



**Agenda Item 5: Operational implementation of new ATM automated systems and integration of the existing systems - ADS-B implementation in the SAM Region**

**IMPLEMENTATION OF ADS-B IN COLOMBIA**

(Presented by Colombia)

**SUMMARY**

The purpose of this working paper is to present the study conducted by the Civil Aviation Authority of Colombia for the implementation of ADS-B. The regulation mandating the use of ADS-B equipment was published on 7 March 2016.

**References:**

- ICAO Doc 9924 “Aeronautical Surveillance Manual”
- Guide on Technical Operational Considerations for the Implementation of ADS-B in the SAM Region
- Regulations of different States that have already mandated the implementation of ADS-B OUT

**1. Background**

1.1 Amongst the new CNS/ATM technologies being developed for aeronautical surveillance, ADS-B is emerging as the future successor of secondary radar, since it provides the same service with more precision and significantly lower infrastructure costs. It has been successfully implemented in countries like Australia, and tests conducted in the United States have proven satisfactory.

**2. Discussion**

2.1 ICAO Doc 9924 - Aeronautical Surveillance Manual defines ADS-B as automatic dependent surveillance radio equipment that transmits, from the aircraft, its position (latitude, longitude, and altitude), speed, identification, and other aircraft data. The SAM Implementation Group published the *Guide on Technical Operational Considerations for the Implementation of ADS-B in the SAM Region*, version 1.2 in May 2013.

2.2 A review was made of regulations of States such as Australia, New Zealand, United States and Europe, which mandate ADS-B implementation on dates between 2018 and 2021.

2.3 ADS-B transmission protocols currently available were assessed: 1090-ES (Extended Squitter), 978-Mhz UAT (Universal Access Transceiver) and VHF Data Link mode 4. These three protocols have technical advantages and disadvantages. For example, UAT is the most inexpensive and is FIS (Flight Information System) capable, but is limited to normal category aircraft and up to FL-180. In addition to surveillance services, VDL 4 can provide CPDLC (Controller Pilot Data Link Communication) service, which makes it very versatile, but is not compatible with current secondary radars.

2.4 Finally, 1090-ES does not have UAT protocol FIS capability, or VDL-4 CPDLC capability. However, it is compatible with the current secondary radars, since they also receive in 1090 MHz, which facilitates transition. Furthermore, it is the most widely used protocol in the States where ADS-B has already been implemented. Therefore, it was concluded that this was the most suitable protocol for Colombia.

2.5 An assessment was made of ground infrastructure costs and the integration of these sensors, which is a challenge given the dynamic way in which information on targets is delivered through TCP/IP protocols for display at the various control centres. The conclusion was that costs were much lower compared to secondary radar stations. However, it should be noted that ADS-B systems rely on the satellite constellation that provides GPS location of aircraft, and therefore should be considered supplementary to SSR Mode S secondary radars, which should continue to be used and to receive proper maintenance.

2.6 The cyber-security of communication networks that carry ADS-B information should also be taken into account, since it is more susceptible to be the target of cyber-attacks that could lead to erroneous information, requiring filtering before delivery to ATM operational centres.

2.7 Prices of on-board equipment were analysed for both normal category aircraft and commuter and transport category aircraft. In the case of the normal and commuter categories, a wide range of options was found from manufacturers such as Garmin, Avidyne, Appareo, Bendix King, Trig Avionics, Aspen Avionics, Cobham, Dynon, amongst others. Prices for ADS-B equipment start at USD 2,500 and are comparable to prices for mode S transponders. This means that the transition to ADS-B will not entail an unreasonable financial burden for aircraft operators. In the case of transport category aircraft, options are still scarce, with only ACSS (now Thales-Raytheon), L3 Aviation and Honeywell in the market. Prices for these units are high, over USD 100,000, including the STC. The assessment took into account that most of these aircraft also have routes approved to the United States, which means that ADS-B installation is mandatory in order to maintain these routes. In Colombia, only a few transport category aircraft, especially in the cargo modality, do not have routes approved to the United States, and for them, the installation of ADS-B represents a high cost.

2.8 In view of the above, the decision was made in March 2016 to implement ADS-B, starting on 1 January 2020, on all aircraft registered in Colombia and on those using Colombian airspace. The regulation was published under item [4.2.2.6](#) of the Aeronautical Regulations of Colombia, which means that aircraft have 3 years and 9 months to be fitted with ADS-B OUT. The installation of ADS-B ground stations was also started. Colombia has already installed 18 stations and 7 are scheduled for this year, totalling 25. In **Annex 1**, stations already installed are shown in yellow and those planned for installation are shown in red.

### **3. Conclusions**

3.1 Colombia suggests the other SAM States to start implementing ADS-B. Undoubtedly, this technology will replace secondary radars, which have provided an excellent surveillance service for a long time. But the new technologies and the introduction of GNSS (Global Navigation Satellite Service) will improve this service, with lower infrastructure costs.

3.2 ADS-B satellite technology must be technically and financially assessed in comparison with the ground ADS-B service. It could be supplemented with ground stations for areas lacking coverage by such stations.

3.3 ADS-B is a surveillance system with many advantages over secondary radar and other methods, such as multilateration (MLAT) and WAM, because of its high precision and low infrastructure cost. Many States are already migrating to this technology. In the SAM Region, Colombia is a pioneering State and is willing to cooperate with other States in order to develop an integrated regional system.

3.4 Colombia is willing to participate in a Regional Working Group to develop an initiative for sharing surveillance information and data from ground or satellite stations among the States of the Region, including ADS-B data, in accordance with the system implemented by each authority.

**4. Suggested action**

4.1 The Meeting is invited to:

- a) take note of the information provided in this working paper; and
- b) analyse technical requirements and suggest activities to encourage ADS-B implementation in the SAM Region to ensure interoperability.

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**ANNEX 1**

**ADS-B STATIONS IN COLOMBIA**



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