International Civil Aviation Organization
North American, Central American and Caribbean Office

WORKING PAPER

ADS-B/OUT/M — WP/09
16/08/19

Automatic Dependent Surveillance – Broadcast OUT Implementation Meeting for the NAM/CAR Regions (ADS-B/OUT/M)

Ottawa, Canada, 21-23 August 2019

Agenda Item 2: **Update Status ADS-B Implementation for States**
2.3 ADS-B trial Statistic collection

COLLECTED STATISTICS ON ADS-B TRIALS IN CENTRAL AMERICAN FIR

(Presented by COCESNA)

EXECUTIVE SUMMARY

This Working Paper presents the results obtained by COCESNA related to statistics generation of ADS-B data on its capacity and the performance of aircraft notified position in Central American to comply with the monitoring requirements and assess the ADS-B information.

Action:	Suggested action is presented in Section 4.
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• Global Air Navigation Plan (GANP) • Strategic Plan of COCESNA

1. Introduction

1.1 Automatic dependent surveillance – broadcast (ADS- B OUT) technology implementation in 1090ES is a key component in COCESNA and its Member States' systems modernization plan. As indicated in WP/04, thirteen (13) ground based ADS-B systems have been installed, as was as one server that collects and multiplex received data of all the ADS-B receptors in a sole database that is integrated to the CENAMER Control centre.

1.2 Additionally, APP control centres have been updated in the different Central American States to integrate ADS-B data that correspondent to their airspaces. These installations have allowed having a second surveillance layer in all the airspace covered by Mode S radars in the continental area and offshore the north part of Central American FIR, as was as another portion of the Pacific Ocean area of the Central American FIR.

1.3 For the operational usage of the ADS-B in a combined manner, in radar and no radar areas (unique surveillance source), and in order for it to be secure, it is necessary to define the operational concept, establish the required standards and to carry out a safety assessment allowing to verify if the performance level of the ADS-B for a determined area exceeds the required levels.

1.4 Safety assessment requires periodical monitoring of ground based stations through monitoring and management systems, determining avionics capacity and the performance level of the information provided by aircrafts.

2. MONITORING ADS-B SYSTEMS AND OBTAINED RESULTS

2.1 By the end of 2018 and during 2019 an informatics system has being developed to allow the capturing, recording and analysing statistical ADS-B data provided by the ADS-B server for monitoring the ADS-B capacities, performance level of the position and the speed notified by aircrafts, and other aircrafts transmitted data.

2.2 Statistics are generated by a database, where are stored each of the Asterix messages fields in Category 21, Version 2.4, registering for each flight the aircraft information and related events with their ADS-B version, Figure of Merit (FoM) of position and speed, identification (ICAO Address, call sing/registry and Mode A), characteristics of message, aircraft status, speed and position information, geometric and barometric high, message date, aircraft intention, latency, loss gap and other received information.

2.3 According to the obtained results, the number of received messages exceeds the 4 million messages per day, considering an updating rate of one second, and the number of identified aircrafts by its ICAO address in all the airspace is higher than an average of seven hundred aircrafts. These data and other generated statistics require validation and deep analysis to obtain conclusions of their outcome.

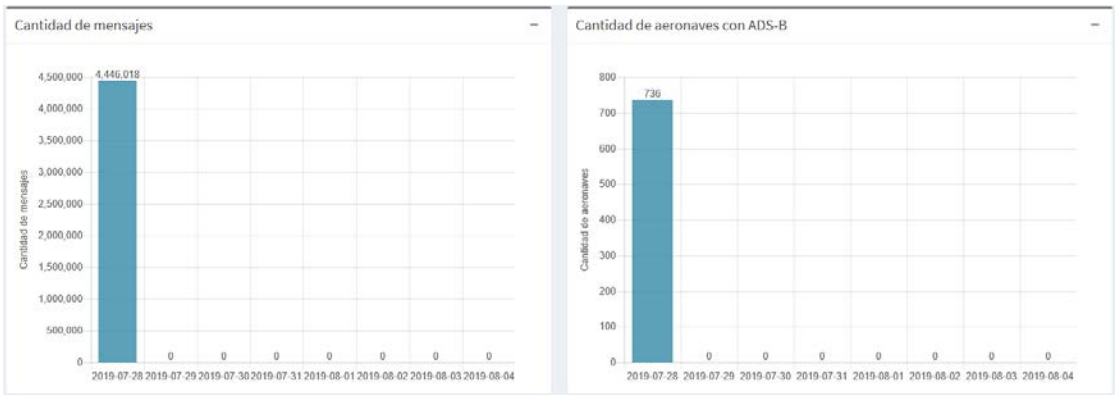

Fig. No. 1.- Number of messages and aircrafts with ADS-B per day

2.4 ADS-B capacity and version in the aircrafts shows interesting data, since in comparison with the 5% of aircraft with Version 2 that were detected in ADS-B trials in 2013, in the last 8 months an increase has been observed from 55% to 80% of aircrafts equipped with ADS-B DO-260B, decreasing the number of aircrafts with Version 0 (DO260). In the case of Version 1 (DO260A) it is stable in 1%.

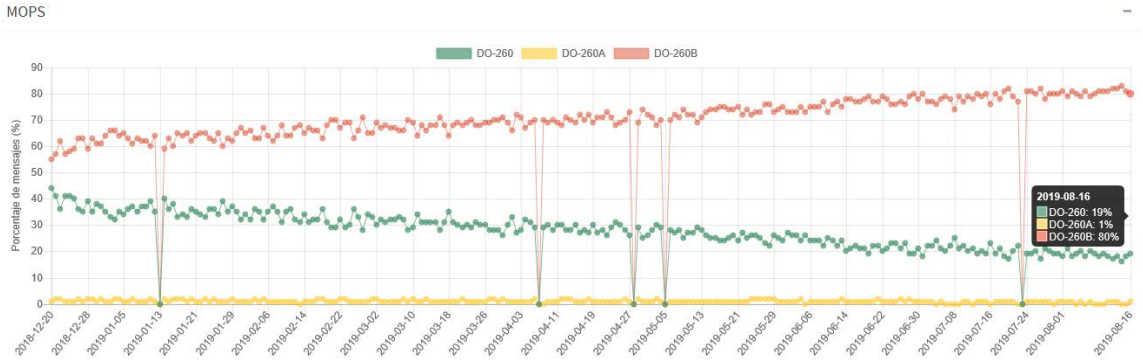

Fig. No. 2.- ADS-B Version evolution in aircrafts(DO-260, DO-260ª and DO-260B)

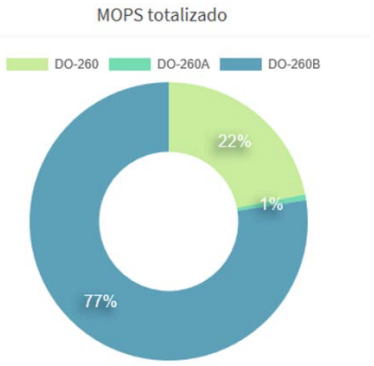

Fig. No. 3.- ADS-B version average in aircrafts

2.5 Precision and integrity of position information transmitted by ADS-B avionics are represented by the Navigational accuracy category – position (NACP), the Navigation integrity category (NIC), the System Design Assurance (SDA) and the Sourse Integrity Level (SIL), being this Figures of merit with their acceptable levels the ones that are used to establish the required performance for the usage of data in the diverse airspaces.

2.6 Related to integrity and precision Figures of Merit of the messages (NUCp/NBIC) and NACP respectively, it is observed that the majority of the received messages have a NUCp/NIC lower than 0.1 NM and the enhancement of the position precision as part of the aircraft equipment with Version DO-260B. See Figures 2 and 3.

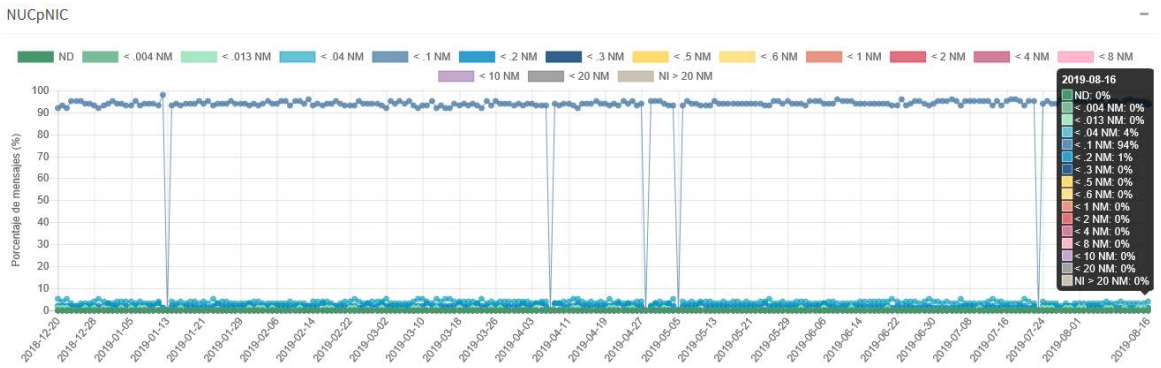

Fig. No. 4.- NUCp/NIC Data reported by aircrafts

Fig. No. 5.- NACp Data reported by aircrafts

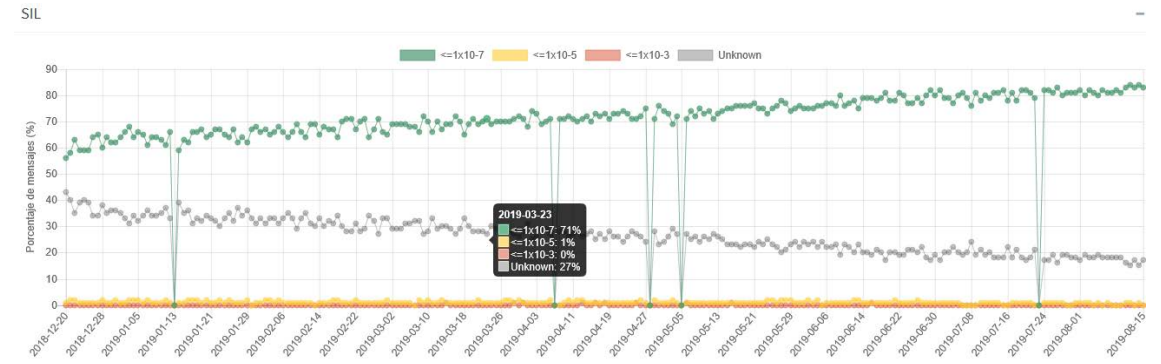

Fig. No. 6.- SIL Data reported by aircrafts

2.7 Here by are shown examples of how to filter data using performance levels of the region based with the established by other States. With these criteria is possible to filter the aircrafts that comply with a determined performance level.

Fig. No. 7.- Example of ADS-B Performance level establishment to filter data

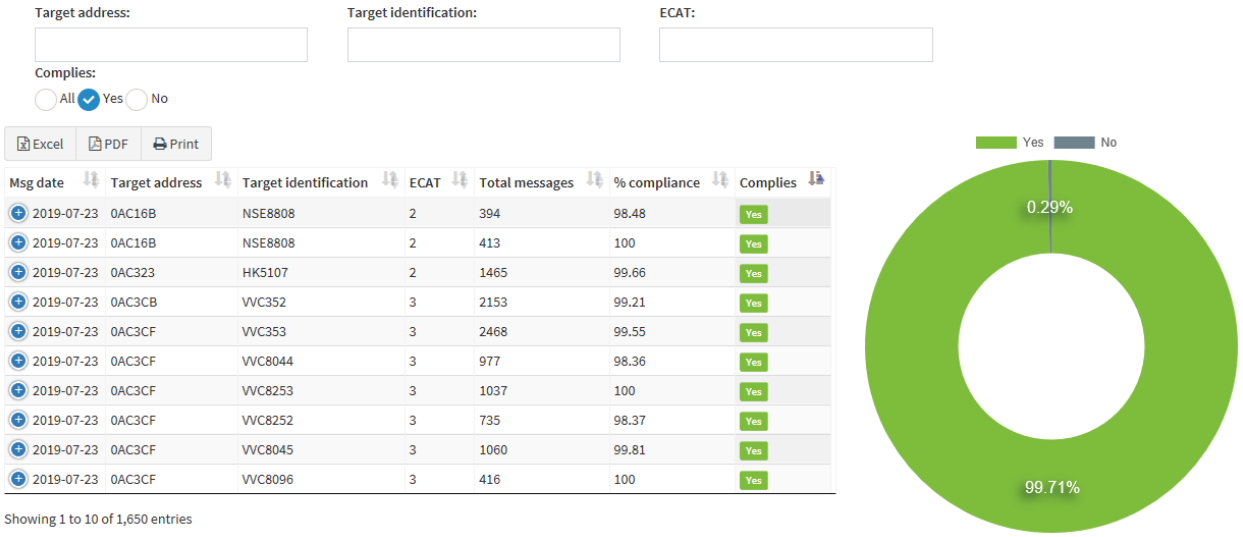

Fig. No. 8.- Filtered aircraft data base on ADS-B performance

3. CONCLUSIONS

3.1 It is necessary monitoring permanently and periodically the ground based ADS-B, avionics and the performance level of the provided data in an automatized manner to assure that safety of the ADS-B implementation complies with the established requirements for the different airspaces.

4. SUGGESTED ACTIONS

4.1 The Meeting is invited to:

a) Be aware of this Working Paper on the ADS-B monitoring system implementation.

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