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

Technical Meeting of the NACC/WG Surveillance Task Force on Automatic Dependent Surveillance – Broadcast (ADS-B) work plan

(ICAO NACC Regional Office, Mexico City, Mexico, 30 to 31 July 2024)

Summary of Discussions

Date	30 July to 1 August 2024
Location	Regional Office for North America, Central America and the Caribbean of the International Civil Aviation Organization
Participants	The Meeting was attended by 8 representatives from Cuba, Mexico, United States, COCESNA, and IATA. The list of participants is shown in **Attachment A.**

1. References

1.1 As a result of the First Meeting of the Surveillance Task Force (SURV/TF/01) of the North American, Central American and Caribbean Working Group (NACC/WG) (May 24, 2024), after to analyze the work carried out to date for the implementation of Automatic Dependent Surveillance - Broadcasting (ADS-B), and taking into account the GREPECAS Conclusion/21, the NACC/WG/SURV/TF coordinated with the International Air Transport Association (IATA) a joint meeting between the States in the process of operational implementation of ADS-B.

2. Background

2.1 During the Third Meeting of the Airspace Optimization Task Force (AO/TF/3) of the North America, Central America and Caribbean Working Group (NACC/WG)[1], NACC/WG/SUR/TF presented to the attending airlines the level of implementation of ADS-B in the region.

2.2 Conclusion GREPECAS/21 establishes to create a work plan for the implementation of ADS-B and present it at the GREPECAS/22 meeting, as follows:

<table>
<tr><td colspan="3">CONCLUSION GREPECAS/21/21</td><td colspan="2">DEVELOPMENT OF AN ACTION PLAN FOR THE ADS-B IMPLEMENTATION</td></tr>
<tr><td colspan="3">What:

That States/Territories, led by ICAO,
a) review the existing Operational Concept for the ADS-B Implementation in the CAR and SAM Regions, including its operational objectives,
b) support the development of model regulations for ADS-B;
c) integrate all different stakeholders in the process; and
d) develop an action plan incorporating activities, accountability, and milestone dates by 15 August 2024.</td><td colspan="2">Expected impact:

☐ Political / Global
☒ Inter-regional
☒ Economic
☐ Environmental
☒ Operational/Technical</td></tr>
<tr><td colspan="5">Why:
ADS-B is an enabler to several of the operational improvements foreseen in the GANP ASBUs, current many States have implemented ADS-B infrastructure as a surveillance mean. To obtain the benefits of ADS-B implementation regional agreements and priorities for the CAR and SAM States</td></tr>
<tr><td colspan="2">When: 15 August 2024</td><td colspan="3">Status: ☒ Valid / ☐ Superseded / ☐ Completed</td></tr>
<tr><td colspan="5">Who: ☒ States ☒ OACI ☒ Others: IATA</td></tr>
</table>

2.3 In this regard, to achieve the objectives requested in Conclusion GREPECAS/21/21, a teleconference was held in coordination with IATA on 2 April 2024, with IATA representatives covering Air Navigation Services (ANS) issues for the Caribbean (CAR) Region and the South American (SAM) Region, in which a work plan was agreed upon to work jointly on what was requested in this conclusion.

2.4 As part of the regional analysis, it was concluded that the CAR and SAM Regions cannot work together at this time because the level of implementation of ADS-B is different in each region, but it was indicated that as implementation proceeds in the different States, the benefits of ADS-B can be integrated in both regions.

[1] The AO/TF/3 meeting held at the ICAO NACC Regional Office, Mexico City, Mexico, 25-29September 2023 included the Fifth Meeting of the NACC/WG Air Traffic Flow Management Implementation Task Force (ATFM/TF/5) and Seventh Meeting of the ICAO IATA CANSO Free Airspace Routes Team (CIIFRA/7) (AO/TF/3/ATFM/TF/5/CIIFRA/7).

2.5 During the LATAM/CAR RCG (Regional Coordination Group) meeting (Miami, Florida 22 April 2024), ICAO presented the level of regional CAR implementation in ADS-B and the safety benefits obtained with this implementation, as well as the regional impact to be achieved by taking advantage of its operational benefits.

2.6 Finally, the online meeting held between the NACC/WG Surveillance Task Force (NACC/WG/SURV) and IATA/LATAM on 2 April 2024 agreed on a series of activities and information exchange to facilitate knowledge between the parties and also agreed to hold a face-to-face meeting to jointly address the development of the action plan for the implementation of ADS-B in the CAR Region.

2.7 This face-to-face meeting between the States of the CAR Region ready for the implementation of ADS-B and IATA was held at the ICAO offices in Mexico City, Mexico from July 30 to 1 August 2024, and this report is presented as a result of this meeting.

3. Objective of NACC/WG Technical Meeting Surveillance Task Force

3.1 The objective of this meeting (Ref.: NT-NE57-3 - E.OSG-NACC112116) was to socialize with IATA the operational implementation of ADS-B in the Central American Flight Information Region (FIR) integrated by all Central American States and COCESNA (Central American Corporation of Air Navigation Services) and Mexico to put ADS-B into operation in the upper airspace of the States involved and take advantage of the safety and efficiency benefits that this functionality provides.

4. Introduction

4.1 The Secretariat explained the functioning and implementation objectives of the ADS-B in accordance with the Global Air Navigation Plan, GANP (ICAO Doc. 9750), which is on the following online platform:

https://www4.icao.int/ganpportal/

4.2 ADS-B is an element of the Aviation System Block Upgrade (ASBU). The ICAO GANP ASBU methodology is a programmatic and flexible global approach that allows all Member States to enhance their air navigation capabilities based on their specific operational requirements. ADS-B belongs to Block 0 and is the first element of the surveillance area.

4.3 ADS-B supports the provision of air traffic services and operational applications with reduced cost and increased surveillance coverage. ADS-B provides accurate position/speed information throughout the airspace (accuracy is not range dependent as with radar). It also provides aircraft call sign and accurate position/velocity information to nearby aircraft with Automatic Dependent Surveillance – Broadcast (ADS-B-in) receivers.

4.4 ADS-B can also support airspace access for states aircraft, however, where possible, it should take advantage of the benefits of dual use of state aircraft capabilities to reduce cost and technical impact.

4.5 An important point indicated was that the ADS-B belongs to the GANP technology line and therefore it is an ASBU element that is an enabler, it enables the operational ASBU elements, with which the operational improvements and benefits are implemented.

4.6 It was emphasized that the main operational benefit of ADS-B implementation is safety by providing surveillance data coverage in places where it did not previously exist and where radar data coverage does not provide surveillance coverage. Without the implementation of ADS-B, the implementation of operational ASBU elements would not be possible.

5. Development of activities

5.1 As part of Conclusion GREPECAS/21/21 "Development of an action plan for ADS-B implementation", the following activities were carried out:

Review of the Operational Concept document for ADS-B implementation

5.2 This document, developed by the States of the CAR Region and reviewed by Brazil, was approved in 2019 during the Automatic Dependent Surveillance - Broadcast (ADS-B OUT) Implementation Meeting for the NAM/CAR Regions held in Ottawa, Canada.

5.3 Through Decision ADS-B/OUT/M/03 "CONCEPT OF NAM/CAR TRANSACTIONS, the document was approved and underwent a process of review and updatie according to regional needs and was again revised and updated in line with the comments provided by the States and the industry. The document was approved by the Meeting and it was recommended that the ICAO NACC Regional Office distribute the document by sending its final version to the NAM/CAR States, Brazil and French Guiana, since these States/Territories of the SAM Region participated in the last revision of the document. The document was subsequently approved for use by the NAM/CAR/SAM Regions.
https://www.icao.int/NACC/Documents/Meetings/2019/ADSBOUT/ADS-B-OUT-M-InformeFinal.pdf

5.4 The document has been reviewed and updated according to current needs and no further requests for updating the document have been received from the industry.

Development of an ADS-B regulatory model for operational implementation in the CAR Region

5.5 The ADS-B as an ASBU element has a series of enablers that must be implemented prior to placing the ADS-B fully operational. These enablers are:

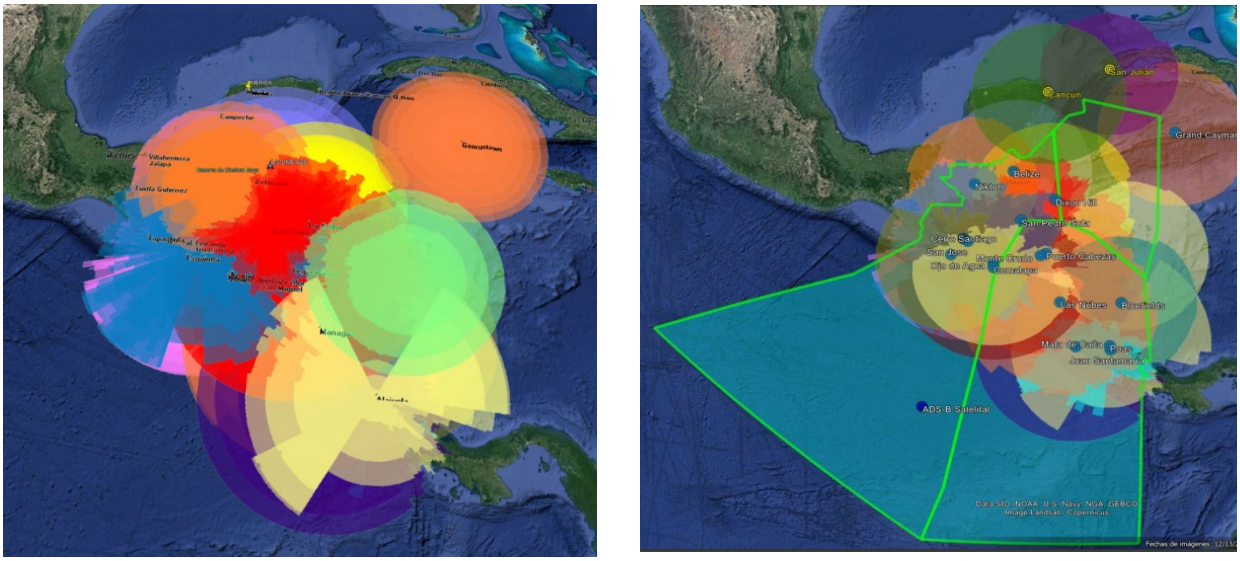
1. Ground System Infrastructure (ground antennas, communication systems, integration to the air traffic control center and enabling data at air traffic control positions, controller positions).
2. Avionics capability on board aircraft to be able to send and provide surveillance data.

3. Personnel training (all technical and operational personnel related to the start-up)
4. State regulation to enable the use of ADS-B (indicates the roles and responsibilities of each stakeholder).

5.6 The CAR Region, in the States that already have ADS-B, has already completed the implementation of the first three enablers and the implementation of the fourth enabler, which is the regulation for the implementation of ADS-B in each of the States, is missing. The Meeting analysed the proposed regulation of Central American States and the Central American Corporation of Air Navigation Services (COCESNA), as a sole one, and Mexico.

5.7 The Central American States and COCESNA, due to their operational structure, propose to establish a regulation per State based on their operations to cover tower and approach air traffic control operations. In a harmonized manner at the Central American subregion level to cover air traffic control service operations in the upper airspace provided by the COCESNA on behalf of the Central American States (Belize, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua) and for the lower airspaces where ADS-B coverage exists.

5.8 Surveillance radar coverage of Central America is reflected in the following



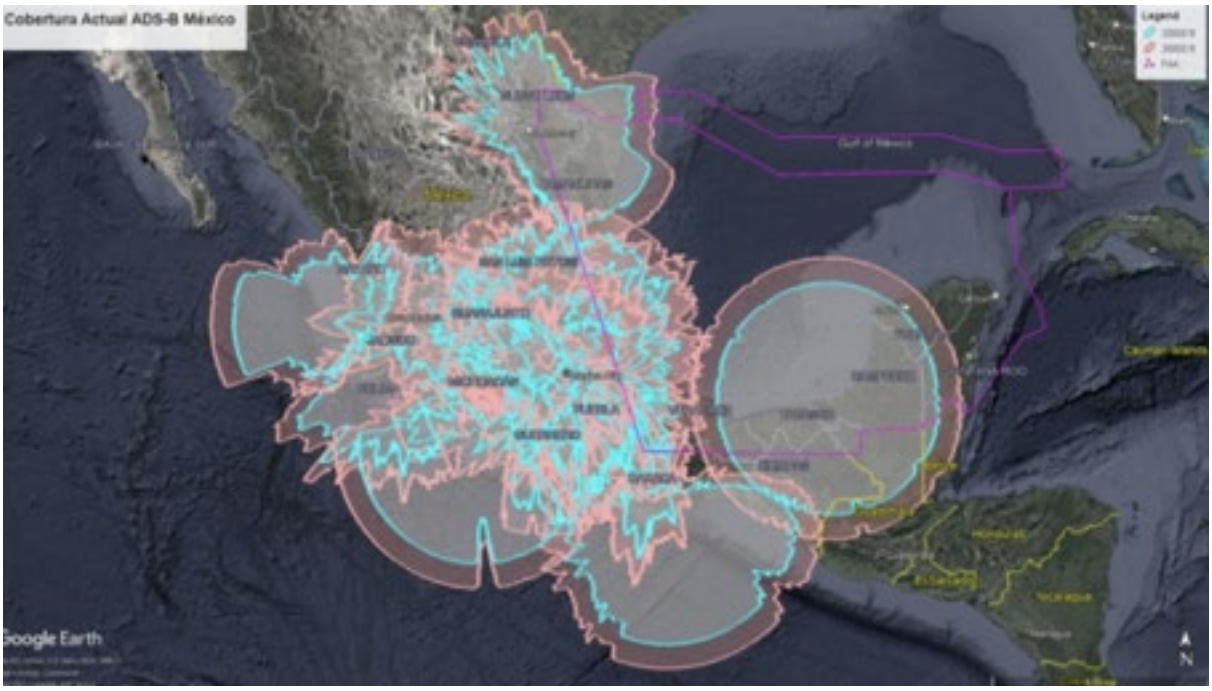
Note: This graph reflects the coverage that Central American surveillance systems provide throughout the Central American FIR, in addition to the fact that COCESNA shares surveillance data with Cuba, Grand Cayman, Jamaica, Mexico, , and Panama to support regional redundancy of surveillance data and to support the automation process (Air Traffic Services Inter-Facility Data Communication –AIDC- and Norh American Interface Control Document -NAM/ICD) among the regional control centres.

5.9 **Appendix B** presents the draft regulation proposed by the Central American States and COCESNA, with a mandatory implementation date of ADS-B of 1 January 2025.

5.10 Mexico indicated that the process of final implementation of ADS-B in its control centres was underway, by the hardware/software update of them, and that it had published the Mexican Official Standard NOM-91/2-SCT3-2022, which establishes the specifications for the installation of ADS-B in aircraft. The document can be found in **Appendix C** of this report.

5.11 Mexico has a project to deploy ADS-B antennas around its border, with the objective of improving coverage, providing radar backup data and boosting operational improvement in areas where radars did not fully cover the Mexican geography.

5.12 The following graph shows the coverage areas that have been improved with the implementation of the ADS-B antennas installed to date:



5.13 **Appendix D** contains the Surveillance Coverage Charts for Central America and Mexico.

5.14 The following table contains a comparison of the regulations evaluated:

ADS-B REGULATION CONTENT

No	ÍTEM	Mexico	CENTRAL AMERICA
1	**PREFACE**	Mexican Official Standard NOM-91/2-SCT3-2022 Legal framework, context, background and participants of the ADS-B regulation.	To be defined by each country the type of regulation, AIC and subsequently incorporated in RAC 91 or RAC 10.
2	**INDEX**	Content of the standard	It will depend on the type of publication of the regulation.
2	**OBJECTIVE AND FIELD OF APPLICATION**	ADS-B OUT 1090 ES Installation Requirement, applicable to aircraft operators operating in the FIR	Requirement to install ADS-B Out 1090 ES equipment in the upper and lower space where ADS-B coverage exists, minimum DO-260B or higher. Equipment must remain in transmit mode.
3	**REFERENCES**	Reference to aircraft modification standards	References are included as part of the bibliography.
4	**DEFINITIONS AND ABBREVIATIONS**	Applicable to regulations, including ADS-B Avionics definitions and figures of merit.	Related to ADS-B avionics, including figures of merit.
5	**GENERAL PROVISIONS**	All aircraft must comply with the regulation and the conditions of exceptions Mandatory Circular “CO AFAC-01/21 R2	Deviations and contingencies due to failures must be authorized by ATC personnel and the exceptions will be those established in the regulations of each country according to its regulatory framework.
6	**REQUIREMENTS FOR USE AND INSTALLATION OF ADS-B OUT**	All aircraft must have ADS-B OUT installed, transmission mode, minimum equipment requirement.	Figures of merit have been established as a minimum to ensure 5 MN clearances for all applicable airspaces.
7	**ADS'B FUNCTIONALITY REQUIREMENTS**	Exclusively Version 2, RTCA-DO 260B, ES 1090MHZ, performance requirements equal to FAA, updated figures of merit and minimum elements to be transmitted, latency requirements.	Minimum Version 2, RTCA-DO 260B, ES 1090MHZ, performance requirements equal to FAA, updated figures of merit and minimum elements to be transmitted, latency requirements.
8	**PROCEDURES FOR ADS-B OUT INSTALLATION**	Aircraft modification and exceptions	To be defined by each country
9	**DEGREE OF COMPLIANCE WITH STANDARDS AND GUIDELINES**	Basic standards used	To be defined by each country
10	**BIBLIOGRAPHY**	Annexes and ICAO docs.	RTCA, FAA Regulations, and ICAO Annex Doc.
11	**COMPLIANCE WITH THIS STANDARD**	Who is responsible for compliance with the standard	To be defined by each country
12	**CONFORMITY ASSESSMENT**	Installation specifications and conformity assessment	To be defined by each country
13	**CURRENT**	80 days after publication. 28 August 2024 according to Mexican Official Standard NOM-91/2-SCT3-2022.	1/1/2025, although there are states such as Costa Rica whose regulations are in force as of January 2025.

5.15 Regarding the measurements made by Mexico and Central America of the avionics capacity of the aircraft that have operations in their respective FIRs, the following table shows this capacity:

Operations	MEXICO	Central America
Lower airspace	Percentage of compliance with the standard NOM-91/2-SCT3-2022 of the aircraft detected with ADS-B.1 sensors Version 99.30% NIC 99.10% NACp 99.00% NACv 99.60% SIL 98.60%	No data
Upper airspace	Percentage of compliance with the standard NOM-91/2-SCT3-2022 of the aircraft detected with ADS-B.1 sensors Version 99.30% NIC 99.10% NACp 99.00% NACv 99.70% SIL 99.20%	99.0%

5.16 IATA, on behalf of the airlines, shared a series of questions, which were answered by the States:

1. Effective date of implementation of Automatic Dependent Surveillance – Broadcast (ADS- B) OUT.

   - Mexico: 80 days after August 28, 2024, according to Mexican Official Standard NOM-91/2- SCT3-2022
     The regulation issued by Mexico last March is only for aircraft to be equipped and they are in the process of evaluating the data that will be obtained and will be fully operational until the four control centers in Mexico are up to date. The data will not be used for separation.

   - Central America and COCESNA: 1 January 2025.

2. The possibility of publishing an exemption equivalent to FAA 12555 for aircraft currently operating under that exemption.

   - Mexico: No, there are currently no plans to issue an exemption.
   - Central America: No, there are currently no plans to issue an exemption.

3. Indicate whether SBAS/WAAS is a mandatory requirement to meet mandated aircraft position source performance.

- Mexico: Not considered a requirement, as long as the parameters required by the standard are met.
- Central America: Not considered a requirement, as long as they meet the parameters required by the regulation.

4. Whether SA-AWARE (GPS) equipped aircraft comply with the mandate.

   - Mexico: If they obtain merit parameters equal to or higher than those required by the standard, they are considered compliant.
   - Central America: If figures of merit parameters equal to or higher than those required by the regulation are reported, they are considered compliant and will be monitored for each aircraft.

5. Are there any actions in Mexico/Central America to accommodate SA-ON (GPS) equipped aircraft?

   - Mexico: If they obtain merit parameters equal to or higher than those required by the standard, they are considered compliant.
   - Central America: Not considered a requirement, as long as they meet the parameters required by the regulation.

6. IATA asked if in the planning of the Central American and Mexican States it makes available a tool such as the FAA SAPT/ADAPT https://sapt.faa.gov/default.php.?

   - Mexico: Currently, there are no plans for a similar development.
   - Central America: Currently, there are no plans for a similar development, but it can be evaluated at the regional level and with the collaboration of IATA in the search for alternatives.

7. Asked if the mandate mandates any requirements for ADS-B IN equipment on aircraft.

   - Mexico: ADS-B IN is not a requirement for compliance with the standard.
   - Central America: ADS-B IN is not a requirement for regulatory compliance.

8. About the flight levels and airspace covered by the mandate.

   - Mexico: The Mexican Official Standard is applicable to all Aircraft Licensees, Permission Holders or Operators of fixed wing or rotary wing aircraft operating in controlled airspace within the Mexico FIR (MMFR) and the Mazatlán Oceanic FIR (MMFO).
   - Central America: The regulation includes all the upper space of the Central American RIS, including the Pacific Ocean and the lower spaces where ADS-B coverage exists.

9. IATA indicated that airlines would like to clarify whether to extend the mandate to oceanic airspace.

   - The Mexican Official Standard is applicable to all Aircraft Licensees, Permission Holders or Operators of fixed wing or rotary wing aircraft operating in controlled airspace within the Mexico FIR (MMFR) and the Mazatlan-Mazatlan Oceanic FIR (MMFO).

- Central America: ADS-B satellite coverage is included.

10. What arrangements exist for sharing ADS-B data with adjacent Air Navigation Service Providers (ANSPs)?

    - Mexico: Agreements are already in place with adjacent ANSPs, COCESNA and FAA.
    - Central America: Agreements are already in place with Cuba, Jamaica, Mexico, Panama and in negotiations with Colombia.

11. How many RADAR facilities (Primary and Secondary) would Mexico seek to deactivate and replace with ADS-B separation?

    - There are no plans to replace radars and their coverage with ADS-B; on the contrary, there are plans to strengthen such coverage.
    - Central America: The region has optimal en route surveillance infrastructure and the TMAs of each international airport in the region have conventional Mode S radars with elementary and enhanced surveillance, as well as ADS-B capability integrated into the same system.

Note: The implementation of ADS-B seeks an improvement in terms of providing surveillance data to boost operational safety. Each State performs an assessment of its infrastructure and has developed project in this case to cover areas with surveillance data deficiency, in addition to taking into account that surveillance data supports the implementation of automated channels which has several operational benefits, among them the decrease of longitudinal separation between aircraft.

12. What operational and financial penalties would apply to non-compliant aircraft entering mandatory ADS-B OUT airspace?

    - Mexico: The issue of penalties must be coordinated with the Executive Directorate of Aviation Safety of the ACAA. It is worth mentioning that, at the beginning, surveillance will be carried out in parallel RADAR-ADS-B, that is, there will be a transition and when SENEAM requires to operate with ADS-B as primary surveillance equipment, possible sanctions will be notified.
    - Central America: Initially no actions are considered, but if operational improvements are expected to be implemented in some airspaces based on aircraft that are better equipped, they will be better served.

13. What monitoring tools does Mexico consider using to ensure aircraft compliance with the ADS-B OUT mandate?

    - Mexico: The information transmitted by the ADS-Bs within the ADS-B coverage area is being monitored and analyzed. The tools used are developed by IACC, THALES in the control centers and our own.

    - Central America: A performance assurance system is in place for automated surveillance systems with permanent recordings, including all ADS-B and satellite systems; additionally, since the beginning of 2019, a system for monitoring avionics capabilities has been in place, which allows generating statistics on ADS-B information

and capabilities.

14. What improved separation standards will Mexico and Central America implement based on ADS-B?

- Mexico: At the moment we are considering maintaining the current separation levels, strengthening the surveillance coverage in the FIR Mexico and FIR Mazatlan Oceanic. Increasing the situational awareness of air traffic controllers and thus, the operational safety in Mexican airspace.
- Central America: The separation standards are expected to be applied as if it were radar, provided that the capacity and integrity c r i t e r i a are met and that all aircraft are equipped, prior to the operational safety analysis.
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Note: it is important to point out that ADS-B as a new implementation needs a monitoring and evaluation period, in addition to the maturity period regarding the implementation of the air traffic control services, in this sense the improvement is not an immediate effect of the implementation, but a consequence of the continuous improvement and that it is integrated to the avionics capacity of the aircraft.

15. Is there any economic incentive offered by Mexico for operators to equip themselves with ADS-B OUT?

- Mexico: NO, no incentive is considered.
- Central America: Not planned.

Note: initially the region has not considered any incentive, however, in the medium and long term the airlines that are better equipped will benefit from better services within the airspace.

16. Does the mandate provide immunity for state/government/military aircraft to operate without ADS-B?

- Mexico: Mexico: Only military aircraft are exempt from the Mexican Official Standard NOM 91/2-SCT3-2022, which establishes the specifications for the installation in aircraft of Automatic Dependent Surveillance-Broadcasting Equipment (ADS-B) OUT.
- Central America: It is under the authority of each Central American State.

6. Conclusions

6.1 The implementation of ADS-B in the FIRs of the Central American and Mexican States is carried out in all the coverage of their airspace, where in the case of Mexico it will be done in a controlled manner as the State is ready. In the case of Central America, each Central American State will publish its regulation for tower and approach airspace and a single regulation will be published for the upper airspace.

6.2 States will not penalize non-compliance with ADS-B information quality parameters in their RISs.

6.3 Initially the benefit of the implementation of ADS-B is safety, since it will be covering the areas in the Caribbean where the current radars do not provide coverage, since initially

the ADS-B will be backup, with the objective that once all aircraft are equipped, the implementation of separation reduction analysis will begin (initially 10 NM) and will provide greater benefits to the airlines that comply with the equipment. The report will provide examples of how this is being done in the South Pacific area, where COCESNA has already implemented satellite ADS B and airlines are already obtaining operational benefits.

6.4 Through the ICAO NACC Regional Office it is indicated that IATA can count on the support of States to be able to give feedback at the next RCG meeting to airlines on the implementation of automated protocols, radar data behavior and other ANS implementations, which are unique to this region and which airlines would like to know about.

6.5 In summary, the Action Plan to implement the ADS-B in the Central American and Mexico FIRs will contain the following actions and target dates:

1. Mexico: according to its implementation process in the Mexican FIR, starting in September 2024.
2. Central American RIS: January 01, 2025.

7. Recommendations and Next actions

7.1 It is important that the airlines, in coordination with the States, work in a coordinated manner to implement ADS-B in the upper airspace of the Mexican and Central American States by January 2025 in accordance with the Action Plan paragraph 6.5.

7.2 That States and airlines (users), with the support of the NACC/WG operational technical groups, conduct a continuous evaluation of the implementation so that as it matures in its operation, operational improvements are planned to be put into operation.

7.3 The NACC/WG/SURV/TF will support States in the implementation process of States establishing ADS B implementation projects.

7.4 The Secretariat prepares for GREPECAS/22 a progress update as required by GREPECAS Conclusion 21/21.

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Technical meeting for the work plan of the Automatic Dependent Surveillance – Broadcasting
Reunión técnica del Grupo de tarea de Vigilancia del NACC/WG sobre el plan de trabajo de la Vigilancia dependiente automática – radiodifusión

ICAO NACC Regional Office, Mexico City, Mexico, 30 July to 1 August 2024
Oficina Regional NACC de la OACI, Ciudad de México, México, del 30 de julio al 1 de agosto de 2024

APPENDIX A / APÉNDICE A

LIST OF PARTICIPANTS / LISTA DE PARTICIPANTES

MEXICO/MÉXICO
1. Salvador Lozano Díaz
2. Daniel Castañeda
3. Héctor García Cruz
4. Andrés Román Araujo
5. Juan Gustavo Covarrubias

UNITED STATES/ESTADOS UNIDOS
6. Alejandro Rodríguez

COCESNA
7. César Núñez

IATA
8. Jaime Abigantus

ICAO/OACI
9. Mayda Ávila

APPENDIX B

PROPOSED ADS-B REGULATION FOR CENTRAL AMERICA UPPER AIRSPACE (COCESNA)

1. AUTOMATIC DEPENDENT SURVEILLANCE EQUIPMENT - BROADCAST (ADS-B OUT)

1.1 **Definitions. For the purposes of this regulation:**

ADS-B Out is a function of the avionics aboard an aircraft that periodically transmits the aircraft status vector (three-dimensional position and velocity) and other required information as described in this section.
Navigation Accuracy Category for Position (NACP) specifies the accuracy of an aircraft's reported position.
Navigation Accuracy Category for Velocity (NACV) specifies the accuracy of the velocity of a reported aircraft.
Navigation Integrity Category (NIC) specifies an integrity containment radius around the reported position of an aircraft.
Position Source refers to equipment installed on board an aircraft that is used to process and provide aircraft position information (e.g., latitude, longitude, and velocity).
Source Integrity Level (SIL) indicates the probability that the reported horizontal position exceeds the containment radius defined by the NIC on a per sample or per hour basis.
System Design Assurance (SDA) indicates the probability that an aircraft malfunction will result in the transmission of false or misleading information.
Total latency is the total time between the time the position is measured and the time the aircraft transmits it.
Uncompensated latency is the time during which the aircraft does not compensate for the latency.

1.2 **ADS-B OUT 1090 ES Equipment Installation**

a) After January 1, 2025, unless otherwise authorized by ATC, no person may operate an aircraft in upper airspace (above 19,500 feet MSL) unless the aircraft has equipment installed that:

i) Meets the performance requirements in:

1. TSO-C166b and Section 2 of RTCA DO-260B (as referenced in TSO-C166b); or
2. TSO-C166c and Section 2 of RTCA DO-260C as modified by DO-260C-Change 1 (as referenced in TSO-C166c); and
3. Meets the requirements of this regulation.

b) After January 1, 2025, unless otherwise authorized by ATC, no person may operate an aircraft below 19,500 feet MSL where ADS-B coverage exists unless the aircraft has equipment installed that:

i) Meets the performance requirements in:

1. TSO-C166b and Section 2 of RTCA DO-260B (as referenced in TSO-C166b);
2. TSO-C166c and Section 2 of RTCA DO-260C as modified by DO-260C-Change 1 (as referenced in TSO-C166c);
3. Meets the requirements of this regulation.

c) Each person operating an ADS-B Out equipped aircraft must operate this equipment in the transmit mode.

d) Requests for ATC-authorized deviations from the requirements of this section must be made to the ATC unit having jurisdiction over the airspace concerned within the time periods specified below:
i) For operation of an aircraft with an inoperative ADS-B Out, to the final destination airport, including intermediate stops, or to proceed to a location where appropriate repairs can be made, or both, the request may be made at any time.
ii) For operation of an aircraft not equipped with ADS-B Out, the request must be made at least 1 hour prior to the proposed operation.
iii) In any case, it will be the power of ATC to authorize or deny these requests, according to the availability of radar signal in the area within which it is intended to operate without ADS-B.

1.3 **1090 MHz ES transmit link and power requirements:**
Aircraft operating in airspace must have equipment installed that meets the antenna and power output requirements for Class A1S, A1, A2, A3, B1S or B1 equipment as defined in TSO-C166b and Section 2 of RTCA DO-260B (as referenced in TSO-C166b), or TSO-C166c and Section 2 of RTCA DO-260C as modified by DO-260C-Change 1 (as referenced in TSO-C166c).

1.4 **ADS-B output performance requirements for NACP, NACV, NIC, SDA and SIL:**

a) For aircraft transmitting ADS-B Out

i) Aircraft NACP must be less than 0.3 nautical miles (NACp>= 6);
ii) The aircraft NACV must be less than 10 meters per second (NUC>=1);
iii) The NIC of the aircraft must be less than 1 nautical mile (NIC>=5);
iv) The SDA of the aircraft must be less than or equal to 10 -5 per hour of flight (SDA=2); and
v) The aircraft SIL must be less than or equal to 10 -7 per flight hour or per sample (SIL =3).
b. Changes in NACP, NACV, SDA and SIL must be transmitted within 10 seconds.
c. Changes in NIC must be transmitted within 12 seconds.

1.5 **Minimum set of broadcast message elements for ADS-B OUT.**

Each aircraft must transmit the following information as defined in TSO-C166b (including Section 2 of RTCA DO-260B, as referenced in TSO-C166b), TSO-C166c (including Section 2 of RTCA DO-260C as modified by DO-260C - Change 1, as referenced in TSO-C166c). The pilot must enter information for the message elements listed in items (7) through (10) of this section during the appropriate phase of flight.

1. The length and width of the aircraft;
2. The aircraft position indication in latitude and longitude;
3. The aircraft's barometric pressure altitude;
4. The indicated speed of the aircraft;
5. The indication of whether you have an ACAS or ACAS II system installed and operating in a mode that can generate resolution advisory (RA) alerts;
6. Whether you have an ACAS II installed and operational and there is a resolution advisory (RA) indication;
7. The indication of the Mode A transponder code specified by ATC;
8. The indication of the aircraft identification or call sign filed on the flight plan or aircraft registration.
9. The indication if the flight crew has identified an emergency, radio communications failure or unlawful interference;
10. The “IDENT” indication of the aircraft to ATC;
11. The indication of the 24-bit ICAO code or address assigned to the aircraft.
12. The indication of the aircraft's emitter category;
13. The indication of whether an ADS-B with “IN” capability is installed.

14. The indication of the geometric altitude of the aircraft;
15. The indication of the navigation accuracy category for position (NACP);
16. The indication of the navigation accuracy category for velocity (NACV);
17. The indication of the Navigation Integrity Category (NIC);
18. the System Design Assurance (SDA) indication; and
19. The Source Integrity Level (SIL) indication.

1.6 **ADS-B Latency Requirements:**

1. The aircraft shall transmit its geometric position no later than 2.0 seconds from the time of position measurement to the time of transmission.
2. Within the 2.0 total latency allowance, a maximum of 0.6 seconds may be uncompensated latency. The aircraft shall compensate for any latency greater than 0.6 seconds up to the maximum 2.0 second total by extrapolating the geometric position at the time of message transmission.
3. The aircraft shall transmit its position and velocity at least once per second while airborne or in motion over the airport surface.
4. The aircraft shall transmit its position at least once every 5 seconds while stationary on the airport surface.

1.7 **Position Information Source**

The position information source shall be a GNSS that meets the requirements of one of the following technical standards:

a. TSO-C129. GPS + ABAS
b. TSO-C145. GPS + multi-sensor SBAS
c. TSO-C146. GPS + SBAS stand alone.
d. TSO-C196. GPS + ABAS

1.8 **Incorporation by Reference.**

The standards required by this section are incorporated by reference upon approval.

a) U.S. Department of Transportation, Office of Subsequent Distribution, DOT Warehouse M30, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785; website: www.faa.gov/aircraft/air_cert/design_approvals/tso/

i. TSO–C166b, Automatic Dependent Surveillance-Broadcast Extended Squitter (ADS–B) and Traffic Information Service-Broadcast (TIS–B) Equipment Operating on the 1090 Megahertz (MHz) Radio Frequency, December 2, 2009.
ii. TSO–C166c, Automatic Dependent Surveillance-Broadcast Extended Squitter (ADS-B) and Traffic Information Service-Broadcast (TIS-B) Equipment Operating on the 1090 Megahertz (MHz) Radio Frequency, March 10, 2023.

(b) RTCA, Inc., 1150 18th St. NW, Suite 910, Washington, DC 20036; website: www.rtca.org/products .

i. RTCA DO–260B, Minimum operational performance standards for 1090 MHz broadcast-automatic dependent surveillance extended squitter (ADS-B) and traffic information services (TIS-B) broadcast, Section 2, Equipment performance requirements and test procedures, 2 December 2009.
ii. RTCA DO–260C, Minimum operational performance standards for 1090 MHz broadcast-automatic dependent surveillance extended squitter (ADS-B) and traffic information services broadcast (TIS-B), Section 2, Equipment performance requirements and test procedures, 17 December 2020.
iii. RTCA DO–260C, Minimum operational performance standards for 1090 MHz broadcast-automatic dependent surveillance extended squitter (ADS-B) and traffic information services broadcast (TIS-B), Change 1, 25 January 2019. 2022.

APPENDIX C

MEXICAN OFFICIAL STANDARD NOM-91/2-SCT3-2022, WHICH ESTABLISHES THE INSTALLATION SPECIFICATIONS ON AIRCRAFT FOR AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B) OUT EQUIPMENT

PREFACE

The Civil Aviation Law, Article 6, section IX, establishes the powers of the Ministry of Infrastructure, Communications, and Transport in matters of civil aviation, including the issuance of the Mexican Official Standards and other administrative provisions.

The Civil Aviation Law, in its article 4, indicates that civil navigation in the airspace over national territory is governed, in addition to what is provided for in said Law, by the treaties to which the United Mexican States is a party. Mexico is a signatory to the Convention on International Civil Aviation held in the City of Chicago, Illinois, United States of America, in 1944.

In addition to complying with the Civil Aviation Convention of the International Civil Aviation Organization (ICAO) and optimizing the use of national airspace, Mexico has decided to implement projects to benefit safety and environmental initiatives to mitigate important problems such as congestion at airports, noise generation, emissions of polluting gases and improve fuel consumption efficiency, projects that not only focus on solving the current problem but also on solving future needs for air traffic demand, as part of the Mexican Air Navigation Plan.

In Mexico's Air Navigation Plan, it was determined that it is essential to move from navigation surveillance based on ground-based radar systems, to procedures based on satellite information, to systems with greater precision, through the installation of Automatic Dependent Surveillance-Broadcast (ADS-B) OUT equipment in aircraft, which will be integrated into Air Traffic Control (ATC) surveillance resources as a satellite-based aircraft location system through ADS-B ground stations. ADS-B OUT is a performance-based surveillance technology, more precise than radar, which provides air traffic controllers and pilots with more detailed information to help maintain a safe separation between aircraft in flight and on the ground. The technology combines a positioning capability through aircraft avionics and ground infrastructure to allow more precise transmission of aircraft information to ATC services.

ADS-B is an environmentally friendly technology that improves safety and efficiency and directly benefits pilots, air traffic controllers, airports, airlines, and the public in general. It forms the basis for moving from ground-based radar surveillance to more precise tracking using satellite signals, which will enable:

- Reducing the risk of runway incursions by displaying the location of aircraft and equipped ground vehicles on the screens of both the pilot and air traffic controller, even at night or during any weather event obstructing visibility.

- Gaining greater coverage because ground stations are much easier to position than radar.

- Counting with improved accuracy, integrity, and reliability of satellite signals superior to radar means that air traffic controllers will eventually be able to reduce the separation between aircraft, thereby potentially increasing safe airspace capacity for civil navigation.

ADS-B is another way of broadcasting aircraft position information. ADS-B technology has two capabilities: one for emission (ADS-B OUT) and one for reception (ADS-B IN).

- ADS-B OUT transmits its location using information provided by the aircraft's GNSS/GPS Satellite Navigation receiver, altitude, ground speed, and other data to ground stations and other aircraft once per second. Air traffic controllers and aircraft equipped with ADS-B IN can receive this information immediately. This provides more accurate aircraft tracking compared to radar technology, which scans position information in a 5- to 12-second interval.

- ADS-B IN provides properly equipped aircraft with weather and traffic position information delivered directly to the cockpit. Aircraft so equipped have weather activity available on graphical displays inside the cockpit, as well as text messages, including advisories to pilots.

The purpose of this Mexican Official Standard is to:

a) Provide aeronautical technical personnel with information about the General Provisions and Procedures regarding implementing the ADS-B System in our State, which will provide Air Traffic Controllers with real-time aircraft position information, which is more accurate than the information currently available from radar-based systems. This greater precision provides Air Traffic Controllers with the ability to separate aircraft with greater precision, timeliness, and safety.
b) Benefit Concessionaires, Permit Holders, and Air Operators by ensuring greater security in their surveillance and allowing them greater access to airspace and airports.
c) Increase Safety.

In compliance with the procedure established in the Federal Law on Metrology and Standardization, on 22 October 2021, the Draft Mexican Official Standard PROY-NOM-091 / 2-SCT3-2021 was published in the Official Gazette of the Federation, which establishes the specifications for the installation of automatic dependent surveillance-broadcasting (ADS-B) OUT equipment on aircraft, so that in terms of the THIRD and FOURTH TRANSITIONAL articles of the Quality Infrastructure Law; 47, section I of the Federal Law on Metrology and Standardization and 33 of its Regulations, interested parties submitted comments to said Project within 60 calendar days from the date of its publication in the Official Gazette of the Federation.

Once the aforementioned consultation period has concluded, in compliance with the THIRD and FOURTH TRANSITIONAL articles of the Quality Infrastructure Law; 47, sections II and III of the Federal Law on Metrology and Standardization and 33 of its Regulations, said comments were presented, discussed and responded to by the National Advisory Committee on Air Transport Standardization, publishing said response in the Official Gazette of the Federation on 17 November 2023.

The National Advisory Committee on Air Transport Standardization, under article 28, section II, subsection d) of the Regulations of the Federal Law on Metrology and Standardization, establishes that the code of the standard must refer to the year in which it is approved by the National Advisory Committee on Air Transport Standardization, approved the update of the code or key of the Mexican Official Standard in question, in the following terms: NOM-91/2-SCT3-2022.

By this and as established in the THIRD and FOURTH TRANSITIONAL articles of the Quality Infrastructure Law; 47, section IV of the Federal Law on Metrology and Standardization, the Mexican Official Standard NOM-91/2-SCT3-2022 was issued, which establishes the specifications for the installation of automatic dependent surveillance-broadcasting (ADS-B) OUT equipment on aircraft.

In compliance with the provisions of articles 78 of the General Law on Regulatory Improvement and Fifth of the Agreement that establishes the guidelines that must be observed by the decentralized agencies and bodies of the Federal Public Administration regarding the issuance of administrative acts of a general nature to which article 69-H of the Federal Law on Administrative Procedure is applicable, the maximum term for resolving the procedure with code AFAC-2020-290-083-A is reduced to 60 calendar days.

The following entities participated in the preparation of this Mexican Official Standard:

- MINISTRY OF INFRASTRUCTURE, COMMUNICATIONS AND TRANSPORTATION.
- FEDERAL CIVIL AVIATION AGENCY.
- MEXICAN AIRSPACE NAVIGATION SERVICES
- MEXICAN INSTITUTE OF TRANSPORTATION.
- NATIONAL POLYTECHNIC INSTITUTE.
- HIGHER SCHOOL OF MECHANICAL AND ELECTRICAL ENGINEERING-TICOMÁN PROFESSIONAL UNIT.
- ASSOCIATION OF AERONAUTICAL ENGINEERS, A.C.
- COLLEGE OF AIR TRAFFIC CONTROLLERS OF MEXICO, A.C.
- COLLEGE OF MEXICAN AERONAUTICAL ENGINEERS, A.C.
- COLLEGE OF AVIATION PILOTS OF MEXICO, A.C.
- FEDERATION OF ASSOCIATIONS OF PILOTS AND OWNERS OF AGRICULTURAL AIRCRAFT OF THE MEXICAN REPUBLIC, A.C.
- MEXICAN FEDERATION OF PILOTS AND OWNERS OF AIRCRAFT, A.C.
- MEXICAN ASSOCIATION OF AVIATION TRAINING AND CAPACITY-BUILDING CENTERS A.C.
- NATIONAL CHAMBER OF AIR TRANSPORT A.C.
- AVEMEX, S.A. DE C.V.
- AIRWAYS OF MEXICO S.A. DE C.V.
- ALE SERVICE CENTER S. DE R.L. DE C.V.
- EXECUTIVE AIRLINES, S.A. DE C.V.

- AEROTRANSPORTES MÁS DE CARGA, S.A.
- AIRBUS HELICOPTERS S.A. DE C.V.
- VUELA AVIATION COMPANY CONCESSIONAIRE, S.A.P.I. DE C.V.
- GOVERNMENT OF PUEBLA.
- HONEYWELL AEROSPACE MeXICO, S.A. DE C.V.
- THALES MÉXICO S.A. DE C.V.

INDEX

1. Objective and Field of Application

This Mexican Official Standard establishes the installation specifications for the Automatic Dependent Surveillance-Broadcast (ADS-B) OUT Equipment. It is applicable to all Concessionaires, Permit Holders, or Air Operators of fixed-wing or rotary-wing aircraft that operate in controlled airspace within the Mexico FIR (MMFR) and the Mazatlán Oceánica FIR (MMFO).

2. References

It is necessary to consult the Mexican Official Standard NOM-021/3-SCT3-2010, or the one that replaces it, which establishes the requirements that must be met by the technical studies for modifications or alterations that affect the original design of an aircraft.

3. Definitions and Abbreviations

For this Mexican Official Standard, the following definitions and abbreviations are considered:

3.1. **ACAS (Airborne Collision Avoidance System).** An aircraft system based on secondary surveillance radar (SSR) transponder signals that operates independently of ground-based equipment to provide pilot warning of potential conflicts between aircraft equipped with SSR transponders.

3.2. **ADS-B (Automatic Dependent Surveillance - Broadcast).** An avionics function that periodically broadcasts the aircraft's location vector (position and velocity) in 3 dimensions and any other required information.

3.3. **ADS-B IN (Automatic Dependent Surveillance - Broadcast).** An avionics function in an aircraft or vehicle that receives surveillance data transmitted by ADS-B OUT functions installed in other aircraft or vehicles. In addition, it may also receive additional data from the ground from other aircraft that do not transmit ADS-B OUT or because their ADS-B OUT is transmitted using a different ADS-B technology.

3.4. **ADS-B OUT (Automatic Dependent Surveillance-Broadcast)** is an avionics function in an aircraft or vehicle that periodically broadcasts its state vector (position and velocity) and other information obtained from onboard systems in a format suitable for ADS-B IN-capable receivers.

3.5. **Aircraft.** Any vehicle capable of autonomously transiting airspace with people, cargo or mail.

3.6. **Fixed-wing aircraft.** A heavier-than-air, mechanically propelled aircraft that derives its lift in flight primarily from aerodynamic reactions exerted on surfaces that remain stationary under certain conditions.

3.7. **Rotary-wing aircraft.** An aerodyne that remains in flight primarily by air reaction on one or more engine-powered rotors, which rotate around vertical or almost vertical axes.

3.8. **ATC**. Air Traffic Control.

3.9. **Civil Aviation Authority:** The Ministry of Infrastructure, Communications and Transportation through the Federal Civil Aviation Agency; based on the FOURTH TRANSITIONAL ARTICLE of the DECREE by which the decentralized administrative body of the Ministry of Communications and Transportation, called the Federal Civil Aviation Agency, is created.

3.10. **Concessionaire.** A commercial company established under Mexican law, to which the Ministry of Infrastructure, Communications and Transport grants a concession for the operation of regular national public air transport services, and whether for passengers, cargo, mail or a combination of these, subject to national routes, fixed itineraries and frequencies, as well as to the registered rates and schedules authorized by the Ministry; or a concession for the operation, administration, operation and, where appropriate, construction of airports.

3.11. **EMC.** Electromagnetic compatibility.

3.12. **EMI.** Electromagnetic interference.

3.13. **ES.** (Extended Squitter / Extended spontaneous signals). Periodic and spontaneous transmissions of a 112-bit Mode S signal format at 1090 MHz containing 56 bits of additional information (e.g., used for ADS-B, TIS-B, and ADS-R).

3.14. **Mexico FIR.** Mexico Flight Information Region, under the jurisdiction of the Mexican State. Within the Mexico FIR there are Upper and Lower Control Areas (UTA), Terminal Control Areas (TMA), Control Zones (CTR), and Aerodrome Traffic Zones (ATZ) and a wide network of ATS routes within which the appropriate ATS unit/dependency provides Air Traffic Control Services (controlled airspace).

NOTE 1: Within the Mexico FIR, pilots must apply the methods and procedures established in the Mexican Laws, Regulations and Current Standards.

3.15. **GPS.** Global Positioning System.

3.16. **GNSS.** Global Navigation Satellite System.

3.17. **ABAS.** Aircraft Based Augmentation System.

3.18. **SBAS.** Satellite-Based Augmentation System.

3.19. **GBAS.** Ground-Based Augmentation System.

3.20. **ICA.** Instructions for Continued Airworthiness.

3.21. **Aircraft Identification (IDENT).** A group of letters or numbers, or a combination of both, equivalent to an aircraft's call sign for air-ground communications expressed in code, used to identify aircraft in communications and between ground centres or air traffic control services.

3.22. **Uncompensated Latency.** This is the time during which the aircraft does not compensate for latency.

3.23. **Mode S**. Data link protocol in transponder equipment that allows selective addressing of aircraft using a 24-bit aircraft address that uniquely identifies each aircraft and has a two-way data link between the ground station and the aircraft for the exchange of information.

3.24. **NACp.** (Navigation Accuracy Category for Position). An indication of the navigation accuracy category for position.

3.25. **NACv.** (Navigation Accuracy Category for Velocity). An indication of the navigation accuracy category for speed.

3.26. **NIC.** (Navigation Integrity Category). Specifies the integrity of a reported aircraft within a containment radius around its position.

3.27. **Air carrier.** The owner or possessor of a State aircraft, of those included in Article 5 Section II subsection a) of the Civil Aviation Law, and of non-commercial private air transport, Mexican or foreign.

3.28. **Permit holder.** Legal or physical person, in the case of private commercial air service, national or foreign, to whom the Ministry of Infrastructure, Communications and Transport grants a permit for the provision of regular international, national and non-regular international or private commercial air transport service; likewise, it is the legal or physical person to whom the Secretariat grants a permit for the administration, operation, exploitation and, where appropriate, construction of civil aerodromes other than airports; legal or physical person, Mexican or foreign, or for the establishment of aeronautical workshops and training and instruction centers.

3.29. **SDA.** (System Design Assurance). Indicates the probability of malfunction of an aircraft, causing the loss or false information transmitted.

3.30. **SIL.** (Source Integrity Level). Indicates the probability that the reported horizontal position exceeds the containment radius defined by the NIC, in a sample or on an hourly basis.

3.31. **STC.** Supplemental Type Certificate.

3.32. **Broadcasting.** This is a protocol within the Mode S system that allows uplink messages to be sent to all aircraft in the coverage area and downlink messages to be made available to all interrogators monitoring the aircraft that wishes to send the message.

4. General Provisions

4.1. Every fixed-wing or rotary-wing aircraft operating within the controlled airspace of the Mexico FIR must comply with the provisions of this Mexican Official Standard.

4.2. Every Concessionaire, Permit Holder or Air Operator that requires an extension to compliance with the provisions of this Mexican Official Standard must obtain the corresponding authorization from the Civil Aviation Authority, under the Mandatory Circular “CO AFAC-01/21 R2, Which establishes the procedure for granting exceptions, exemptions and extensions”, as well as the Advisory Circular “CA AV-46/22, Which establishes a guide to request the granting of exceptions, exemptions and extensions”, in their current versions or those that replace them.

5. Requirements for Use and Installation of ADS-B OUT

5.1. All aircraft of Concessionaires, Permit Holders or Air Operators operating within the controlled airspace of the Mexico FIR must have ADS-B OUT equipment installed that meets the specifications indicated in section 6 of this Mexican Official Standard.

5.2. All Concessionaires, Permit Holders, or Air Operators' aircraft with ADS-B OUT installed must always operate in transmission mode. Systems with an ON/OFF option must remain ON.

5.3. To carry out operations with ADS-B OUT equipment or any components inoperative, the Concessionaire, Permit Holder or Air Operator must have an authorized deferral procedure in the Minimum Equipment List.

6. ADS-B OUT Performance Requirements

6.1. The ADS-B OUT equipment to be installed following the requirements of section 5. of this Mexican Official Standard must be exclusively an ADS-B OUT, version 2, that is, it must comply with the RTCA/DO-260B specification, which corresponds to the minimum operational performance standards for extended squitter signals of 1090 MHz for Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services - Broadcast (TIS-B).

6.2. ADS-B OUT performance requirements for NACp, NACv, NIC, SDA and SIL:

a) For aircraft broadcasting with ADS-B OUT, as stipulated in section 5.2. and 5.3. of this Mexican Official Standard, the following must be met:

i. The aircraft Navigation Accuracy Category by Position (NACp) must be less than 0.05 nautical miles;
ii. The aircraft Navigation Accuracy Category by Speed (NACv) must be less than 10 meters per second;
iii. The aircraft Navigation Integrity Category (NIC) must be less than 0.2 nautical miles;
iv. The aircraft System Design Assurance (SDA) must be 2 and
v. The aircraft Source Integrity Level (SIL) must be 3.

b) Changes to the Navigation Accuracy Category by Position (NACp), Navigation Accuracy Category by Speed (NACv), System Design Assurance (SDA), and Source Integrity Level (SIL) must be issued within 10 seconds.
c) Changes in the Navigation Integrity Category (NIC) must be issued within 12 seconds.

6.3. Set of minimum elements that must be contained in the message to be transmitted by ADS-B OUT. The pilot must enter the message data listed in paragraphs g) to j) of this section during the appropriate phase of flight.

a) The length and wingspan of the aircraft;
b) Indication of the aircraft's position (latitude and longitude);
c) Indication of the aircraft's barometric altitude;
d) Indication of the aircraft's speed;
e) Indication that the ACAS II Airborne Collision Avoidance System is installed and operational in a mode that can generate resolution alerts;
f) If an ACAS II Airborne Collision Avoidance System is installed and operational, it must have an indication that the resolution warning is effective;
g) Indication of the Mode 3/A transponder code specified by ATC services;
h) Indication of the aircraft call sign as filed in the flight plan, or the aircraft registration number,
i) Indication in case the flight crew identified an emergency, radio communications failure, or unlawful interference situations;
j) Aircraft Identification (IDENT) for Air Traffic Control;
k) Indication of the 24-bit Aircraft Address granted by the Civil Aviation Authority, assigned to the aircraft;
l) Indication of the category of the aircraft transmitter;
m) Indication of whether it has installed capabilities of an Automatic Dependent Surveillance Equipment - Broadcasting - Reception (ADS-B IN);

n) Indication of the geometric altitude of the aircraft;
o) Indication of the Position Navigation Accuracy Category (NACp);
p) Navigation Accuracy Category by Speed (NACv) indication;
q) Navigation Integrity Category (NIC) indication;
r) System Design Assurance (SDA) indication, and
s) Source Integrity Level (SIL) indication.

6.4. ADS-B OUT latency requirements.

a) The aircraft must transmit its geometric position in no more than 2.0 seconds from the time of position measurement to the time of its transmission.
b) Within the 2.0-second latency allowance, a maximum of 0.6 seconds may be uncompensated latency. The aircraft must compensate for any latency above 0.6 seconds up to a maximum of 2.0 seconds total by extrapolating the geometric position to the time of message transmission.
c) The aircraft must transmit its position and velocity at least once per second while airborne or moving on the airport surface.
d) The aircraft must transmit its position at least once every 5 seconds while stationary on the airport surface.

7. Procedures for installing ADS-B OUT

7.1 Except as provided in section 7.2., aircraft equipped with ADS-B OUT belonging to Concessionaires, Permit Holders or Air Operators must have a Type Certificate issued by the Civil Aviation Authority of the State of Design and validated by the Civil Aviation Authority following Article 127 of the Regulations of the Civil Aviation Law, where it is accredited through the lists of equipment installed since its manufacture.

7.2 Aircraft in the service of Concessionaires, Permit Holders, or Air Operators that the ADS-B OUT is not listed among the components installed since its manufacture, as indicated in section 7.1, to install said equipment, must comply with the provisions of section 7.2.1 or 7.2.2 or 7.2.3.

7.2.1 The Concessionaire, Permit Holder or Air Operator must carry out a Technical Study following the Mexican Official Standard, “Which establishes the requirements that must be met by the technical studies for modifications or alterations that affect the original design of the aircraft” for its corresponding authorization, per the provisions of Article 145 of the Regulations of the Civil Aviation Law.

7.2.2 The Concessionaire, Permit Holder, or Air Operator must modify the aircraft by applying for a Supplementary Type Certificate (STC) previously validated by the Civil Aviation Authority.

7.2.3 The Concessionaire, Permit Holder, or Air Operator must modify the aircraft by applying a service bulletin.

7.3 The execution of the works due to the modifications for the installation of the ADS-B OUT, according to what is indicated in sections 7.2.1. or 7.2.2. or 7.2.3., must be carried out in an aeronautical workshop under the provisions of Article 145 of the Regulations of the Civil Aviation Law, and the engineering order or equivalent document must be developed for its installation. All documentation generated by the modification made must be incorporated into the aircraft maintenance history and must be recorded and preserved following the provisions of Articles 137 and 138 of the Regulations of the Civil Aviation Law.

7.4 It is the responsibility of the Concessionaire, Permit Holder, or Air Operator to determine the new weight and center of gravity of the aircraft after the modification, in accordance with the

applicable Legal System that establishes the maintenance of aircraft airworthiness and based on the data on changes in the basic weight contained in the same Service Bulletin.

7.5 For aircraft that, at the date of entry into force of this Mexican Official Standard, are already modified and that do not have the authorization of the modification of the ADS-B OUT equipment by the Civil Aviation Authority; the Concessionaire, Permit Holder or Air Operator, following Article 145 of the Regulations of the Civil Aviation Law, must review the records and maintenance controls of the aircraft, to obtain the documentation that accredits said installation following section 7.2., which must satisfy the specifications indicated in section 6. relative to the requirements for the operation of the ADS-B OUT Equipment, of this Mexican Official Standard.

7.6 The National Air Transport Concessionaire, as well as National and Foreign Permit Holders or Air Operators that operate aircraft with nationality and registration marks other than Mexican, must comply with the modification procedures established by the State of registration of the aircraft in question for the installation of the ADS-B OUT.

8. Degree of Concordance with International Standards and Guidelines and with the Mexican Standards taken as a basis for their preparation

8.1. This Mexican Official Standard complies with Article 37 of the Convention on International Civil Aviation and the standards and recommended practices in Annex 10, Volume III, Part I, Chapter 5; Volume IV, Chapters 2, 3, and 4, issued by the International Civil Aviation Organization.

8.2. No Mexican Standards have served as a basis for its preparation since there are no published regulatory precedents in this regard at the moment.

9. Bibliography

9.1. Annex 10 - Aeronautical Telecommunications, Volume III, Part I - Digital Data Communications Systems, Chapter 5, to the Convention on International Civil Aviation, Second Edition.

9.2. Annex 10 - Aeronautical Telecommunications, Volume IV, Surveillance and Collision Avoidance Systems, Chapter 5, Extended Mode S Squitters, to the Convention on International Civil Aviation, Fifth Edition.

9.3. International Civil Aviation Organization Document 9871 - Technical Provisions for Mode S Services and Extended Squitters. Chapter 4, Edition 2.

9.4. International Civil Aviation Organization Document 9924 - Aeronautical Surveillance Manual.

9.5. International Civil Aviation Organization Document 9750 - Global Air Navigation Plan 2013–2028.

9.6. RTCA/DO-260B, Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B).

9.7. Federal Aviation Administration, 14 CFR Part 91 Automatic Dependent Surveillance-Broadcast (ADS–B) Out Performance Requirements to Support Air Traffic Control (ATC) Service; FAR 91.225 and 91.227.

9.8. TSO-C166b “Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Service - Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)”, Federal Aviation Administration.

9.9. TSO-C129a. “Airborne Supplemental Navigation Equipment Using the Global Position System (GPS),” Federal Aviation Administration.

9.10. TSO-C145d. “Airborne Navigation Sensors Using The Global Positioning System Augmented By The Satellite Based Augmentation System (SBAS)”, Federal Aviation Administration.
9.11. TSO-C146d. “Stand-Alone Airborne Navigation Equipment Using The Global Positioning System Augmented By The Satellite Based Augmentation System (SBAS)”, Federal Aviation Administration.
9.12. TSO-C196b. “Airborne Supplemental Navigation Sensors for Global Positioning System Equipment Using Aircraft-Based Augmentation”, Federal Aviation Administration.
9.13. AC 20-165B “Airworthiness Approval of Automatic Dependent Surveillance-Broadcast OUT Systems,” Federal Aviation Administration.

10. Compliance with this Standard

10.1. The Civil Aviation Authority monitors compliance with this Mexican Official Standard.

11. Conformity assessment

11.1. It is the power of the Civil Aviation Authority to verify compliance with the Technical Administrative Provisions, both national and international, that guarantee safety of civil aircraft, as well as to verify compliance with the specifications and technical procedures of this Mexican Official Standard, which establishes the specifications for the installation of automatic dependent surveillance-broadcasting equipment (ADS-B OUT) in aircraft operating in controlled airspace, within the Mexico FIR (MMFR) and the Mazatlán Oceánica FIR (MMFO), as well as its characteristics.
11.2. The Concessionaire, Permit Holder, or Air Operator shall be subject to conformity assessment, through verification of the installation of ADS-B OUT in fixed-wing aircraft, evaluation of its characteristics, and acceptance of the procedures implemented for the installation of ADS-B OUT, in accordance with this Mexican Official Standard.
11.3. When the Concessionaire, Permit Holder or Air Operator requests conformity assessment in accordance with the specifications of this Mexican Official Standard, it must submit physically or electronically to the Civil Aviation Authority a written request specifying the following:

a) Place and date of issue of the document;
b) Name, denomination or company name of the person or persons who promote the conformity assessment, if applicable, the legal representative;
c) Addressed to the Federal Civil Aviation Agency through the Executive Directorate of Aviation;
d) The facts or reasons that give rise to the request;
e) Address to receive notifications;
f) Name of the person or persons authorized to receive notifications and
g) Signature of the interested party or his legal representative, unless he does not know or cannot sign, in which case, his fingerprint must be printed.

Legal basis: 15 and 15-A of the Federal Law of Administrative Procedure.

11.4. Attached to the document mentioned in section 11.3. of this Mexican Official Standard, the Concessionaire, Permit Holder or Air Operator must present the following:

a) Power(s) of the legal representative(s) (1 original or 1 certified), under Article 19 of the Federal Law of Administrative Procedure;

b) Document that must be named as "Declaration of compliance with the Mexican Official Standard NOM-91 / 2-SCT3-2022" in which the form and / or method of compliance with each of the provisions indicated in numerals 5, 6 and 7 of this Mexican Official Standard is described, integrating all the information and documents that justify the form and method of compliance and, where appropriate, indicate the references to manuals, catalogues, log books, aircraft maintenance history, training plans and programs, general operations manual, general maintenance manual, maintenance program, Minimum Equipment List, Air Service Operator Certificate, Approvals or Authorizations granted by the Civil Aviation Authority, among other resources, that fully justify the requirement of this Mexican Official Standard. Documentation that cannot be attached to the application because it is considered essential for the operation of the aircraft or the company must be classified and identified as “On-site Evaluable Only,” specifying the type of document and the section of this Mexican Official Standard that it complies with. Regulatory Appendix “A” shows the format to be used for the declaration of compliance and examples;
c) Indicate the suggested dates for conducting verification visits in which all the information that proves compliance with this Mexican Official Standard is available and the conformity assessment can be carried out by the Civil Aviation Authority.

11.5. The compliance declaration required in this conformity assessment procedure must be kept in the file of the concessionaire, permit holder or air operator as part of the records subject to periodic verification scheduled for this purpose by the Civil Aviation Authority in the technical-administrative verification programs or following the provisions of Articles 97 of the Regulations of the Federal Law on Metrology and Standardization, 191 and 193 of the Regulations of the Civil Aviation Law in force. 11.6.

11.6. The compliance declaration required in this conformity assessment procedure may be updated at the discretion and opinion of the concessionaire, permit holder or air operator at any time deemed convenient due to changes in the references or documents that served as support to accredit each of the requirements of the sections of this Official Mexican Standard; However, the declaration of compliance must be updated when, for reasons of conformity assessment of this Standard, verification and/or surveillance visits are carried out under the provisions of the Federal Law on Metrology and Standardization, the Civil Aviation Law and their respective Regulations and the declaration of compliance contains obsolete or non-existent data or references.

11.7. Once the complete application has been received, the Civil Aviation Authority must resolve the application within the period established in section 11.8, to carry out the verification and assessment of conformity with compliance with this Official Mexican Standard.

11.8. Response time.

Three months from the date on which the duly completed application was submitted.

If at the end of the maximum response period, the Civil Aviation Authority has not responded, it will be understood that the application was resolved in a negative sense to the promoter.

Legal basis: Article 17 of the Federal Law of Administrative Procedure.

If necessary, the Civil Aviation Authority has a maximum period of 30 calendar days from the date the application is submitted to request the missing information from the promoter. Likewise, the promoter

has 10 business days from the date the notification takes effect to correct said omissions; after the corresponding period has elapsed without the prevention being resolved, the procedure will be dismissed.

12. Validity

12.1. This Mexican Official Standard will enter into force one hundred and eighty calendar days after its publication in the Official Gazette of the Federation.

TRANSITIONAL

ONE. - Approvals to the Equipment Plans issued by the Civil Aviation Authority under Mandatory Circular CO AV 91.2/19, "Which establishes the specifications for the installation of Automatic Dependent Surveillance-Broadcast Equipment (ADS-B) OUT in aircraft," will remain valid.

NORMATIVE APPENDIX "A"
Format of Declaration of Compliance with the Mexican Official Standard
NOM-91/2-SCT3-2022

A.1. This Regulatory Appendix indicates the form and method of preparing and integrating a declaration of compliance with the Mexican Official Standard NOM-91/2-SCT3-2022, which must consider the proposed operation of the Concessionaire, Permit Holder or Air Operator and the characteristics and/or specifications of the aircraft. Each section that is relevant and applicable to the proposed operation must be identified and accompanied by a brief description, or preferably a specific reference to a manual or other document as indicated in paragraph b) of section 11.4 of this Mexican Official Standard; the brief description, or reference, must describe the method of compliance for each provision listed.

A.2. If the precise method of compliance has not been developed at the time of the formal application in a process for granting the Air Operator Certificate (AOC), which is only for the case of Concessionaires or Permit Holders, an initial declaration of compliance shall be submitted and it shall be sufficient to indicate the date on which this information will be provided to the Civil Aviation Authority, provided that the proposed time in which it is submitted for compliance is within a period that includes after the verification visit for the evaluation of conformity has been carried out, as indicated in section 11.5 of this Official Mexican Standard, but not before obtaining the compliance opinion of the referred Official Mexican Standard.

A.3. If the precise method of compliance has not been developed at the time of the request of an Air Operator, an initial declaration of compliance shall be submitted and it shall be sufficient to indicate the date on which this information will be provided to the Civil Aviation Authority, provided that the proposed time in which it is submitted for compliance is within a period that includes after the verification visit for the conformity assessment has been carried out, as indicated in section 11.5 of this Official Mexican Standard, but not before obtaining the opinion of compliance with the referred Official Mexican Standard.

A.4. Concessionaires, Permit Holders or Air Operators must submit an initial declaration of compliance if any of the requirements of the Official Mexican Standard are partially met or are not yet met and there is a date on which the information will be provided upon having submitted all the documentation and/or complying with all the provisions indicated in this Official Mexican Standard, the final declaration of compliance must be submitted indicating full compliance with this Standard. In the case of foreign air transport permit holders who intend to operate in national

territory, they must submit the final declaration of compliance with all applicable sections that are fully developed.

A.5. Below are some examples of expressing the regulatory provisions in the initial declaration of compliance.

EXAMPLE 1.
Declaration of compliance - The compliance method was not developed at the time of the application.
Mexican Official Standard NOM-91/2-SCT3-2022, section 5.3. of the Requirements for Use and Installation of ADS-B OUT, carrying out operations with the ADS-B OUT equipment or with any of its inoperative components.
EXAMPLE 2.
Declaration of Compliance - Compliance method fully developed.
Mexican Official Standard NOM-91/2-SCT3-2022, section 6.1. Requirements for operating the installed ADS-B OUT that complies with version 2.
- Documentation is attached that accredits the installation and the operation requirement of the ADS-B OUT version 2, since the manufacture of the aircraft (a list of equipment installed at the time of delivery of the aircraft to the owner is attached). See Annex 2 to this declaration.

A.6. For the purposes of a better preparation of this declaration of compliance by the Concessionaire, Permit Holder or Air Operator and a quick review by the Civil Aviation Authority, it is recommended to present it in the form of a table, which is shown below using the same examples:

[Initial or final] declaration of compliance with Mexican Official Standard NOM-91/2-SCT3-2022.

NOM Section	**Compliance Method**	**Compliance description**
5.1. ADS-B OUT Installation and Usage Requirements	***Not developed*** at the time of application [formal AOC application] [air operator conformity assessment]	- These requirements are currently under development and will be submitted for consideration on (insert date)
6.1. ADS-B OUT Operation Requirements	***Not developed***	- Operational approval of ADS-B OUT dated 7 February 2018, according to the attached reference letter (indicate the letter number), dated (indicate the date of the letter); Documentation accrediting the installation and the requirement for operation of ADS-B OUT version 2 is attached since the manufacture of the aircraft (a list of the equipment installed at the time of delivery of the aircraft to the owner is attached). See Annex 2 to this declaration.

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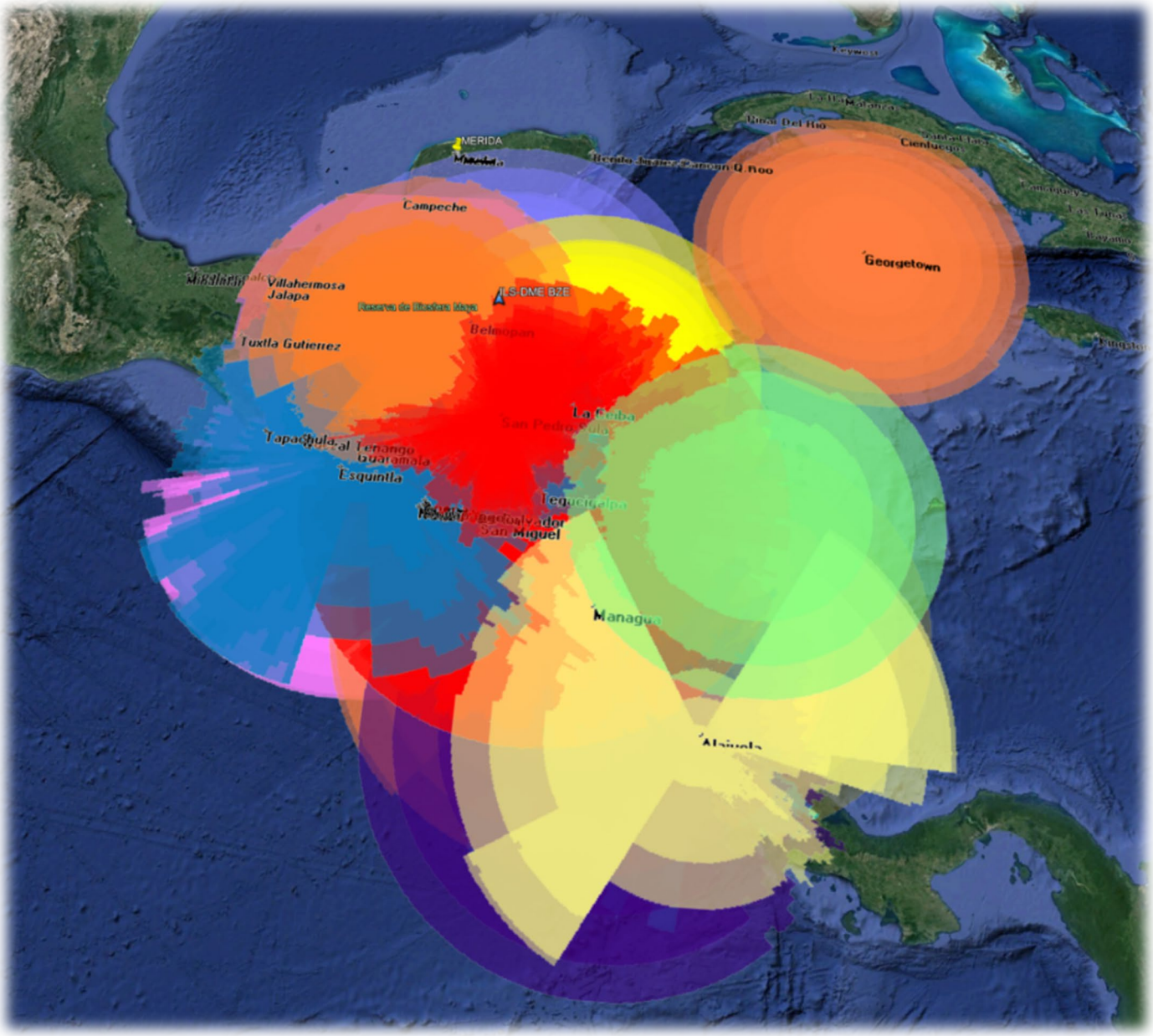
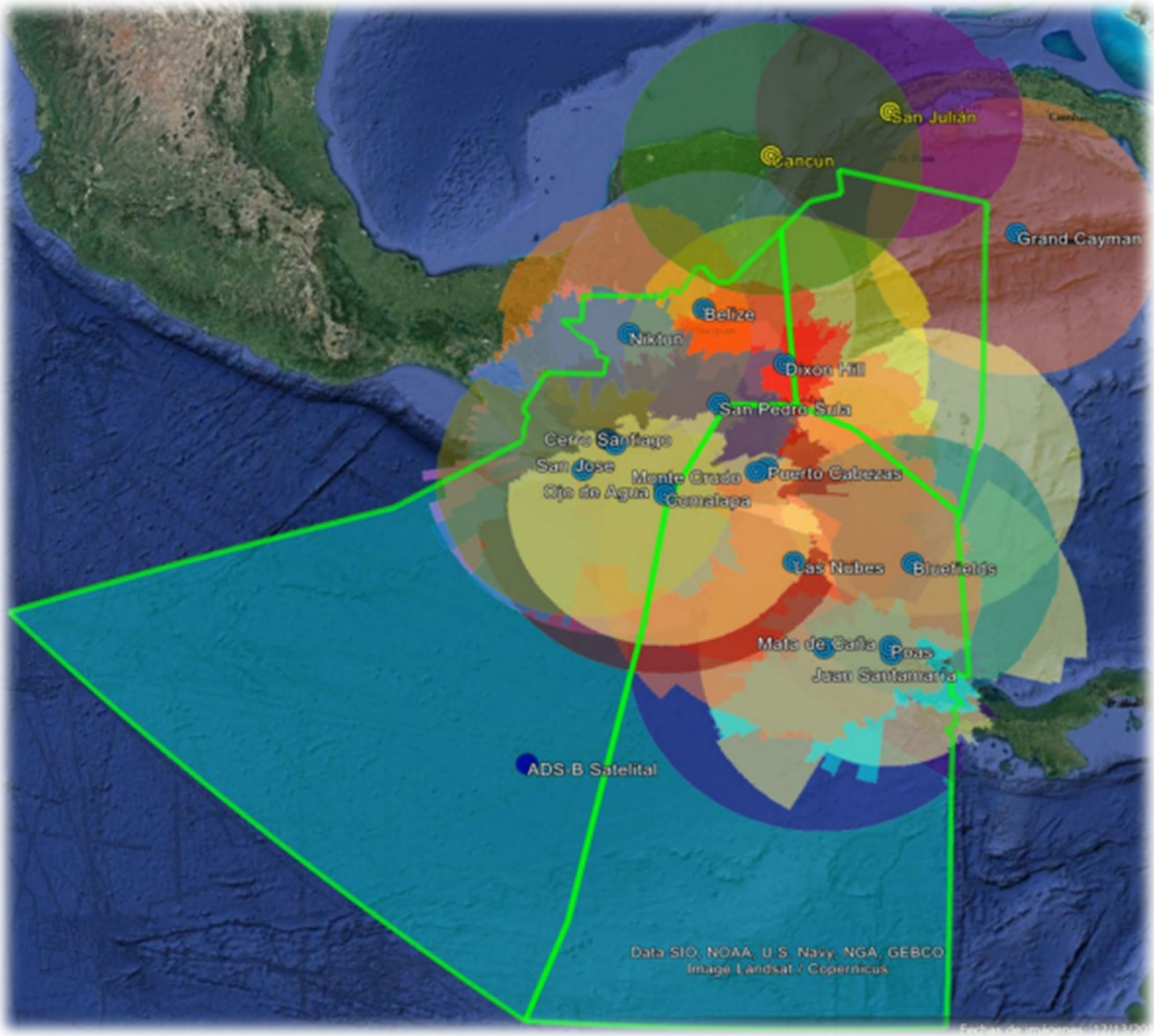
APPENDIX D

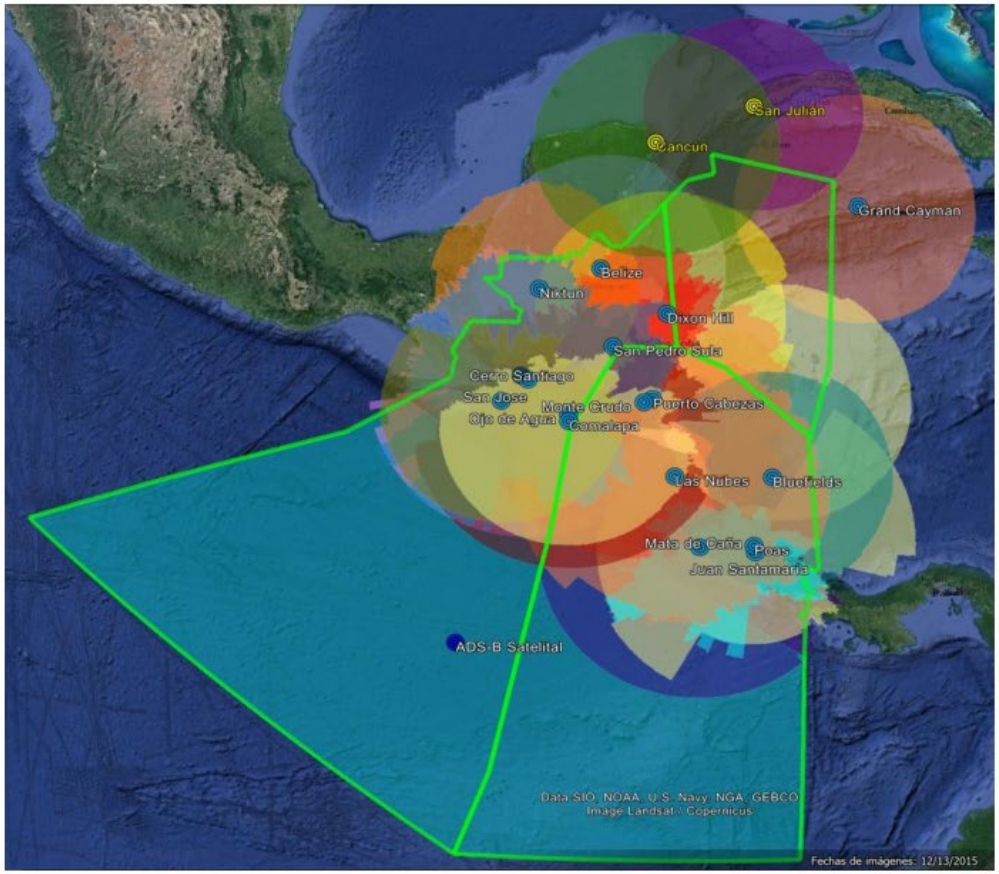
SURVEILLANCE COVERAGE CHARTS

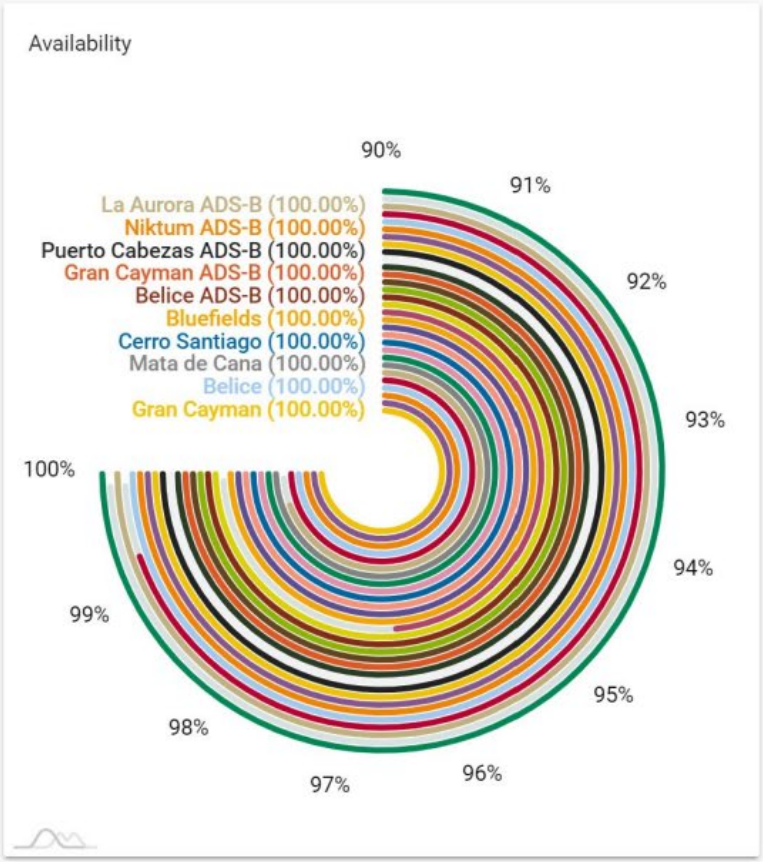
1. Central America FIR and COCESNA



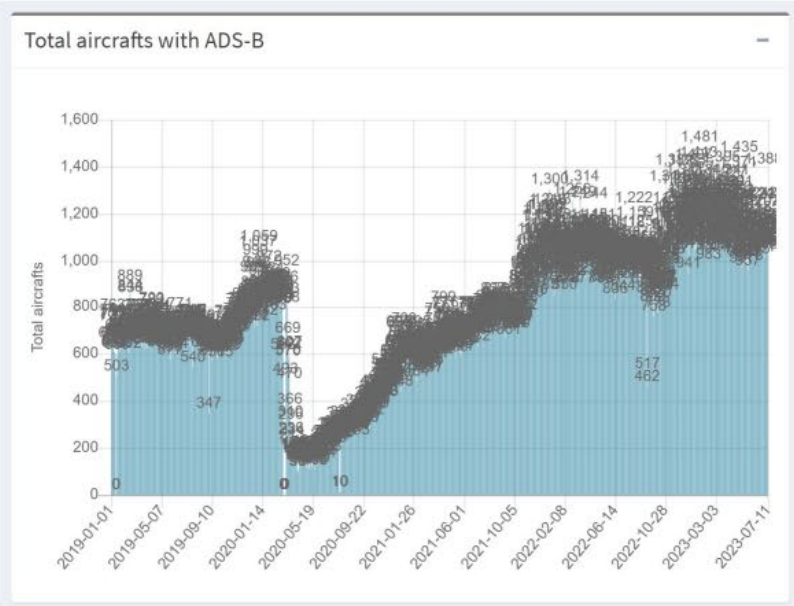

San Julián
Cancún
Grand Cayman
Belize
Nixtun
Dixon Hill
San Pedro Sula
Cerro Santiago
San Jose
Monte Crasón
Puerto Cabezas
Ojo de Agua
Comalapa
Las Nubes
Bluefields
Mata de Caña
Poas
Juan Santamaría
ADS-B Satelital
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

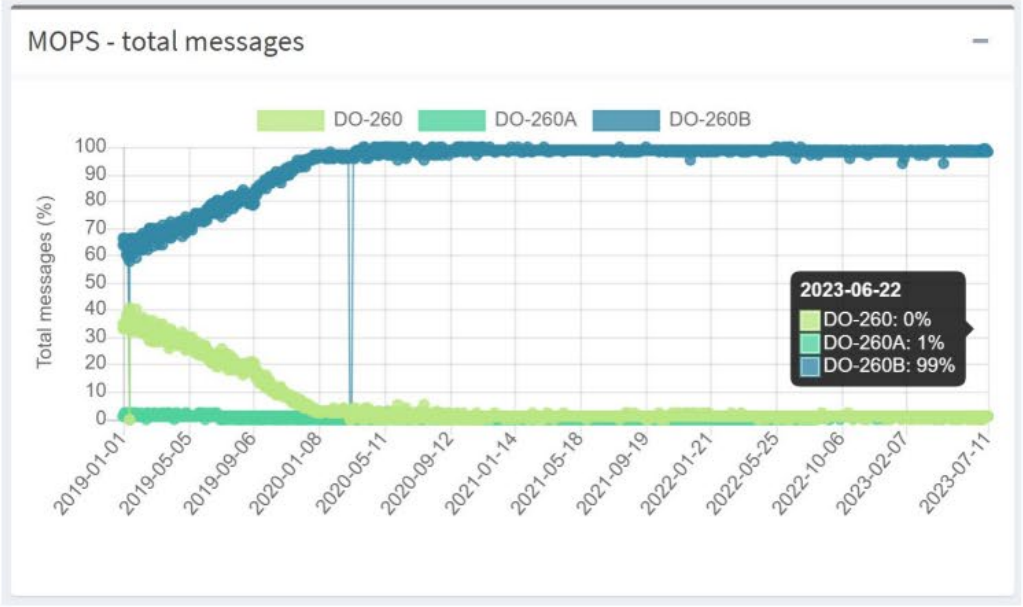
Enablers: Aeronautical Surveillance Systems
Systems Performance Assurance





Enablers: Avionics
ADS-B data monitoring system



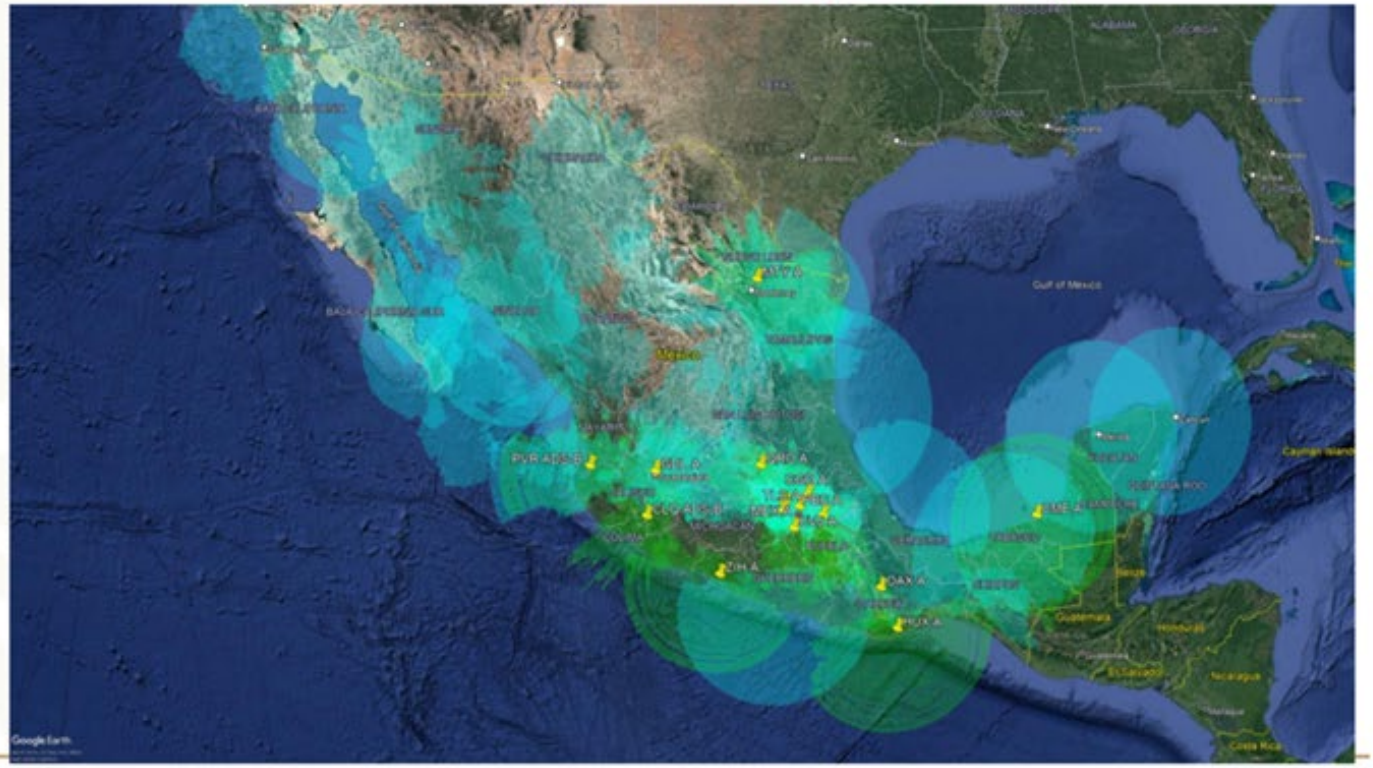


Note¿The.Central.American.region.has.monitored.that.the.capacity.of.the.aircraft.that.cross.its.FIR.is.❺❺↘ .trained.in.the.DO_8❷6B.version.in.terms.of.avionics¡.In.that.sense.in.terms.of.aircraft.technology?.they.are.qualified.for.the.use.of.ADS_B¡

2. Mexico

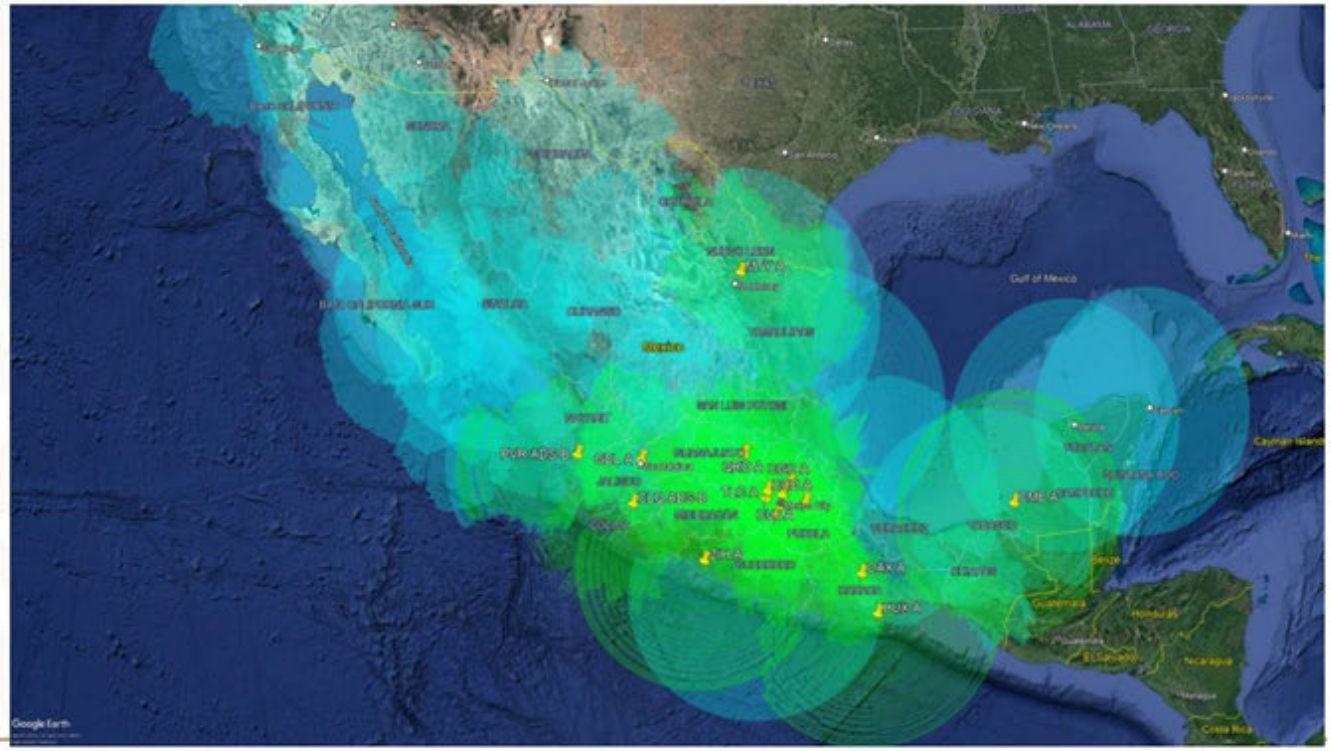
SENEAM
SERVICIOS A LA NAVEGACIÓN EN EL ESPACIO AÉREO MEXICANO

Theoretical coverage of radar and ADS-B systems (FL150)



SENEAM
SERVICIOS A LA NAVEGACIÓN EN EL ESPACIO AÉREO MEXICANO

Theoretical coverage of radar and ADS-B systems (FL300)



Note¿According.to.the.latest.statistics.presented.by.Mexico?69 .of.the.aircraft.in.its.airspace.are.ADS_B.capable¡

— END —