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South American Regional Office 09/27/2022
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(Lima, Peru, 3 to 7 October 2022)

Agenda Item 5: Other Business

PROGRESS, CHALLENGES AND ADVANTAGES OF ADS-B IMPLEMENTATION IN THE SAM REGION

(Presented by Colombia

SUMMARY

This working paper presents the implementation status of the Automatic Dependent Surveillance - Broadcast (ADS-B) in the SAM Region, the progress made by some States and the difficulties encountered, as well as, its use in the control centres and towers, the compliance process in the industry and the updating of aeronautical standards for its implementation; all with a view to the enhancement of Safety and Air Navigation.

References:

- Annex 10 — *Aeronautical Telecomunications*, Volume IV — Surveillance and Collision Avoidance Systems
- First NAM/CAR/SAM Meeting/Workshop on Planning the Implementation of Automatic Dependent Surveillance – Broadcasting (ADS-B/ANP/1) (Teleconferences 2–4 March 2022)
- *Guide on Technical and Operational Considerations for the Implementation of ADS-B in the SAM Region.*

ICAO Strategic Objectives:	*A – Safety* *B – Air Navigation Capacity and Efficiency* *ASBU: ASUR-B0/1 (ADS-B), ASUR-B1/1 (SB ADS-B)*

1. INTRODUCTION

1.1 As the basis for ADS-B implementation in the SAM Region, a harmonized Surveillance Strategy for the CAR/SAM Regions and a Guide on Technical and Operational Considerations for the implementation ADS-B in the SAM Region have been drawn up.

1.2 In the near future, this technology is likely to replace secondary radars, which have provided excellent surveillance service for a long time, but new technologies and the Global Navigation Satellite System (GNSS) now in place provide a better service at a significantly lower infrastructure cost. In countries in which it has been deployed, such as Australia, United States of America (USA) and much of Europe, it has displayed high accuracy and reliability as a surveillance system.

2. DISCUSSION

2.1 Ground-based ADS-B implementation in the SAM Region

2.1.1 **Argentina:** ANAC has approved the draft air traffic surveillance system modernization plan, which provides for the technological upgrading of 22 INVAP-manufactured secondary radars currently operating in Mode S and ADS-B, replacement of A/C/S primary and secondary radars with ADS-B and a meteorological channel for the terminal at Baires, Cordoba and Mendoza, installation of two new Mode A/C/S and ADS-B secondary radars in the Comodoro Rivadavia FIR and five ADS-B stations in order to broaden aeronautical surveillance coverage. Under the schedule, these facilities will be ready in 2025.

2.1.2 **Brazil:** Brazil has effected ADS-B implementation primarily in support of air operations in Macaé TMA, which is an area of importance to the petroleum sector and is characterized by helicopter movement between the mainland and platforms or vessels anchored at Cuenca, in that oceanic basin, for the transport of persons and cargo.

2.1.2.2 To serve Cuenca de Campos, which is in the Macaé TMA airspace, six ADS-B stations will be installed – four on offshore stations and two on the mainland. This infrastructure, integrated into the existing radar network that supports air traffic control in that region, will permit surveillance throughout the TMA airspace at 500 feet and above.

2.1.2.3 Likewise, Brazil has a project to implement 66 ADS-B stations to provide coverage of all continental airspace, which will be developed in phases.

2.1.3 **Chile:** A feasibility study was conducted in 2013 on the provision of low-level surveillance between the Cochrane area and Puerto Montt. It covered secondary radars, multilateration (MLAT) and ADS-B. As a result, it was proposed mainly that ADS-B hardware be installed and it was concluded that a total of 14 ADS-B stations were required.

2.1.4 **French Guiana (France):** French Guiana has installed five ADS-B stations in the following places: Rochambeau, Mont Matoury, Maripasoula, Mana and Saint Georges.

2.1.5 **Guyana:** Guyana has installed four ADS-B stations: Port Kaituma (SYPK), Kamarang (SYKM), Kaieteur SYKA) and Annai (SYAN).

2.1.6 **Panama:** Panama has installed four ADS-B stations, at Cerro Jefe, Volcán Barú; Cerro Cana Agua and El Porvenir.

2.1.7 **Paraguay:** Paraguay has installed six ADS-B stations, at the M.R. Alonso One-Stop System Centre, Guaraní Airport, Concepción Airport, San Juan Baptista, Mariscal Estigarribia Airport and Bahía Negra Airport.

2.1.8 **Peru:** Peru has completed the modernization of its automatic system in the Area Control Centre to permit the integration of all signals from its SSR, ADS-B and MLAT surveillance sensors combined. In the last two years, it has completely repowered eight secondary radars, which has entailed the installation of eight integrated dual ADS-B receivers, additional to the independent ADS-B system currently in place at Pisco.

2.1.9 **Uruguay:** Uruguay has divided ADS-B implementation into three phases: Phase 1 – ADS-B as back-up or for SSR contingencies at Carrasco and Durazno; Phase 2 – Gap filler in areas with no SSR coverage in 2019-2023; and Phase 3 – Installation of five ADS-B/MLAT ground stations (for wide area multilateration (WAM) configuration) in 2023-2025.

2.1.10 **Venezuela:** Venezuela has initiated the procurement of ADS-B systems for Lagunazo, Santa Elena de Uairen, Cerro Los Colorados Station, Cerro Catire Station, Puerto Ordaz Airport, Margarita Airport and La Chinita Airport.

2.1.11 **Colombia**

2.1.11.1 Colombia has installed a total of 25 ADS-B receiver stations and two fusion processors from three manufacturers: Spain's INDRA, for airports or aeronautical stations at Tumaco, Bogota, Barranquilla, Santa Helena, San Jose del Guaviare, Mitú, Tasajero, Monteria, San Andres, Riohacha and Florencia; Germany's COMSOFT, at Araracuara, Leticia, Puerto Inírida, Puerto Carreño, Puerto Leguizamo, Carepa, Santana and the Bogota fusion processor; and Spain's GECI, at Neiva, Arauca, Cartagena, Yopal, Bucaramanga, Pasto, Quibdó, and the Bogota fusion processor. See Figure 1.

2.1.11.2 These sensors are currently integrated into various surveillance centres and halls, with ASTERIX, Category 21, version 0.23, where operationally required.

2.1.11.3 The 1090ES has been chosen because it is compatible with current secondary radars, which also receive 1090 MHz, thus facilitating transition. Moreover, it is the protocol recommended by ICAO and the one most used in States that have already implemented ADS-B. For these reasons, it was concluded that it was the most suitable protocol for Colombia and possibly for the Region's other States. The costs of ground infrastructure, together with installation and integration into operational platforms in various control centres and towers, and the maintenance and operation of these services in the medium and long terms have been assessed and it was concluded that those costs were much lower than conventional technology costs and that Colombia should stand ready to aid and assist States with this important acquired knowledge which would constitute a challenge for the Region's States in implementing this technology.

2.1.11.4 Colombia has therefore taken the initiative of encouraging SAM Region States to implement ADS-B technology as a regional endeavour by sharing resources and assisting in process implementation for the above reasons, drawing on the experience gained over several years by ANSP staff in Colombia. In conclusion, the cost-benefit analysis is much more favorable than that of the operation and maintenance of primary and secondary radar systems, but it must be explained that an ADS-B system relies on the satellite constellations that provide GPS location of aircraft and it must therefore be regarded for the time being as alternate and complementary to secondary SSR Mode S radars, which must continue to be used and properly maintained.

2.1.11.5 A study has been conducted on the prices of hardware on board aircraft both in the normal category and in the commuter and transport category. In the case of aircraft in the normal and commuter categories, it found that there was a wide and varied choice of manufacturers, such as Garmin, Avidyne, Appareo, Bendix King, Trig Avionics, Aspen Avionics, Cobham and Dynon, among others, and that ADS-B hardware prices were in the USD 2,000 range and were comparable with the prices of Mode S transponders, which meant that the switch to ADS-B would not be an excessive financial burden on these aircraft operators. In the case of aircraft in the transport category, the choice was rather limited to only ACSS (known as Thales-Raytheon), L3 Aviation and Honeywell. Hardware prices were high, in excess of USD 100,000 (STC included). The evaluation noted that most of these aircraft flew on approved routes to the USA, which meant that ADS-B installation was mandatory in order to retain those routes. In Colombia, only a few transport-category aircraft, in particular cargo carriers, do not operate on approved routes in the USA and their ADS-B installation costs are high.

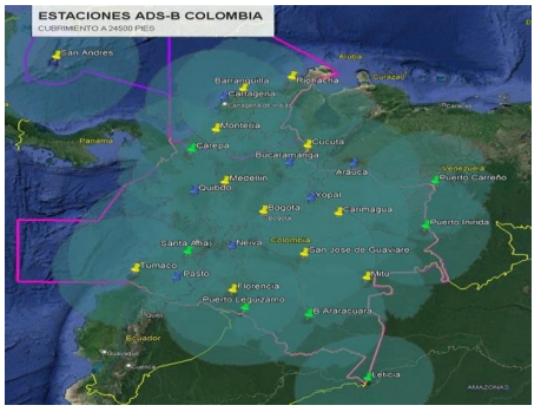
2.1.11.6 In view of the foregoing, it was decided in March 2016 to implement ADS-B and to set 1 January 2020 as the inception date, which has been extended to 1 November 2023.

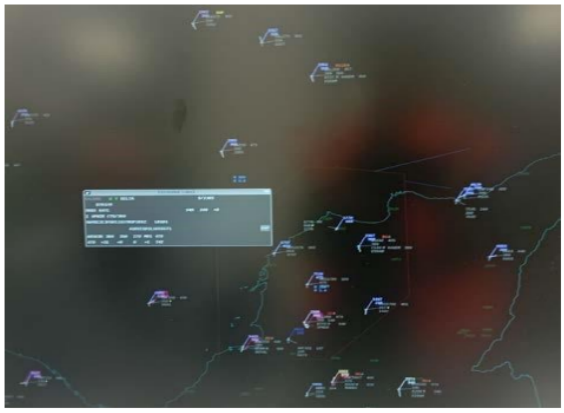
2.2 *Project on satellite-based ADS-B implementation*

2.2.1 In accordance with Project RLA/06/901 – Assistance for the establishment of a regional ATM system based on the ATM operational concept and the corresponding technological support for communications, navigation and surveillance (CNS) and with the related activity framework adopted at the Eleventh Meeting of the Coordination Committee (RCC/11), held in Lima, Peru, on 5 October

2017, consideration has been given to the need to conduct an analytical study on the desirability and feasibility of ADS-B satellite service provision at the regional level under the action plan on the establishment of surveillance, MLAT and ADS systems in the region.

2.2.2 The Implementation Group approved the preliminary study and requested that States contribute additional information so that it could be completed. Accordingly, the CNS specialist was assigned the task of concluding the study in the week of 24 to 28 September 2018; it which was effectively completed and submitted to the SAM/IG/22 Meeting, held in Lima from 19 to 23 November 2018. The SAM/IG/22 Meeting approved the study and requested the Secretariat to circulate the document to all of the Region's States for information and for evaluation by each country's planning officials with a view to supporting the Meeting's discussions on participation in regional implementation.





3. CONCLUSIONS

3.1 ADS-B is a surveillance system that has advantages over secondary radars and other methods such as MLAT and WAM, owing to its high accuracy and low infrastructure costs. Many States are migrating towards this technology. In the SAM Region, Colombia is one of the pioneering States and it is willing to work with other States to establish an integrated regional system.

3.2 The Meeting is suggested to promote the work carried out by the CNS/SUR Subgroup of the INTEROP TF, with the purpose of developing an initiative that seeks to share information and surveillance data among the States that make up the Region, including ADS-B data, either information from ground or satellite stations and in accordance with the system implemented by each Air Navigation Service Provider and the Authorities in each State.

4. SUGGESTED ACTIONS

4.1 The Meeting is invited to:

a) Take note of the information presented;

b) Discuss ways to promote ADS-B implementation in the SAM Region and the exchange of surveillance information; and

c) Analyze other considerations that the Meeting deems pertinent.