/Planificado S – Study/Estudio

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APPENDIX C

CAR/SAM Regional strategy for the ADS and ADS-B systems Implementation

Near-Term (2005 – 2011)

1. The ADS or ADS-B implementation should be prioritize in the oceanic/continental airspaces where there is no radar surveillance available, taking into consideration the density of traffic, the operational requirements and aircrafts capability. Also, consideration should be given to the potentialities to complement or replace the SSR in a scarcely to medium traffic density area, for route surveillance, in terminal areas, for surface movement control (ADS-B) and other applications.

2. Each State/Territory/International Organization needs to evaluate the: maximum density traffic nowadays and expected for the year 2015. The useful life of their radars and the potentiality for their replacement with ADS-B, the locations of potential ADS-B ground station sites, and the capabilities of existing and planned ATC automation systems to support the ADS or ADS-B.

3. The proportions of equipped aircrafts are also critical for the ADS and ADS-B deployment, for which it is required to periodically provide, al least, the following information: number of equipped aircrafts operating in the concern airspace, number and name of the airlines that have equipped aircrafts for ADS and ADS-B, type of equipped aircrafts, categorization of the accuracy/integrity data available in the aircrafts.

4. The ADS-B deployment should be associated at early stages in coordination with the States/Territory/International Organizations responsible for the control of adjacent areas, and the correspondent ICAO Regional Office, establishing a plan in the potential areas of ADS-B data sharing, aimed at a coordinated, harmonious and interoperable implementation.

5. Each State/Territory/Organization should investigate and report their own Administration's policy in respect to the ADS-B data sharing with their neighbours and from cooperative goals.

6. The ADS-B data sharing plan should be based selecting centres by pairs and analyzing the benefits and formulating proposals for the ADS-B use for each pair of centre/city with the purpose to improve the surveillance capacity.

7. Likewise, it is necessary to consider implementing surveillance solutions for surface movement control by the implementation of ADS-B.

8. To support the ADS and ADS-B regional plan, the States/Territories/International organizations, as well as the entity representing the airspace users, should organized and provide the following information; a focal point of contact, its respective implementation plan, including a time-table, and information on its air-ground communications and automation systems.

9. The ADS-B data links technology that will be use for the Mode S 1,090 MHz extended squitter to (1090 ES). Likewise, al the end of the medium term the introduction of ADS-B data sharing could be initiated and be approved by ICAO for its use in a long-term to satisfy the new requirements of the global ATM system.
10. The implementation would be in conformity with the SARPs, ICAO guidelines and the GREPECAS conclusions.

Medium-Term (2011 – 2015)

11. Continuation of the ADS-B use with the 1090 ES technique and the planning initiation for the ADS-B implementation by new data links to satisfy the ATM global system requirements

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CAR/SAM Regional strategy for the ADS and ADS-B systems Implementation

Longer-Term (From 2015)

12. The planning and implementation would be carried out according to the ADS and ADS-B evolution, with the associated technology developments, in conformity with the global ATM systems, with the new SARPs and ICAO guidance.

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