E/CAR/NTG/12 & E/CAR/RD/10 — WP/05
24/07/23

Twelfth Eastern Caribbean Network Technical Group (E/CAR/NTG/12) and Tenth Eastern Caribbean Radar Data Sharing Ad hoc Group (E/CAR/RD/10) Meetings
Miami, United States, 24-25 July 2023

Agenda Item 4: Surveillance Sharing Activities
4.1 Surveillance/Automatic Dependent Surveillance – Broadcast (ADS B)/Multilateration (MLAT) Developments/Updates)

PROCESS OF AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST (ADS-B) IMPLEMENTATION

(Presented by the Secretariat)

EXECUTIVE SUMMARY
Automatic Dependent Surveillance–Broadcast (ADS-B) supports the provision of Air Traffic Services and operational applications at reduced cost and increased surveillance coverage. It also increases safety and supports the implementation of many operational functionalities. This working paper provides information about the process of ADS-B implementation and how the Eastern Caribbean States must obtain benefits from this implementation.

Action:	To be evaluated by all E/CAR meetings E/CAR/NTG, E/CAR/RD and E/CAR/CATG. The suggested action is presented under Section 4.
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency • Environmental Protection
References:	• Second Meeting of Rapporteurs of the North American, Central American and Caribbean Working Group (NACC/WG/RAP/2), Mexico City, Mexico, 28 to 31 March 2023: https://www.icao.int/NACC/Pages/meetings-2023-wgrap02.aspx • NAM/CAR/SAM Workshop on the Development of the regulation for the implementation of Automatic Dependent Surveillance – Broadcast (ADS-B) (ADS-B-Imp), ICAO NACC Regional Office, Mexico City, Mexico, 17 to 21 July 2023: https://www.icao.int/NACC/Pages/meetings-2023-adsb.aspx

## 1.		Introduction

1.1		Automatic Dependent Surveillance–Broadcast (ADS-B) is an Aviation System Block Upgrade (ASBU) element, part of the Surveillance Module that provides data and accurate reports of an aircraft's position. The ADS-B data provides precise position/velocity information in all airspaces (accuracy not range-dependent as with radar). It also provides aircraft call sign and precise position/velocity information to nearby aircrafts having ADS-B-In receivers. ADS-B can also support State aircraft airspace access, however it should, when possible, leverage benefits from dual-use of State aircraft capabilities to reduce cost and technical impact.

1.2		ADS-B provides an aircraft's identification, position, altitude, velocity, and other information to any receiver (airborne or ground) within range. The broadcasted aircraft position/velocity is normally based on the Global Navigation Satellite System (GNSS) and transmitted at least once per second.

1.3		Many benefits were identified about the ADS-B implementation such as: improves level of safety and efficiency in the control traffic operation, improves Safety, increases pilots' Situational Awareness and ATC operations, and supports other important operational services.

1.4		"ICAO and States recognize ADS-B as an enabler of the global ATM operational concept bringing substantial safety and capacity benefits."

## 2.		ADS-B Implementation for the Eastern States

2.1		Several of the Caribbean States are in the process of ADS-B implementation and other States require the implementation of surveillance systems to support their air traffic control operations in the lower airspace.

2.2		In order to obtain real benefits from the implementation of this facility, it is advisable to carry out a regional analysis of this implementation with the objective of achieving goals that benefit the entire region, that support efficiency, capacity and above all operational safety throughout the region.

2.3		The implementation of ADS-B would allow the Caribbean region to better plan its operational improvements and standardize regional air traffic control procedures. Although implementation on a single island would benefit the individual safety of the implementing State, coordinated regional implementation among the States would benefit the entire region.

2.4		In this sense, it would be very important to take advantage of all the individual projects being carried out by the States, but also to develop an integrated project covering the entire region. The ICAO NACC Regional Office recommends looking at implementation on a regional basis and pursuing these regional objectives to obtain the benefits that ADS-B provides.

## 3.		Development of a regional project of ADS-B Implementation

3.1		The creation of a multidisciplinary group with specialists from the E/CAR region is recommended for the development of a regional ADS-B project. The AD-Hoc Group would be responsible for developing the following deliverables:

1.   Regional Status of the ADS-B implementations.
2.   Identification of ADS-B objectives for the E/CAR States.
3.   Development of a CONOPS for ADS-B Implementation.
4.   Development of a Request for an Information Document (RFI).

3.2   About the current ADS-B implementation, it is necessary to update the Status of the implementation basic on the ADS-B enables implementation Status. The **Appendix** provides a check list to support the analysis of the ADS-B S implementation status.

3.3   This information would provide the necessary information to carry out the development of a regional project with benefits for all.

3.4   Taking into consideration the experience of the North American and Central Caribbean States, this initiative would be supported by the ICAO NACC Regional Office and by the Surveillance Task Force, a member of the North American, Central American and Caribbean Working Group (NACC/WG).

4.   Suggested Actions

4.1   The Meeting is invited to:

a)   Do an analysis about all the information presented in this working paper;

b)   adopt the recommendation as conclusion of the recommendation provided in Section 3.1 of this working paper; and

c)   other appropriate actions.

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North American, Central American and Caribbean Office (NACC)
Oficina para Norteamérica, Centroamérica y Caribe (NACC)

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ADS-B IMPLEMENTATION ACTION PLAN
PROJECT PLAN DEVELOPMENT

ADS-B IMPLEMENTATION		
Why?: the main purpose is that it provides a summary of the essence of the element for the operational elements, it provides information of the direct relationship of the performance.	**What?** description of what stakeholders can do with this element that could not be done before. This section is not intended to describe performance enhancement or benefits	**How?** additional information to improve the understanding of the element.
- Define Objective	- Define Stakeholders - Integrate all stakeholder in the project. - Define action plan. - Define benefits	- Case study - Technical evaluation - Risk analysis - Cost benefit - Business and Safety case - Schedule - Implementation Strategy - Others
Relationship of the performance (Key performance indicators)		
"What cannot be measured cannot be improved"		
KPI01 **Departure punctuality**	KPI09 Airport peak capacity	KPI17 Level-off during climb
KPI02 **Taxi-out additional time**	KPI10 Airport peak throughput	KPI18 Level capping during cruise
KPI03 **ATFM slot adherence**	KPI11 Airport throughput efficiency	KPI19 Level-off during descent
KPI04 **Filed flight plan en-route extension.**	KPI12 Airport/Terminal ATFM delay	KPI20 Number of aircraft accidents
KPI05 **Actual en-route extension**	KPI13 Taxi-in additional time	KPI21 Number of runway incursions
KPI06 **En-route airspace capacity**	KPI14 Arrival punctuality	KPI22 Number of runway excursions
KPI07 En-route ATFM delay	KPI15 Flight time variability	KPI23 Number of airprox/TCAS alert/loss of separation/near midair collisions/midair collisions (MAC)
KPI08 **Additional time in terminal airspace**	KPI16 Additional fuel burn	
https://www4.icao.int/ganpportal/ASBU/KPI		

ADS-B ENABLES		
1. Infrastructure		
Ground system infrastructure: The type of infrastructure to be implemented can depend on different factors (e.g., Terrain, operational requirements, coverage requirements, avionics compatibility, etc.)		
Element	**Technical Needs**	**Standards and technical information to incorporate in the analysis**
ADS-B ground stations receive information from aircraft and transmit it to one or more Service	- Technical requirements - Evaluation terrain - Communication needs (main and backup needs) - Energy needs - Security - maintenance logistics - Others according with implementation	- ICAO Annex 10 Volume IV Chapter 2,3 and 5 - ICAO Doc. 9871 Technical Provisions for Mode S Services and Extended Squitter - RTCA/EUROCAE MOPS: DO-260/ED-102, DO-260A, or DO-260B/ED-102A EUROCAE ED-129, ED-129A or ED-129B - ICAO Doc. 9924 Aeronautical Surveillance Manual
Service Delivery Point(s) for ADS-B information	- Technical requirements - ATC integration protocols - Surveillance system purpose and scope - Definition of parameters contributing to quality of services - Components of an aeronautical surveillance system - Definition of parameters contributing to quality of services. - Monitoring System. - Surveillance data evaluation - ATC Alarms	- ICAO Doc. 9924 Aeronautical Surveillance Manual. - ICAO Doc. 4444 PANS ATM
Human Machine Interface (HMI) of the Air Traffic Controller Working Position (ATCo CWP)	- Integrate a technical language. - Integrate in the HMI operational requirements. - Integrate HMI for technical needs.	- ICAO Doc. 9924 Aeronautical Surveillance Manual. - ICAO Doc. 4444 PANS ATM
2. Aircraft Avionics		
SSR Mode S transponder with extended squitter version 0, version 1 and version 2.	Three versions of ADS-B: - Version 0 = DO-260/ED-102 - Version 1 = DO-260A - **Version 2 = DO-260B/ED-102A**	- ICAO Annex 10 Volume IV Chapter 2,3 and 5 - ICAO Doc. 9871 Technical Provisions for Mode S Services and Extended Squitter - RTCA/EUROCAE MOPS: DO-260/ED-102, DO-260A, or DO-260B/ED-102A - ICAO Doc. 9924 Aeronautical Surveillance Manual
Basic Aviation GNSS receiver with RAIM *Receiver autonomous integrity monitoring (RAIM)	Position source. Basic Aviation GNSS receiver with RAIM. RAIM. Receiver autonomous integrity monitoring (RAIM) provides integrity monitoring of GPS for aviation	- Technical performance requirements of either [E]TSO-C129, or [E]TSO-C196, or [E]TSO-C145/-C146. (Note that the US/Europe and equivalent ADS-B

	applications. In order for a GPS receiver to perform RAIM or fault detection (FD) function, a minimum of five visible satellites with satisfactory geometry must be visible to it	mandates require more – see FAA AC 20-165 or EASA CS-ACNS)
Training requirements ADS-B implementation	- Technical training - Operative training - Inspector training - Aircraft certification training - Other according with the different stakeholders and project scope. - Training basic on operational procedures - Others	ICAO Doc. 8071 Manual on Testing of Radio Navigation Aids. - Volume I - Testing of Ground-based Radio Navigation Systems - Volume II - Testing of Satellite-based Radio Navigation Systems - Volume III - Testing of Surveillance Radar Systems
Legislation/regulation	- CNS implementation Strategy - Rules - Technical information (data) - Operational procedures - Aircraft requirements	