



ICAO

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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Roadmap for development of ADS-B regulation in Central America

ADS-B COCESNA and Member States Working Group

NAM/CAR/SAM Meeting Workshop on the Development of the regulation for the
implementation of Automatic Dependent Surveillance – Broadcast (ADS-B)

July 2023

Presentation summary

1. Review of the current situation of regulation in force, by country, in Central America
2. Proposed country regulation components
 - i. Initial information required
 - ii. Minimum information to be included in the regulations
 - iii. AIC's generation
3. Conclusions and recommendations

— INTRODUCCIÓN

By means of **resolution ROCD 244.5** and **agreement CT-143-6-2022** of COCESNA's Board of Directors, a Working Group has been established for Central American countries to work on the generation of the regulations that will allow the use of ADS-B in their respective airspaces.

To date, at least six (6) meetings of this Working Group have been held, where the activities (Road Map) to be carried out to achieve the defined goal have been established.

This presentation contains a summary of these activities and the progress achieved to date.

ROAD MAP



- Appointment of the ADS-B Mandate Follow-up Committee
 - Appointment of the Task Force for the ADS-B Mandate implementation
 - 1st meeting. Approval of the ADS-B Mandate implementation Road Map by the Task Force
 - Request for support to ICAO for the implementation of the ADS-B Regulation, DE-CEO 0604/2022
 - Avionics ADS-B implementation cost analysis and certification scheme by state, https://www.faa.gov/air_traffic/technology/equipadsb/installation/equipment
 - Analysis of avionics equipment status by state, including aircraft registration, https://www.faa.gov/air_traffic/technology/equipadsb/installation/equipment/adsb_ready/
 - Identification and participation of industry and airspace users (commercial and general aviation)
 - Revisions of ICAO Standards on ADS.B, Annex 10, Doc. 9924, circular 326, USOAP questions
 - Review of the ADS-B Regulatory framework and publications by State
 - Case study and lessons learned from FAA, ADS-B Mandate, CFR 91.225, CFR 91.227, TSO-C166B, https://www.faa.gov/air_traffic/technology/adsb
 - Definition / Revision of the ADS_B operation concept by State and by airspace, based on NAM/CAR OPERATIONS CONCEPT DOCUMENT (CONOPS)
 - Consolidation on cost-benefit analysis of the ADS-B implementation
 - Definition of the ADS-B performance requirements, by airspace
 - Evaluation of operational aspects on a global basis
 - Consolidations and making of ADS-B regulation draft
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Belize

Mentions is made about the use of the ADS-B in Belize Civil Aviation Regulation 10 (BCAR 10), where it is highlighted:

- Sensitivity levels and detection probability of UAT Receivers for long, short and UAT ADS-B messages, operating at 978 MHz and below 18,000 ft.
- Displaying of the ADS-B / TIS-B track on the control screens when receiving an ACAS signal from the same aircraft

Currently, work continues the regulations for ADS-B 1090 ES, as there is no legislation in force at this time



Guatemala

The **AIC A 32-22 24 JUN** was published, which established June 24th, 2023, as the deadline for all fixed and rotary wing aircraft to be equipped with ADS-B 1090 in Guatemala airspace.

Subsequently, **AIC A 18-23 23 JUN**, was published, repealing AIC A 32-22 24 JUN, where an **EXTENSION** of up to one year is given, so that finally, ADS-B 1090 will be implemented for all fixed or rotary wing aircraft, in all its airspace, by June 24th, 2024. It has been stated that this extension has been due to the reported implementation times of the necessary avionics in the aircraft

AIC A	 DIRECCION GENERAL DE AERONAUTICA CIVIL	18-23 23 JUN
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CIRCULAR DE INFORMACIÓN AERONÁUTICA
SEGURIDAD, REGULARIDAD Y EFICIENCIA EN LA NAVEGACIÓN AÉREA

ADS-B

La **Dirección General de Aeronáutica Civil**, a través de la Gerencia de Navegación Aérea informa a la aviación en general y operadores aéreos que se aprueba una **PRÓRROGA** de un año más para toda aeronave de ala fija o rotativa que pretenda operar dentro del espacio aéreo guatemalteco deben estar equipados con dispositivos para **VIGILANCIA DEPENDIENTE AUTOMÁTICA-RADIODIFUSIÓN "ADS-B"** (Automatic Dependent Surveillance Broadcast) frecuencia 1090 Mhz, hasta el 24 de junio del año 2024.

Esta AIC cancela a la AIC A 32-22.


Francis Arturo Argueta Aguirre
Director General

DIRECCION GENERAL DE AERONAUTICA CIVIL

El Salvador



Two AICs related to the subject were published:

AIC Serie A, 04/22 20 sep

Where it was declared that, as of June 24th, 2023, all fixed and rotary wing aircraft that intended to operate within Salvadoran airspace must be equipped with devices of Automatic, Dependent Surveillance – Broadcast Out (ADS-B Out) frequency 1090 MHz

AIC Serie A, 07/23 19 jun

Repeals the AIC Serie A, 04/22 20 sep and extends as of June 24th, 2024, so that all fixed and rotary wing aircraft that intend to operate within Salvadoran airspace must be equipped with devices of Automatic, Dependent Surveillance – Broadcast Out (ADS-B Out) frequency 1090 MHz

 TEL.: (503) 2375-2290 2375-2348 2375-2425 2375-2440 AFS: MSLPYOYX E-mail: oficiales.ais@cepa.gob.sv	REPÚBLICA DE EL SALVADOR COMISIÓN EJECUTIVA PORTUARIA AUTÓNOMA AEROPUERTO INTERNACIONAL DE EL SALVADOR SAN OSCAR ARNULFO ROMERO Y GALDÁMEZ SERVICIOS DE INFORMACIÓN AERONÁUTICA	A I C Serie A 07/23 19 JUN
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ADS-B OUT
Vigilancia Dependiente Automática—Emisión

La Autoridad de Aviación Civil de El Salvador (AAC), de conformidad y en cumplimiento con lo prescrito en el artículo 7 numeral 4 de la Ley Orgánica de Aviación Civil, hace del conocimiento de todo el personal involucrado que:

A partir del 24 de junio de 2024, toda aeronave de ala fija o rotativa que pretenda operar dentro del espacio aéreo Salvadoreño debe estar equipada con dispositivos para Vigilancia dependiente automática—Emisión (ADS-B OUT por las siglas en inglés de Automatic Dependent Surveillance—Broadcast Out) frecuencia 1090 MHz.

Esta AIC reemplaza a la AIC A04/22

Honduras - COCESNA



COCESNA has the **ATS Operating Procedures Manual**, which includes the procedures to be used with ground and satellite-based ADS-B, including ADS-C.

It has also published the **AIC Serie A 64/21, effective since September 1st, 2021, IMPLEMENTATION OF AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST (ADS-B) IN THE HIGHER AIRSPACE OF THE CENTRAL AMERICAN FIR.**

These documents establish the use, procedures and airworthiness requirements for the ADS-B track, highlighting:

- The minimum separation for continental airspace of 5NM and oceanic airspace of 50NM, as established in the Procedures Manual
- Procedures for the use of ADS-B and ADS-C.
- Publications of the use of ground and satellite-based ADS-B as of September 1st, 2021.

MANUAL
PROCEDIMIENTOS OPERATIVOS
ATS

Código	Edición	Fecha Ed.
ATS-MAN-001	011	26-MAR

COCESNA
CORPORACION CENTROAMERICANA DE SERVICIOS DE NAVEGACION AEREA
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AIC 64/21
Publicado el 01 SEP 2021

IMPLEMENTACION DE LA VIGILANCIA DEPENDIENTE AUTOMÁTICA RADIODIFUSIÓN (ADS-B) EN EL ESPACIO AÉREO SUPERIOR DE LA FIR CENTROAMERICANA

1. PROPOSITO

1.1 Para atender el crecimiento del tránsito aéreo y con el fin de mejorar la eficiencia operacional en la FIR MHCC se comunica a la comunidad aeronáutica a través de esta circular, la implementación del servicio de Vigilancia ATS por medio de sensores ADS-B terrestres instalados en Centroamérica para el espacio aéreo continental y Caribe y la información de ADS- satelital provista por AIREON para el espacio aéreo del Pacifico.

1.2 La fecha de implementación de los servicios de vigilancia ATS utilizando los sistemas ADS-B es a partir del 1 de septiembre del 2021 y de forma permanente.

2. OBJETIVO FUNDAMENTAL

2.1 En cumplimiento con el objetivo estratégico de OACI: "Aumentar la capacidad y mejorar la eficiencia del sistema de la aviación civil mundial", COCESNA implementará vigilancia ADS-B para la prestación de los Servicios de Tránsito Aéreo (ATS).

3. RAZON DE LA IMPLEMENTACIÓN

3.1 El uso de la tecnología de ADS-B es necesaria para asegurar la optimización del espacio aéreo a través del mejoramiento de la capacidad de vigilancia, confiabilidad y precisión, que debería resultar en una reducción de las mínimas de separación.

3.2 La redundancia de cobertura de vigilancia aeronáutica en el espacio aéreo continental (Radar MSSR-S + ADS-B) y la ampliación de vigilancia ATS en el espacio aéreo oceánico del Pacifico de la FIR Centroamérica (ADS-C + ADS-B Satelital) mejorará la seguridad en caso de contingencia, en comparación con los servicios y estándares de separación que se pueden proporcionar en un entorno sin sistemas de vigilancia.

3.3 Los mandatos ADS-B, vigentes a partir del 1 de enero de 2020 en los Estados Unidos y el 7 de junio de 2020 en los espacios aéreos europeos, que establecen que ninguna persona puede operar una aeronave en el espacio aéreo de Clase "A" a menos que la aeronave tenga "ADS-B" y "Modo S mejorado", han incrementado el porcentaje de aeronaves equipadas con transpondedores compatibles con el sistema ADS-B, incluyendo la actualización de la aviónica de las versiones DO-260 y DO-260A a DO-260B. Por medio del análisis de datos de vigilancia se ha podido evidenciar que más del 90 % de la aviación comercial dispone de capacidad ADS-B y de estas un 99% las aeronaves que sobrevuelan el espacio aéreo continental de la FIR Centroamérica disponen de la Versión DO-260B.

Nicaragua

Work continues on the development of regulations associated with the implementation of ADS-B 1090 ES in its airspace.

Currently, there are no AIC publications related to the mandatory use of ADS-B.

Costa Rica



It has Decree No. 42880-MOPT RAC-10 COSTARRICAN AERONAUTICAL REGULATIONS ON AERONAUTICAL TELECOMMUNICATIONS

In addition, it has the **AIC Serie C 09 26 JUL 2022 CNS USE OF ON-BOARD TRANSPONDING EQUIPMENT AND / OR ADS-B IN AIRCRAFT**, where it is established that:

- As of January 1st, 2023, ADS-B technology as a secondary source of detection and identification in ATS surveillance system in Costa Rican airspace.
- Establishes as of January 1st, 2024, as per RAC-10.03170 Mandatory ADS-B onboard equipment requirement.
- Includes ADS-B Version 2.
- Includes performance requirements to be reviewed and approved
- Defines elements of the ADS-UAT



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COSTA RICA
2022-2026
TRABAJAMOS EN COMERCIO, LEJOS Y CERCA

AIC Serie C 09
26 JUL 2022

CNS

USO DEL EQUIPO TRANSPONDEDOR Y/O ADS B DE A BORDO EN LAS AERONAVES

La Dirección General de Aviación Civil, a través del Departamento de Servicios de Navegación Aérea, recuerda a los operadores aéreos que toda aeronave operando dentro del espacio aéreo costarricense deberá disponer obligatoriamente de equipo respondedor de abordó (Transpondedor) en modo C en condiciones normales de funcionamiento, de acuerdo con lo dispuesto en RAC 02, Sección 02.215. El equipo debe cumplir con las especificaciones: TSO-C74B ó TSO-C74C ó de clase TSO-C112.

Además, de acuerdo con el RAC 10 REGULACIONES AERONÁUTICAS COSTARRICENSES - TELECOMUNICACIONES AERONÁUTICAS, 10.03165, (a): Se insta a los diferentes operadores aéreos a realizar mejoras en sus equipos mediante la introducción del ADS-B (equipo de Vigilancia dependiente automática-radiodifusión "ADS-B" (Automatic Dependent Surveillance Broadcast)) conforme a la normativa del RAC-10, Anexo 10 y sus enmiendas, que tiene como objetivo mejorar la seguridad operacional.

A partir del 1 de enero del 2023, la tecnología ADS-B se utilizará como fuente secundaria de detección e identificación en los Sistema de Vigilancia ATS en espacio aéreo costarricense.

A partir del 1 de enero del 2024, según el RAC-10.03170 Requisito equipo ADS-B a bordo, será obligatorio disponer de tecnología ADS-B a bordo de conformidad con las disposiciones aplicables en el RAC-10, Anexo 10 y sus enmiendas.

Esta Dirección realizará inspecciones periódicas a las aeronaves para determinar su fiel cumplimiento.

Aeronaves de uso agrícola:
Las aeronaves de uso agrícola operando hacia espacios aéreos controlados (mantenimiento o vuelos ferry) que requieran operar sin equipo respondedor a bordo, deberán enviar el formulario adjunto con un mínimo de 24 horas de anticipación al e-mail: rlc@dgac.go.cr para la aprobación del Departamento de Servicios de Navegación Aérea.

Vehículos Ultraligeros Motorizados:
Los Vehículos Ultraligeros Motorizados podrán volar en el espacio aéreo controlado siempre y cuando cuenten con transpondedor modo C operativo y/o ADS-B.

REEMPLAZA CON MODIFICACIONES A LA AIC C05/22

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Departamento de Servicios de Navegación Aérea / Unidad de Servicios de Información Aeronáutica
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FE DE ERRATAS

DE EJECUTIVO

DECRETOS

DECRETOS VARIOS

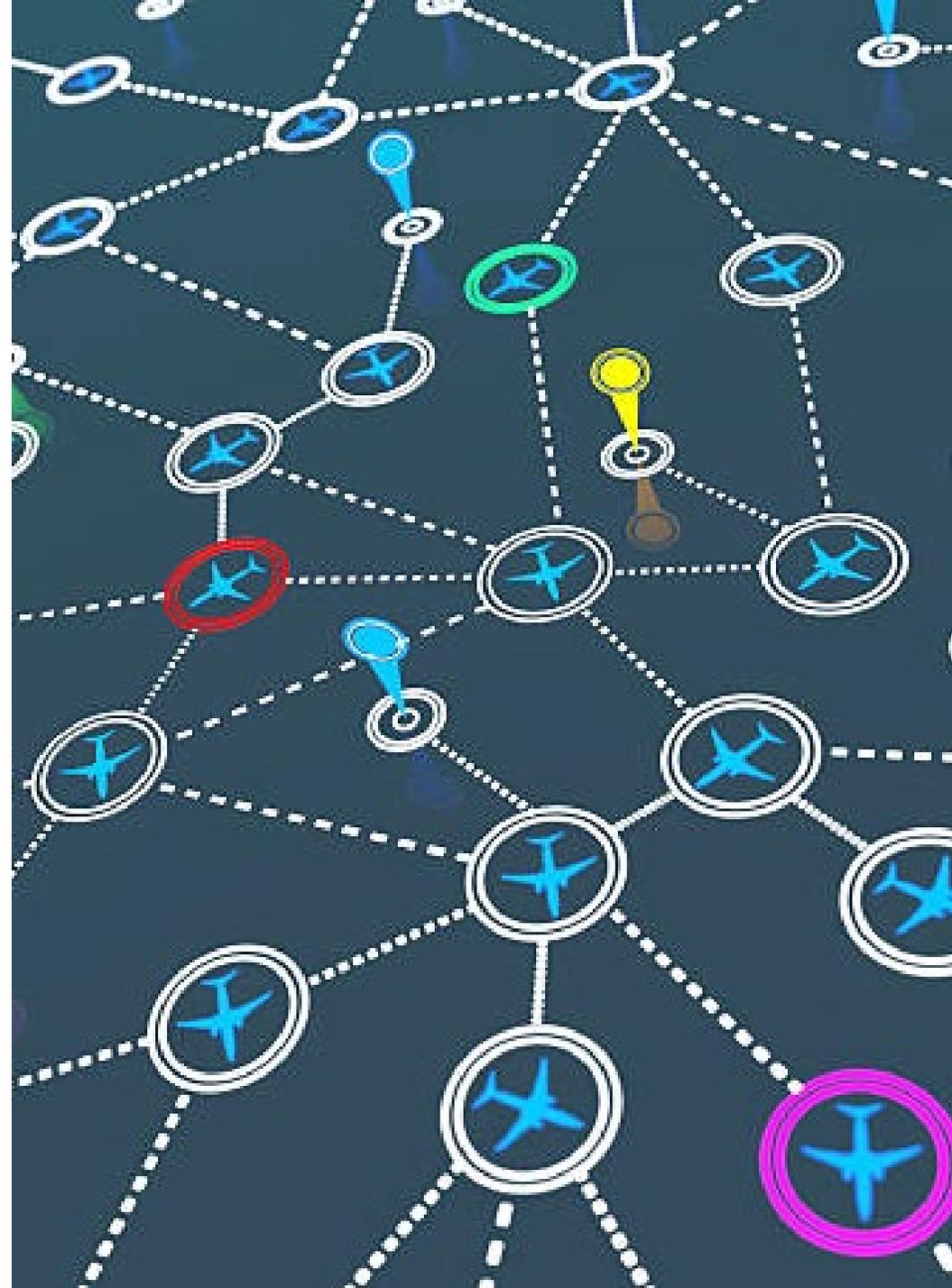
DE HACIENDA

DE SERVICIOS DESCENTRALIZADOS

DE ADMINISTRACIÓN CENTRAL DE COSTA RICA

Imprenta Nacional
La Uruca, San José, C. R.

Component content elements of the regulation / standards for the use ADS-B.



INTRODUCTION

It is proposed to create the regulations associated with the implementation of ADS-B, for each of the States, taking into consideration some basic elements in the structure of such regulations and considering the publications of the States and experiences obtained by the region.

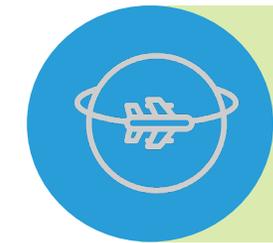
Additionally, it is suggested to promote the notification of these regulations through the publication of Aeronautical Information Circulars (AIC).

It is suggested to take as a basis, the standards published by the FAA in its CFR 91.225 and 91.227, which are quite comprehensive and complete, recommending to obtain feedback from the FAA on the experience gained and planned improvements.

ADS-B REGULATION

1. The ADS-B Out transmits information about an aircraft via an onboard transmitter to a ground receiver. CENAMER's experience has led to operational benefits.
2. ADS-B Out enables a shift from radar-based air traffic control to a more accurate and performance-based satellite-derived position source coming from the aircraft location system to safely and efficiently accommodate aircraft operations and increased demand.
3. Enabling improved capacity, reduced delays, reduced incidents and improved environmental care and protection.
4. ADS-B is an essential element of the GANP for future improvements and to reduce coverage gaps at a positive cost-benefit outcome.

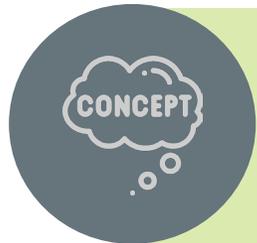
Preliminary information suggested as a basis for the establishment of ADS-B regulation as an essential element of the GANP



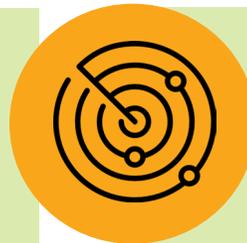
Airspace types definitions



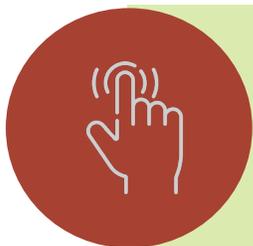
Degree of implementation and timelines for avionics equipment installation



Specific CONOPS on the ADS-B use for those airspace types



Degree of implementation of the enablers, according to economic feasibility



Intentions of use of the ADS-B data



Involvement of all stakeholders and airspace operators.

Suggested content (CFR 91.225)

- **Definition of the type of technology to be used (1090 ES) and the version of the ADS-B message (DO-260B or higher).**
 - Use of the extended spontaneous signal transmission link (ES) at 1090 MHz, internationally agreed by ICAO.
 - Equipment performance requirements (DO-260B or higher), which is a mature standard, with better defined performance requirements and fully supports national and international aeronautical surveillance.
 - The use of UAT is not recommended due to the lack of enabling, financing of two technologies and operational complexity.
- **Definition of the ADS-B CONOPS for the different airspaces.**
 - Establishment of the minimum flight level of application of the regulations, according to the types of airspace identified: terminal, continental and oceanic.
- **Definition of the types of aircraft to which the use of ADS-B will apply.**
 - Fixed wing and rotary wing aircraft.
 - Consideration should be given as to whether it will also apply to unmanned aircraft such as gliders, hot air balloons, drones, etc.

Suggested content (CFR 91.225)

- **Restrictions by type of operations**
 - Civilian
 - Military
 - Reconnaissance
 - etc.
- **Harmonization of operational criteria with adjacent airspaces.**
 - Transition of control, if the airspace is shared or adjacent to another controlling entity or ANSP.
- **Treatment of contingencies when an aircraft is not able to send the ADS-B OUT signal, or it contains errors.**
- **Exceptions, if applicable, in case an aircraft does not have avionics compatible with the ADS-B signal.**

Suggested
content
(CFR 91.227)

- **ADS-B terms and definitions**
- **Definition of figures of merit** with their minimum allowable levels and transmission rate, compatible with version **DO-260B or higher**.
- **Power and antenna requirements** for ADS-B OUT signal from aircraft, according to version **DO-260B or higher**.

Suggested
content
(CFR 91.227)

- **Basic aircraft information contained in the ADS-B message:**
 - Longitude and width of the aircraft
 - Position (longitude and latitude)
 - Aircraft barometric pressure altitude
 - Aircraft speed
 - Presence and operation of TCAS II or ACAS on board
 - An indication of the mode 3/A transponder code specified by ATC
 - 24-bit ICAO address assigned to the aircraft
 - Indication if the crew has generated any emergency signal, communications failure or unlawful interference
 - An indication of the aircraft's "IDENT" to ATC

Suggested content (CFR 91.227)

- **Basic aircraft information contained in the ADS-B message (Cont.):**
 - An indication of the aircraft's category of transmitter;
 - An indication of whether an ADS-B In capability is installed;
 - An indication of the geometric altitude of the aircraft;
 - An indication of the navigation accuracy category for position (NAC_p);
 - An indication of the navigation accuracy category for velocity (NAC_v);
 - An indication of the navigation integrity category (NIC);
 - an indication of the system design assurance (SDA); and
 - An indication of the source integrity level (SIL).

Suggested
content
(CFR 91.227)

- **Definition of required airspace performance based on the figures of merit implied in DO-260B or higher, which state that:**
 - The aircraft NAC_p must be less than 0.05 NM;
 - The NAC_v of the aircraft must be less than 10 meters per second;
 - The NIC of the aircraft must be less than 0.2 NM;
 - The SDA of the aircraft must be 2;
 - The aircraft SIL must be 3.
 - Changes in $NACP$, $NACV$, SDA and SIL must be transmitted within 10 seconds.
 - Changes in the NIC must be transmitted within 12 seconds.

Suggested content (CFR 91.227)

- **ADS-B signal latency requirements:**
 - The aircraft must transmit its geometric position no later than 2 seconds from the time of position measurement to the time of transmission.
 - Within the total latency allowance 2.0, a maximum of 0.6 seconds may be uncompensated latency. The aircraft must compensate for any latency greater than 0.6 seconds up to the maximum total of 2.0 seconds by extrapolating the geometric position to the message transmission time.
 - The aircraft must transmit its position and velocity at least once per second while airborne or while moving on the airport surface.
 - The aircraft must transmit its position at least once every 5 seconds while stationary on the airport surface.

Suggested
content
(CFR 91.227)

- **Minimum requirements for on-board equipment installed for the generation of ADS-B messages, having an acceptable valid certification. Suggestions can be provided.**

CONCLUSIONS

- Each state should consider the current and immediate future situation with respect to its currently installed surveillance and communications infrastructure, along with its defined airspaces, that will allow for the very near-term implementation of the ADS-B signal.
- The definition of the use of the ADS-B signal will drive the regulatory implementation efforts.
- Currently, the States that have defined a date for the implementation and mandatory use of ADS-B in their airspace do not agree on the same date, but significant progress has been made in the ADS-B enablers.
- The regulations established by the States of Guatemala, El Salvador, Belize and Costa Rica include the ADS-B UAT signal in their existing regulations.

CONCLUSIONS

- A Working Group, composed of technical and operational personnel, has been successfully established and is carrying out activities related to the elaboration of the regulations needed for the implementation and use of ADS-B in Central America, which has already yielded many fruits in its actions.
- The current infrastructure of Aeronautical Surveillance and the capacities installed in the Control Centers and Towers of Central America allow the incorporation of the ADS-B 1090 ES data in their operations, and the experience of CENAMER supports the implementation in the region.
- It is proposed a basic content that should contain the regulation of the States to regulate the use of ADS-B in their airspace.

RECOMMENDATIONS

- Promote the use of the ADS-B signal as a secondary surveillance layer in the available radar space, following the initiative included in the current regulation of the State of Costa Rica and CENAMER. This implies:
 - Train personnel in the use of the ADS-B signal and the respective symbology.
 - Update operating procedures to define the use of ADS-B as a secondary medium.
 - Make the respective publications in the AIP of the States.
- Generate a state regulation that takes the experience gathered in the standards published by the FAA in its CFR 91.225 and 91.227, in addition to TSO-C166b and higher, as a guide for implementation and regulation, adjusted to the needs of each state and the defined airspaces.

RECOMMENDATIONS

- Focus on the implementation of ADS-B 1090 ES and discourage the installation of UAT-based avionics (not included in the regulations), considering the experiences of other States and the complexity of managing this signal. This will require modification of existing regulations.
- Continue with implementation plans, generating the required regulations, coordinating with adjacent ATCs and, to the extent possible, harmonizing implementation deadlines so that there is only one implementation deadline in the Central American region.



Thank You!