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

WORKING PAPER

NACC/WG/7 — WP/12
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Seventh North American, Central American and Caribbean Working Group Meeting (NACC/WG/7)
ICAO NACC Regional Office, Mexico City, 30 August - 1 September 2022

Agenda Item 3: **Follow-up of the Activities of the NACC/WG Task Forces**
3.1 Progress of the NACC/WG on Aeronautical Information Management (AIM), Air Traffic Management (ATM) and Communications, Navigation and Surveillance (CNS)

TECHNICAL ASSISTANCE AND COLLABORATION FOR THE INSTALLATION OF STATISTICAL ANALYSIS SOFTWARE OF ADS-B AERONAUTICAL SURVEILLANCE SYSTEMS

(Presented by Cuba)

EXECUTIVE SUMMARY	
This working paper presents actions carried out in the technical assistance through the collaboration project between Cuba and Mexico with the installation of the ADS-B statistical analysis system developed by Cuba.	
Action:	Suggested actions are presented in Section 5.
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency • Economic Development of Air Transport
References:	• ICAO Doc 9924, ICAO Cir324, EUROCONTROL ASTERIX.

1. Introduction

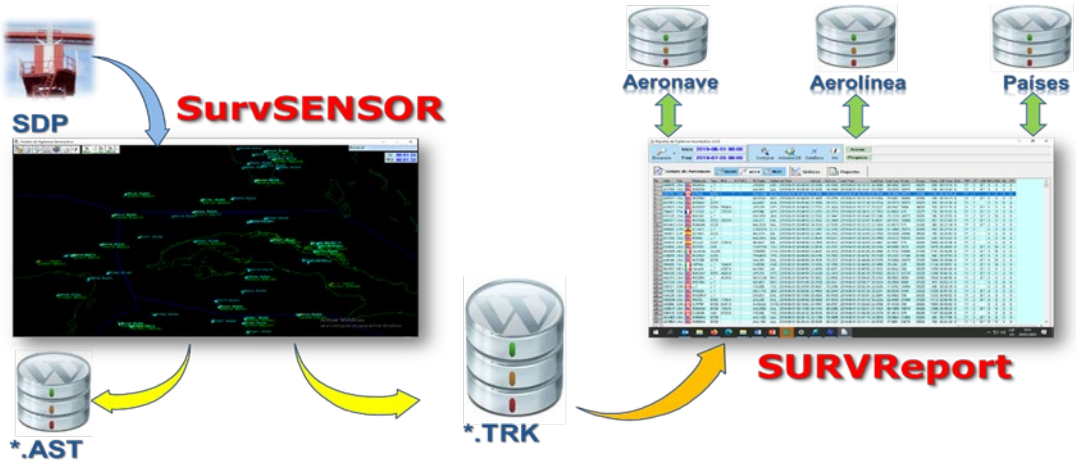
1.1 ICAO and México, through the Civil Aviation Federal Agency (AFAC) coordinated this technical assistance mission based on the offer made at the Ottawa Automatic dependent surveillance-broadcast (ADS-B) implementation meeting in 2019 by the Surveillance Group rapporteur, in order to supply software developed by Cuba for monitoring and statistical compilation of the performance of the ADS-B systems, which was of interest to the Mexican delegation for monitoring the installed ADS-B receivers, making this request official in 2020, an action that was postponed due to the pandemic of COVID-19 and being able to execute from 15 to 21 May 2022.

1.2 For the study required on the ADS-B implementation trials, Cuba has developed several tools that made it possible to decode, store and process information from the different sources of the surveillance systems it has. such as RADAR, ADS-B and multilateration (MLAT). Since the end of 2014, this storage began to later obtain this information that would serve as the basis for statistical analysis of the system's performance.

1.3 Following the aspects that must be taken into account in ICAO Doc 9871 to evaluate the quality of a surveillance system, the comparison criteria were selected to make a rational comparison in terms of region of interest, system coverage, flight level, detection time, information quality, accuracy, and system availability.

2. Analysis

2.1 The installation of the developed tools (SURVSensor-SurvReport) was carried out in the control area (CTA) of Mexico, achieving the coupling between the software and 7 available ADS-B receivers to start their storage and statistical processing, which was achieved thanks to the procedures and configurations of the system technicians.

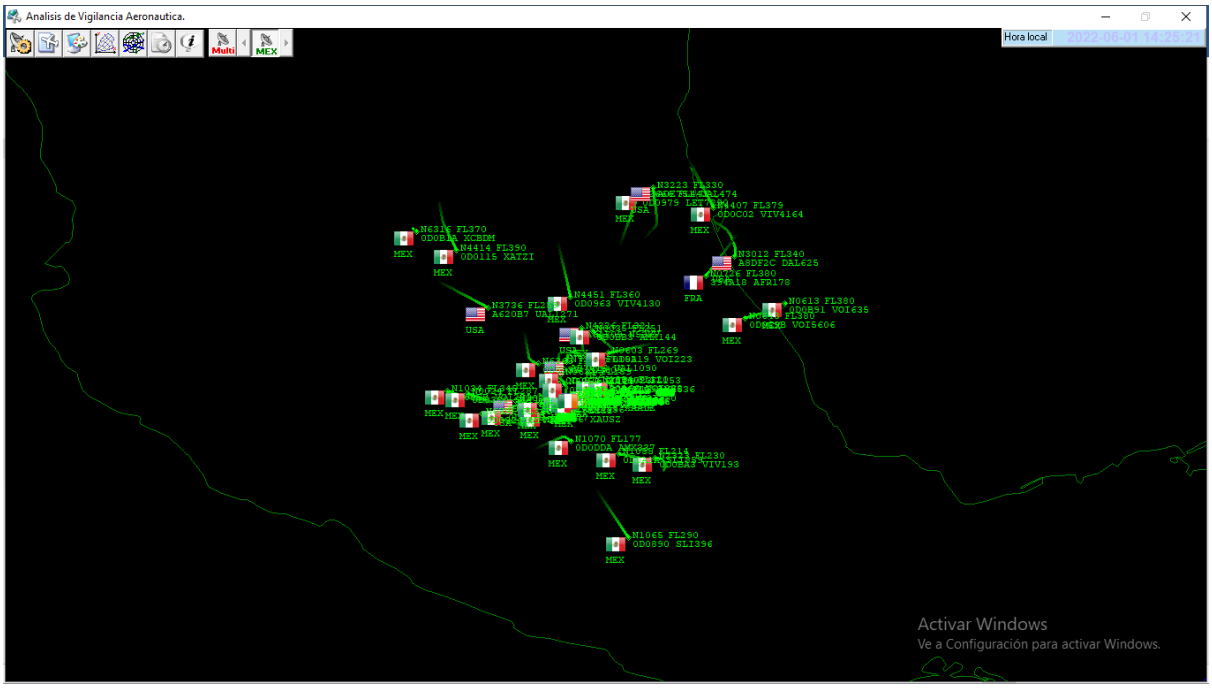


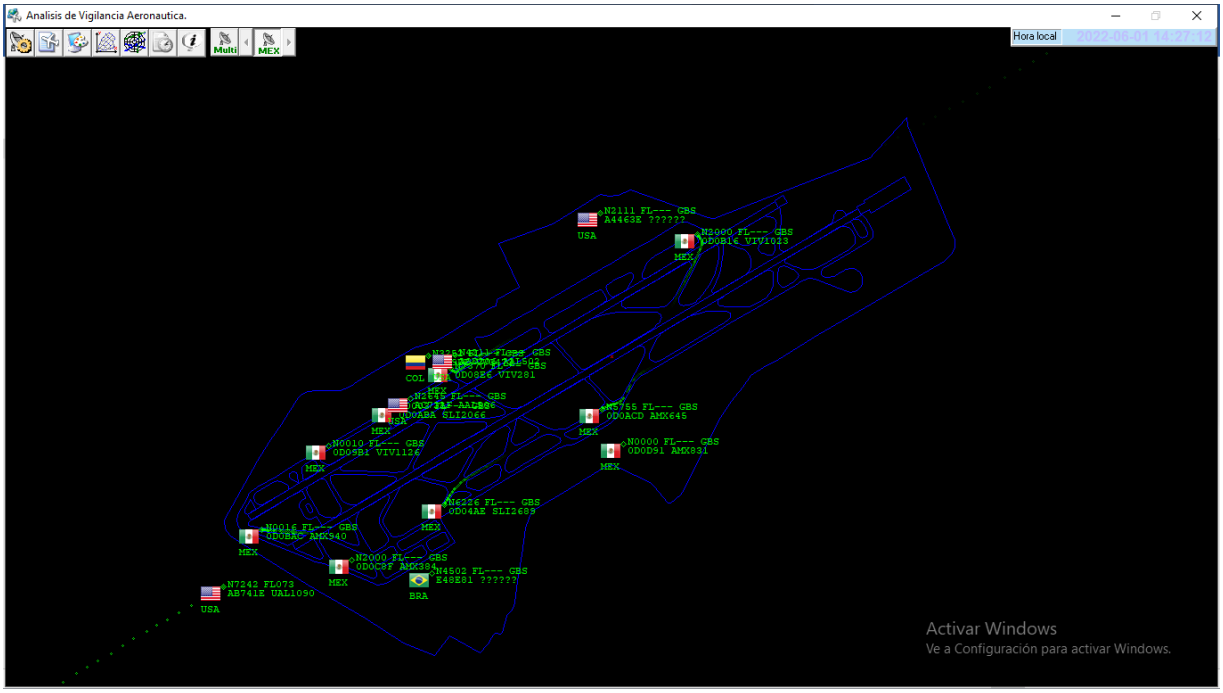
2.2 The information used in Air Traffic Control (ATC) is sent from the receivers in multicast User Datagram Protocol (UDP) format, developing the reception interface in both multicast and unicast. The scenario where the ADS-B information of the Flight Information Region (FIR) of Mexico is detected has greater volumes of information, also testing the optimization characteristics of the system processing and being able to verify the stability of the system.

2.3 The receivers were configured with the Cat021 v2.1, being able to acquire the information of the ADS-B stations of:

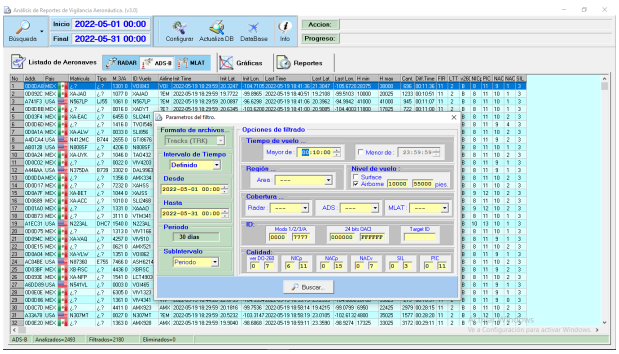
1. Cerro Gordo (CGO)
2. Toluca (TLC)
3. Guadalajara (GDL)
4. Mexico City (MEX)
5. Cuernavaca (CVJ)
6. Queretaro (QRO)
7. Puebla (PBC)

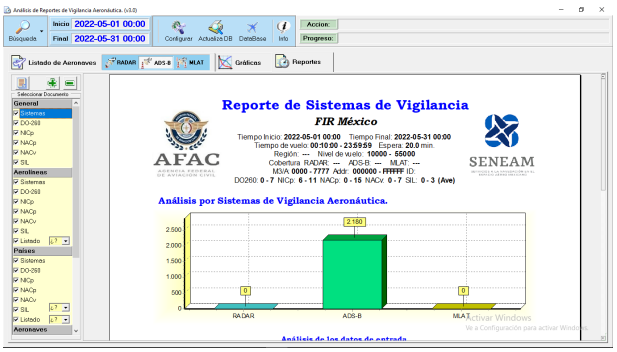
2.4 This received, processed and stored information is displayed on a screen that reflects the map of the selected area and the actual flight position of each aircraft, based on the data received in ADS-B.





2.5 The statistical processing of the different parameters of interest that are configured and filtered by the user is carried out.





2.6 All these data are processed and presented in a summary format based on the interests that were selected for monitoring the ADS-B signals coming from each sensor, and can be exported to a PDF file. The system is currently being dynamically developed with new possibilities arising from this project.

3. Achievements

3.1 It is possible to optimally process and store the information from which the statistically processed data is obtained, and other algorithms can be implemented for future statistical analyses.

3.2 A standardization of the results obtained is achieved, which can be used to demonstrate the performance of the implementation of surveillance systems and analyze both from the part of the receivers on the ground, as well as the installed configuration of the ADS-B transponders on board. of the aircraft.

3.3 A tabulated report of the statistics is obtained in a time interval with the application of several configured filters, being able to export the results to a PDF file.

3.4 The statistics of the detected flights are grouped by countries, airlines, aircraft type designator and by the ADS-B parameters of version DO260, NIC, NAC and SIL.

4. Conclusions

4.1 After installing the software and based on the data storage time of 24 hours, several fundamental aspects were evidenced:

- In the collected statistics, 99.2% of the aircraft had DO-260B version transponders installed.

- Most aircraft had NIC greater than 8 and NAC greater than 9.

- Errors were identified at that time of aircraft whose registration was registered in the State of Mexico that had the 24-bit code encoding misconfigured since the assigned range for Mexico is 0D0000-0D0FFF and whose detections were in another range. In this way, one of the functionalities of the software was demonstrated.

4.2 Mexico has carried out the statistical analysis of this information on a monthly basis, whose results from the implementation of surveillance systems by ADS-B have provided benefits by previously determining some inconsistencies of aircraft that do not meet the criteria.

5. Suggested actions

5.1 The Meeting is invited to:

a) take note of the statistics presented in this document;
b) analyze the results and trends presented;
c) compare the data presented with those obtained by other states or organizations; and
d) send to the IATA and national airlines the data related to the errors that still persist in the ADS-B transmissions.

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