International Civil Aviation Organization

WORKING PAPER

A40-WP/68
TE/8
11/7/19
(Information paper)
English and Spanish only[1]

ASSEMBLY — 40TH SESSION

TECHNICAL COMMISSION

Agenda Item 30: Other Issues to be considered by the Technical Commission

ADS-B IMPLEMENTATION AT CENTRAL AMERICA FIR

(Presented by the Member States of the Central American Corporation for Air Navigation Services (COCESNA) [2])

EXECUTIVE SUMMARY

This working paper presents the COCESNA experience in the modernization of the aeronautical surveillance systems within the strategic planning framework, which is aligned with the ICAO *Global Air Navigation Plan* (Doc 9750, GANP) and the regional plans. This has ensured interoperability, technological homogeneity, and meeting the needs of the region to obtain operational benefits by increasing the capacity and efficiency of air navigation services in a profitable and safe manner. It also invites to promote the exchange of surveillance data among States.

Strategic objectives:	This working paper relates to the Strategic Objectives on Safety and Air Navigation Capacity and Efficiency.
References:	Doc 9750, *Global Air Navigation Plan*

1. INTRODUCTION

1.1 During the last five years, COCESNA and its member States have implemented a medium and long-term investment plan to modernize the air navigation systems. This plan considers the *Global Air Navigation Plan* (Doc 9750, GANP) and the regional implementation plans and has adapted itself to the specific needs of the region by considering an optimum cost-benefit that allows the capacity and efficiency increase of the air navigation services offered in the diverse airspaces within the Central American flight information region (FIR).

1.2 As part of this planning, objectives and initiatives were considered to update the Central American Aeronautical Surveillance System, highlighting: the modernization of conventional radar technology systems; the new cooperative technologies contemplated in aviation system block upgrades (ASBU) (automatic dependent surveillance — broadcast (ADS-B) and wide area multilateration (WAM)).

1.3 As in other regions of the world, there is no single surveillance solution for the different environments of the Central American Region, so the use of conventional technologies with the new

[1] English and Spanish versions provided by COCESNA.
[2] Belize, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

systems in an integrated manner must be considered to solve the deficiencies in the lower levels of the airspace and ocean space of the Central American FIR.

1.4 The ADS-B is the next-generation surveillance technology, capable of replacing radar and providing significant improvements. However, additional efforts are still needed, including the development of the operational concept, separation standards for all volumes of airspace and avionics equipment to fully realise the benefits of ADS-B.

1.5 For the technologies that are being introduced, it is essential to submit each implementation to an exhaustive process that demonstrates that it supports the agreements and operational procedures under an appropriate cost/benefit ratio.

2. PLANNING AND MODERNIZATION

2.1 In the process of planning and modernization of systems, the following objectives were established:

2.1.1 SUV 1. Optimization of coverage and modernization of conventional systems

Five radar systems with conventional monopulse secondary surveillance radar (MSSR) technology were renewed with Mode S Systems with digital receiver, and ADS-B capacity included for the main terminal areas (TMAs) of Central American airports.

2.1.2 SUV 2. Implementation of new aeronautical surveillance technologies

2.1.2.1 Seven Mode S radars that were half of their lifetime were updated to equip them with digital receptors with ADS-B reception included to extend the useful life and all this with a positive cost/benefit.

2.1.2.2 An ADS-C receiver was installed in the oceanic airspace, an ADS-B receiver at the Coco Island in the Pacific Ocean, and a WAM System in the TMA of the La Aurora Guatemala International Airport.

2.1.2.3 The Central American Area and approach control service (APP) control centres were updated to allow the integration of ADS-B and WAM data in their latest Asterix version and the installation of an ADS-B server that multiplexes the data into a single surveillance source for the CENAMER control centre.

2.1.2.4 The cost/benefit and definition of the operational concept for the implementation of the satellite ADS-B in the oceanic airspace of the Central American FIR was evaluated. Specifically, it is considered that they implemented the Pacific Ocean area complementary to the coverage area of the ADS-B at the Coco Island in those areas, which do not cover the radar and ADS-B network installed on the continental shelf. The same would apply in the Caribbean area, where additional coverage will be required through satellite ADS-B. In the oceanic areas, it is planned to use a combination of satellite ADS-B and controller-pilot data link communications (CPDLC) for the coordination to evaluate the possibility of providing air traffic service (ATS) contingency services for the Caribbean countries.

2.1.2.5 Preliminary evaluations, based on information from the completed flight plans, show that around 90 per cent of the aircraft that fly over the Pacific Ocean airspace have the equipment required to use the satellite ADS-B.

2.1.3 **SUV 3. Implementation of an aeronautical surveillance network**

Migration of management and data communications systems to IP for the sharing of surveillance data with all Control Centres of Central America, thus improving the communication channels with the adjacent FIRs.

2.1.4 **SUV 4. Establishment of ADS-B regulations and operational concept**

In coordination with COCESNA Member States and through its Technical Committee, we shall work on the establishment of the necessary regulations for the use of ADS-B in the different airspaces.

2.1.5 **SUV 5. Continuous evaluation of the performance, monitoring and control of aeronautical surveillance systems**

2.1.5.1 Within this objective, a system has been implemented to ensure the performance of the different conventional ground-based surveillance systems (MSSR-S, PSR) and non-conventional systems (ADS-B and WAM), which allows continuous evaluation and publishing on a WEB page of the features regarding detection, accuracy, integrity, false targets, latency and reliability of the sensors and/or surveillance data.

2.1.5.2 It is through the assurance of the performance of the surveillance systems that the safety and efficiency of air operations are achieved.

2.1.5.3 Additionally, COCESNA is developing a monitoring system of the capacities of ADS-B avionics within the FIR surveillance, through ADS-B Asterix Cat 21 data, 2.4 edition, which are recorded permanently to extract information from the ADS-B version, figures of merit, latency and other data.

2.1.5.4 This system tracks the avionics capacities of ADS-B aircraft and determines the number of ADS-B aircraft, MOPS versions, Figures of Merit (FOM) and other information available in the ADS-B data. This allows a successful fulfilment of the ICAO command of monitoring the ADS-B capacities.

3. SHARING AND INTEGRATION OF ADS-B DATA

3.1 The sharing of radar data between control centres in Central America and adjacent FIRs improves surveillance coverage and contributes to the automation of air navigation services, thus allowing the overlap of radar coverage and maximising the availability of surveillance data.

3.2 Seven control centres were updated: CENAMER in Tegucigalpa/Honduras, backup of CENAMER in Ilopango/El Salvador and APP control centres in Belize, La Aurora/Guatemala, Mundo Maya/Guatemala, San Pedro Sula/Honduras, Managua/Nicaragua and Juan Santamaría/Costa Rica to integrate the ADS-B data in the latest version Asterix CAT 21 version 2.4 and processing according to the figure of merit to ensure data processing that meet the required quality.

3.3 Implementation of an ADS-B Server capable of integrating 16 sensors with ADS-B data sharing within the CENAMER Control Centre and CENAMER Backup. Moreover, the symbology was standardised in all control centres for the processing of the different surveillance data.

4. DATA EXCHANGE

4.1 To develop more effective and modernise any "aeronautical surveillance system," it requires the participation of the entire industry, including airlines, airport operators, manufacturers, etc. The solution to optimise services and reduce airspace separations also requires joint participation with the service providers in the adjacent and satellite spaces.

4.2 Similarly, it is necessary to effectively develop the exchange of surveillance data among the States to implement situational awareness and improve safety. In this task, ICAO has a fundamental role and requires the adoption of measures to promote such cooperation and exchange.

5. CONCLUSION

5.1 COCESNA and its Member States have an aeronautical surveillance system comprised mainly of conventional systems: MSSR/Mode S radars, which have been updated to digital receivers, thus allowing the improvement of their performance, enabling ADS-B reception, and providing a second surveillance layer at a positive cost/benefit to reduce exploitation costs.

5.2 The main surveillance deficiencies are the southern oceanic area of the FIR where radar coverage is not available, only ADS-C and at the lower levels outside the TMA where flight information is provided, mainly due to orography.

5.3 It is estimated that through the implementation of the satellite ADS-B in the Pacific Ocean airspace, the minimum longitudinal separation between aircraft at the same flight level that follows the same track could be improved. Allowing aircraft to more efficiently manage their altitude and reduce the problems that currently occur especially about the fixed LIXAS to the southeast of the FIR, which acts as a funnel given the large number of flights that converge on the area. All the above would result in lower fuel consumption as well as reduced CO2 emissions and would likely provide more direct routes.

5.4 There is no single solution to the current deficiencies, so the use of conventional surveillance systems and new technologies (MLAT, ADS-B, and ADS-C), or a combination of these, are being considered as is the case of the TMA of La Aurora, where the first WAM system in Central America that includes ADS-B capacity in all stations will be installed.

5.5 The improvement in the surveillance and reduction of aircraft separations in the oceanic airspace of the Pacific Ocean requires a joint solution with the adjacent air navigation service providers and the satellite ADS-B providers to achieve benefits for all airspace users.

5.6 To ensure the early implementation of the ADS-B technology, cooperation of the entire civil aviation industry is necessary.

5.7 The Assembly is invited to: take note of this working paper regarding the ADS-B implementation in the Central American FIR; and to instruct the ICAO Secretariat to take the necessary measures to promote the exchange of surveillance data among the States to increase situational awareness and operational safety.

— END —