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Agenda Item 3: Air Navigation Services

3.1 CNS/ATM

ATM AUTOMATION AND ADS/ADS-B IMPLEMENTATION

(Presented by the Secretariat)

SUMMARY

This working paper presents information on the progress achieved for ATM automation and ADS/ADS-B implementation in the NAM and CAR Regions.

References:

- Annex 10 - *Aeronautical Telecommunications*.
- Annex 11 - *Air Traffic Services*.
- Doc. 4444, PANS-ATM - *Air Traffic Management*.
- Doc 9750 - *Global Air Navigation Plan for CNS/ATM Systems*.
- Doc 9828 - *Report of the Eleventh Air Navigation Conference - Montreal, 22 Sept-3 Oct. 2003*.
- Report of the 12th Meeting of the CAR/SAM Regional Planning and Implementation Group, GREPECAS/12 (Havana, Cuba, 7-11 June 2004).
- State Letter, Ref.: AN 1/63-04/96, dated 30 November 2004.
- North American Common Coordination Interface Control Document (ICD).

1. Introduction

1.1 Annex 11, Chapter 2 makes reference to the classification of ATS airspace and related units providing these services. In this context, ATS are divided in Air Traffic Advisory, Flight Information Service and Air Traffic Control Service (Aerodrome, Approach and Area) that States shall publish in their AIPs depending on the classification of airspace, as indicated in Appendix 4 to this Annex.

1.2 Doc 4444, PANS-ATM, Chapter 8, deals with several operational applications of automation systems; to this end, it indicates the requirement for radar systems to have the capability of integrating to automated systems used for the provision of ATS and of MULTI - RADAR systems for receiving, processing and visualizing on a monitor in an integrated manner radar data from other radar sensors connected to the system. Additionally, in its Chapter 13, it mentions that the automatic dependent surveillance (ADS) capabilities as an element that may integrate to ATS automation systems.

1.3 The AN-Conf/11 adopted ADS-B as a key application of data link for the future ATM system offering new surveillance capabilities for an integral environment of cooperation and collaboration between pilots and controllers as well as for other elements of the global ATM global community. The Conference recognized the importance of automation systems in interface with ADS-B and information exchange for all the phases of flight and in all the fields intervening in the ATM system. The consensus of the Conference was that automation systems provide great advantages with an essential importance for the whole ATM system.

1.4 ICAO State Letter Ref.: AN 1/63-04/96, dated 30 November 2004, highlighted the amendments of Resolution A35-15 of the 35^o session of the ICAO General Assembly, on the consolidated Statement of ICAO policies and practices concerning a global air traffic management (ATM) system through the international collaboration to facilitate the evolution of ICAO CNS/ATM systems in order to ensure that the systems are seamless and interoperable and that they contribute to achieve a global ATM system wherein the limits of the elements are not perceived and allowing the adaptation of systems to efficiently fulfill the regional and local needs.

1.5 GREPECAS/12 Meeting, through Conclusion 12/31, formulated the "Regional Strategy for the integration of ATM automation systems"; when designing these strategies, the need for gradually evolving towards inter-functional, flexible and adaptable systems for digital processing of the required information with safety/security, quality, integrity and in real time as a platform for processing the collaborative decision making (CDM) for the benefit of the global ATM community was taken into account, as emphasized in the ATM operational concept approved by the AN-Conf-11.

Status of the ICAO SARPs and guidance material on ADS and ADS-B

1.6 ICAO has issued operational guidance material on the ADS system for air traffic services in Annex 2, Annex 11 and Doc 4444, PANS-ATM, as well as in ICAO State Letter 226-AN/135. The AN-Conf/11 adopted ADS-B as a key application of data link for the future ATM system as an integral co-operation and collaboration environment offering new surveillance capabilities for pilots and controllers as well as for other elements of the global ATM community.

1.7 Nowadays, ICAO is developing work to include additional guidelines on ADS-B in several of its documents. The general intention of these proposals for amendment is to establish procedures on the use of radar and ADS-B as identical as possible. The result of this from the pilot's and the air traffic controller's view is the provision of a highly up-to-date surveillance system technology. Other tasks assigned by the ANC to the OPLINKP include the operational concept of required communication performance (RCP), ADS-C, CPDLC and AIDC.

2. Discussion

2.1 The automation systems should be capable of providing information to the ATM system in order to optimize the capabilities of the services rendered to airspace users until and beyond year 2025. The target is to achieve a global inter-functional ATM system for all the users during all the phases of flight.

2.2 As a consequence of the relevant impact of automation systems on global ATM, the States, Territories and International Organizations have agreed on continuing working through the *Regional Strategy for the Integration of the ATC Automation systems* and on other actions within the future work of the ATM Committee of the GREPECAS ATM/CNS Subgroup, such as:

- to carry out the integration of automation systems through the use of operational applications standardized by ICAO;
- to establish a harmonized integration using the applications of a regional Interface Control Document (ICD) for data exchange and the coordination among ATS centres, based on ICAO SARPs;
- to foster planning and development of human resources applied to the regional implementation and integration study of ATM automation systems;
- to designate ATM points of contact in each State/Territory/International Organization for coordination of the integration of ATM automation systems of the CAR/SAM Regions.

2.3 During the evolution of ATM automation systems, the integration, operational use and development of technical infrastructure are very important, including communication systems supporting the implementation of operational applications. To this end, the regional application of an Interface Control Document (ICD), for the integration of ATM automation systems in the NAM and CAR Regions is important.

Recommendations of regional actions for the study and implementation of ADS/ADS-B systems in the NAM/CAR Regions

2.4 Also, the following proposed action for the deployment of ADS/ADS-B systems during implementation in the NAM/CAR Regions should be considered and reviewed taking into account the proposed strategy presented in the **Appendix** to this Working Paper.

ATM Automation Systems Integration

2.5 Likewise, the States/Territories/International Organizations should provide the information concerning the operational and inter-connectivity requirements for the interfacing of the automation systems, which includes planned actions for the implementation of ADS-B systems in the NAM/CAR Regions taking into account the strategy presented in the Appendix to this Working Paper.

2.6 In accordance with the regional strategy for ATM Automation Systems Integration approved by GREPECAS/12, the current surveillance capability, the integration and inter-operability aspects among automation systems and other implementation requirements for ATM automation in the CAR/SAM Regions have been widely discussed. The regional strategy has been recognized as perfectly viable and considered as futuristic, supporting the regional interoperable development and harmonious interfacing of ATM automation systems in the short, mid and long-term.

2.7 This strategy also includes the regional guidelines to define the requirements of the States depending on the airspace classification and the ATS service level provided as well as the support to bilateral/multilateral agreements to foster the evolutionary and harmonious implementation and of ATM automation systems in the CAR/SAM Regions.

2.8 In accordance with the comparison of the current capability of the traffic flows in the CAR/SAM Regions, it is obvious that there are still some areas with facilitation requirements, which should be planned in accordance with the objectives and functionalities of a progressively automated interregional ATM.

2.9 Although there is at present a high level of automation in some States, the States/Territories/International Organizations should continue working through a *Regional Strategy for ATM Automation Systems Interface* including other activities within the work programme of the ATM Committee, such as:

- foster the interfacing of the automation systems through the use of ICAO standardized operational applications;
- carry out an operational, technical, harmonized, interface using an interface control document (ICD) for data exchange and coordination among ATS units, based on ICAO SARPs and supplemented as necessary;
- foster the planning and development of human resources applied to the regional implementation and interfacing of ATM automation systems.
- designate ATM contact points in each State/Territory/International Organization for the coordination ATM automation systems interface in the CAR/SAM Regions.

Interface Control Document (ICD) for the Integration of ATM automation systems of the CAR/SAM Regions

2.10 The *Regional Strategy for the Interfacing of ATM Automation Systems* approved by GREPECAS, envisages among other aspects, the need for establishing a common Interface Control Document (ICD) for both regions (CAR and SAM), to achieve interoperability between automation systems and at same time the uniform application of ATM operational functions in accordance with ICAO guidelines.

2.11 Canada, United States and Mexico have developed important levels of automation interface between their ACCs, which are operational and continue to be expanded and developed using an ICD for the evolutionary interfacing of automation systems in the NAM Region. The ICD is based on ICAO SARPs and Doc 4444, PANS-ATM. In this regard, the three States offered their ICD as potential guidance material for the CAR/SAM Regions.

2.12 Taking into account that it is necessary to rely on a common ICD for the interfacing of ATM automation systems in the NAM and CAR Regions, the States/Territories/International Organizations should use the ICD Manual provided by Canada, United States and Mexico with the purpose of achieving the goal of evolutionary interfacing between automation systems in the Region.

2.13 The ICD should cover the data and messages exchange protocols for data on flight plans and exchange of radar transfer between ATS units, allowing different evolution stages of the required automation systems for an interregional ATM system.

3 Conclusion

3.1 The ATM automation systems promote collaborative decision-making through the sharing integrated information and data. The technology allows achieving important advantages with little investment towards a flexible air traffic management system. It is recommended that the States/Territories/International Organizations establish bilateral or multilateral agreements with a view to a regional ATM automation.

3.2 The view should be harmonious and evolutionary for the inter-operability between systems allowing data exchange between ATS units in order to achieve a flexible, transparent, *seamless* and optimum airspace management, increasing at the same time the required ATM safety levels.

3.3 ADS-B implementation contributes expanding and improving the surveillance system, as well as the integration of ATM automation systems to support the global ATM system.

3.4 The following Draft Conclusion is suggested for consideration by the Meeting:

cDRAFT
CONCLUSION 2/X OPERATIONAL INTEGRATION OF ATS AUTOMATION SYSTEMS OF THE NAM AND CAR REGIONS

That the States/Territories/International Organizations:

- a) define the ATM automation requirements, in accordance with their operational and technical needs;
- b) examine the regional implementation of ADS-B or other systems requirements for the integration of ATM automation systems;
- c) establish bilateral or multilateral agreements for the integration of ATM automation systems, with a view to a regional ATM automation in accordance with ICAO guidelines;
- d) designate a point of contact to participate in the work for the integration of ATM automation systems; and
- e) coordinate their action plans with the ICAO NACC Regional Office in order to ensure a regional integration of ATM automation systems, in an integral, harmonious, interoperable manner, coherent with the Regional Air Navigation Plan (ANP) of the CAR/SAM Regions.

4 Suggested action.

4.1 The Meeting is invited to:

- a) note the information contained in this Working Paper
- b) review and adopt the NAM/CAR Regional Strategy for the Implementation of ADS and ADS-B Systems presented in the Appendix to this Working Paper;
- c) review and approve the Draft Conclusion shown in para. 3.4; and
- d) consider and adopt other aspects related with this issue.

APPENDIX

NAM/CAR REGIONAL STRATEGY FOR THE ADS/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, identifying the flows with the highest current and foreseen traffic density, 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, at 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, at 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.

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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