



**Twenty-first Meeting of the CAR/SAM Regional Planning and Implementation Group  
(GREPECAS/21)**

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**Agenda Item 4: GREPECAS Work Programme**

**IMPLEMENTATION OF ADS-B SURVEILLANCE IN BRAZIL**

(Presented by Brazil)

<b>EXECUTIVE SUMMARY</b>	
This Working Paper aims to share the Brazilian experience and challenges in the implementation of national ADS-B systems, their regulation and signal monitoring.	
<i>Strategic Objectives</i>	<ul style="list-style-type: none"> <li>• Air navigation capacity and efficiency</li> <li>• Security</li> </ul>
<i>References:</i>	<ul style="list-style-type: none"> <li>• Air Force Command. National ATM Concept of Operations (CONOPS - DCA 351-2/ 2021)</li> </ul>

**1. Introduction**

1.1 Considering the vast territory of the flight information regions under its responsibility, Brazil has a significant challenge, which is to provide surveillance in order to comply with existing ATS precepts, according to ICAO guidelines.

1.2 The strategic program of DECEA (Brazilian Department of Airspace Control) for the evolution of Brazilian air traffic management, SIRIUS-BRASIL, aligned with the recommendations contained in Document 9750 and with ASBU, considers the implementation of various surveillance systems to meet the identified operational demands, contributing to the evolution of future ATM concepts.

1.3 Current surveillance depends mainly on primary and secondary radars. Brazil also has an ADS-C system for application in the EUR/SAM corridor (FIR-AO), since 2009, with CPDLC resources, and a small ADS-B network installed in an offshore region near Rio de Janeiro.





Fig 2 - Automation System (SAGITARIO)

## 2. Discussion

2.1 The National ATM Concept of Operations (CONOPS - DCA 351-2) considers that the surveillance service in the airspace under Brazilian jurisdiction should be improved and extended to oceanic and remote areas, meeting needs in the areas of higher air traffic density, as well as seeking the most favorable cost-benefit ratio for airspace users and the provider of air navigation services.

2.2 Thus, the improvement of ATS surveillance is focused on the implementation of automatic dependent surveillance (ADS), with use of air-to-ground and air-to-air data link, combined with sufficiently accurate and reliable aircraft navigation systems.

2.3 In this context, surveillance should gradually evolve to allow an increase in crew's situational awareness (ADS-B IN).

### 2.4 ADS-B surveillance in oil basins

2.4.1 Due to the air traffic demand in Oil Basins, ATS surveillance based on ADS-B OUT was initially implemented in Brazil in 2018, as the main means of surveillance and as part of the Project of Aeronautical Surveillance Services Improvement in the Campos Basin, which includes TMA-Macae and the oceanic airspace of the area near the city of Campos.

2.4.2 However, the benefits of ADS-B are also possible in the radar coverage area of the Campos Region, since the data is provided by different surveillance sensors, including these ADS-B stations and radars that have some kind of partial coverage in this area, which includes the oceanic airspace in the area close to the city of Campos, in TMA Macae.

2.4.3 Therefore, there are 2 (two) stations in strategic locations on the coast and 4 (four) ADS-B stations installed on offshore oil platforms, to which all requirements for the use of ADS-B in a coverage radar-free area apply (ADS-B NRA - Non-Radar-Airspace).





Fig 4 - Annual evolution of circulation in the FIR-Atlantico

2.5.3 The ability to accurately track an aircraft allows the Air Traffic Control (ATC) Service to be warned when traffic is detected, so that the aircraft deviates from its authorized route or altitude/flight level. Similarly, conflicting trajectories of two or more aircraft can be perceived and corrected, which were taken to a condition of reduction of the established separations. Alerts are also provided when the aircraft exceeds safe minimum altitudes or inadvertently enters restricted airspace.

2.5.4 Surveillance must evolve to allow applications to increase crew's situational awareness of other flights, in addition to increased ATCO's situational awareness of aircraft.

2.5.5 The ATS surveillance system shall allow periodic transmission to the Control Center of the following parameters: aircraft identification (24-bit direction and flight identification according to flight plan), position (latitude, longitude and pressure altitude), 3D speed and quality of information on integrity, positioning and speed.

2.5.6 Parallel to this surveillance project at FIR-AO, the implementation of Performance Based Communication and Surveillance (PBCS) in the Atlantic Flight Information Region (FIR-AO) is underway, which will provide new requirements in automated systems, in order to improve the assessment and maintenance of compliance of data link performance for communications (CPDLC) and for surveillance to be implemented.

2.5.7 Therefore, DECEA will implement space-based (satellite) ADS-B surveillance by 2026.

## 2.6 ADS-B surveillance in continental airspace.

2.6.1 Initially, the ADS-B system will cover route operations on the continent from FL 245, with priorities being listed in a phased implementation. The radars will be maintained as an alternative means of aeronautical surveillance and will remain after the transition phase.

2.6.2 The national ATM design considers that the surveillance service under Brazilian jurisdiction must be improved and expanded to meet coverage needs in areas of higher air traffic density. This evolution will occur gradually, allowing to increase crew's situational awareness (ADS-B IN) and improve ATC, ATFM and ASM capabilities (ADS-B OUT). The approval of ADS-B IN applications will be subject to demand, duly supported by a cost-benefit analysis, to be activated in a given airspace.



- a) **Phase 1 (January 2023 - July 2024):** implementation of ADS-B OUT in the airspace volume corresponding to FIR-Recife, with the aim of prioritizing part of the EURO SAM corridor and confirming the operational benefits and initial technical challenges of ADS-B in the national airspace, identifying specific system requirements, including the feasibility of using ADS-B for aircraft separation up to 5 NM.

The knowledge obtained in the operation of Phase 1, regarding both the ground system and the equipment of the existing fleet, will allow adjustments for the implementation of the next phase. This Phase 1 must meet the requirements set out in the standards for an ADS-B NRA and ADS-B RAD operating environment in order to support the aircraft minimum separation of 5 NM;

- b) **Phase 2 (March 2024 - December 2024):** Based on the experience gained in Phase 1, the ground infrastructure will be complemented to extend the coverage of the ADS-B system to enable the ATS surveillance service through the FIR-Curitiba;
- c) **Phase 3 (December 2024 - August 2025):** Complement to the EURO-SAM corridor by integrating ADS-B sensors with FIR-Brasilia;
- d) **Phase 4 (August 2025 to May 2026):** Integration of ADS-B sensors with the FIR-Amazonica, complementing ADS-B surveillance above FL 245 over the entire national territory.

2.6.6 From and during the implementation of Continental ADS-B, emphasis should be given to studies focused on the deployment and operational use of onboard applications based on ADS-B IN. The approval of these applications will be subject to the applicable SARP, as well as the demand duly supported by cost-benefit analysis for its activation in certain airspaces.

2.6.7 All infrastructure required for ADS-B shall support the transmission of Mode S Extended Squitter messages at 1090 Hz frequency as follows: Annex 10 - ICAO Volume IV, DOC 9871, RTCA DO-242A and DO-260B.

## 2.7 Regulations in continental airspace.

2.7.1 The ADS-B surveillance system will be applied in the Brazilian upper continental airspace in order to ensure the evolution of air traffic control management in areas with higher air traffic density.

2.7.2 Thus, in Brazil, ADS-B will be operationalized in the upper continental airspace in order to allow greater availability and continuity of the ATS surveillance service.

2.7.3 The entire operationalization strategy is focused on the use of ADS-B OUT 1090 Extended Squitter and the DO 260B version by operators, meeting the Brazilian operational needs and aiming to provide the harmonized ADS-B surveillance service, in terms of requirements, with other international air navigation providers.

2.7.4 In this sense, the ADS-B system on board of aircraft shall provide ground stations/platform with the following minimum set of parameters:

- a) Aircraft identification;
- b) Special Position Identification (SPI);
- c) Emergency indicator;
- d) Barometric altitude;
- e) Aircraft position – latitude and longitude;

- f) Emergency situation; and
- g) Quality indicator.

2.7.5 As of 25 February 2027, all aircraft operating in the Brazilian upper airspace, FL 245 or higher, must be equipped with avionics that meet the requirements of the new surveillance technology ADS-B OUT 1090 ES, DO-260B version.

2.7.6 Aircraft without ADS-B OUT capability will not be able to cooperate with the ATC service, therefore they will not be allowed to operate at FL 245 or higher. This aims at greater efficiency and safety in the provision of air traffic services.

2.7.7 Aircraft certification and approval of airlines to use ADS-B OUT in Brazilian airspace must be obtained in accordance with the standards and procedures established by the National Civil Aviation Agency (ANAC).

## 2.8 Monitoring of ADS-B signal

2.8.1 Brazil adhered to the guidance material on ADS-B signal monitoring provided by ICAO during GREPECAS 20 (NE28), held in Brazil, in the city of Salvador.

2.8.2 Thus, parallel to the implementation of the continental ADS-B system, a list of structural needs and statistical tools, and an action plan to achieve this capability to monitor ADS-B signals are being developed.

## 3. **Conclusion**

3.1 The Working Group is invited to note the information presented in this paper providing an upgrade of ADS-B Surveillance activities in Brazil.