



Agenda Item 3: Activities and Deliverables Report – GT Interop and Subgroups

THE EVOLUTION OF BRAZILIAN AIRSPACE SURVEILLANCE: ADVANCES IN THE IMPLEMENTATION OF ADS-B AND MULTILATERATION TECHNOLOGIES

(Prepared by Brazil)

SUMMARY

This information paper presents a comprehensive overview of Brazil's strategy for modernizing air traffic surveillance systems, in alignment with the global guidelines of the International Civil Aviation Organization (ICAO). It details the evolution of the implementation of the Automatic Dependent Surveillance - Broadcast (ADS-B) system in oceanic oil basins and continental airspace. Additionally, it addresses the strategic implementation of Multilateration (MLAT) in terminal areas, exemplified by the initiative in Porto Alegre. The advancements, updated timelines, challenges inherent to Brazil's vast territorial dimension, and future plans are discussed, evidencing the country's commitment to operational safety and efficiency in air traffic management.

References:

- Annex 10, Telecommunications ICAO Aeronautics Volume IV Surveillance and Anti -Collision Systems.
- Twenty-first Meeting of the CAR/SAM Regional Planning and Implementation Group (Final Report GREPECAS/21, November 14 to 17, 2023).
- Guide on Technical and Operational Considerations for the implementation of ADS-B in the SAM Region.

1. Background

1.1 The continuous evolution of global air traffic demands increasingly sophisticated and efficient management systems, guided by technological advancements that ensure the safety and capacity of air navigation services. In this context, Brazil, aligned with ICAO's Global Air Navigation Plan (GANP), has undertaken significant efforts to modernize its airspace surveillance infrastructure.

1.2 Traditionally based on primary and secondary radars, Brazilian surveillance has been complemented and enhanced by the introduction of collaborative technologies, such as ADS-C and, more recently and broadly, ADS-B and Multilateration (MLAT).

1.3 This article aims to present the recent developments and strategic plans of the Department of Airspace Control (DECEA) in implementing these technologies, highlighting lessons learned, challenges faced, and the vision for a future integrated and robust surveillance system.

Table 1 – Phases of Continental ADS-B Implementation

| Phase | FIR | Start | End | No. of Receivers | Status |
|--|--------------|-------------|-------------|------------------|---------------|
| 1st | CINDACTA III | January/23 | April/25 | 19 | Completed |
| 2nd | CINDACTA II | March/24 | December/24 | 13 | Completed |
| 3rd | CINDACTA I | December/24 | August/25 | 6 | In progress |
| 4th | CINDACTA IV | August/25 | May/26 | 28 | To be started |
| Total Acquisitions: 66 Receivers; 4 Processing Centers; 1 Monitoring Center (CGTEC) | | | | | |

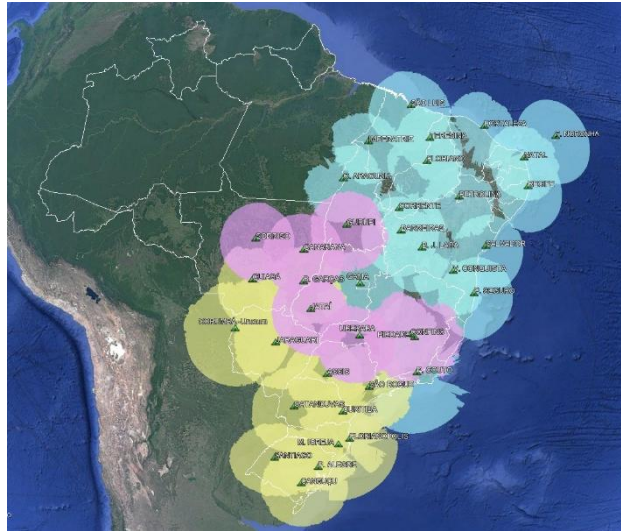


Figure 2 – ADS-B Systems implemented in Phases 1, 2, and 3 (completed) – FL 200

2.6 Currently, field acceptance tests are being conducted, as well as homologation flights and engineering support flights at the Phase 2 and 3 stations. One of the inherent challenges in deployment in a country of continental dimensions, with vast remote areas, has been optimizing data communication infrastructure and information channeling. Ensuring the robustness and quality of data traffic from ADS-B equipment to processing centers in isolated locations requires dedicated connectivity solutions, an aspect that is being carefully addressed and continuously improved to guarantee system integrity.

2.7 Lessons learned during the phases of this deployment, such as the importance of analyzing antenna visibility and verifying basic infrastructure, including grounding networks, telecommunications, stabilized power, and asset security, continue to guide subsequent phases, ensuring more effective planning for future deployments.

Terminal Area Multilateration

2.8 The ability to adapt and respond quickly to critical events is a cornerstone of air traffic management. In 2024, facing the impacts of natural disasters in the state of Rio Grande do Sul, which compromised the surveillance infrastructure at Salgado Filho International Airport (SBPA) and its Terminal Area (TMA-PA), DECEA adopted an innovative solution: the implementation of a Wide Area Multilateration (WAM) system.

2.9 Although SBPA's primary and secondary radars were damaged, the choice of MLAT aims to complement ATS surveillance at lower flight levels in TMA-PA, serving as technical and operational redundancy for the new radars being installed in Canoas (SBCO) and Caxias do Sul (SBCX).

2.10 The MLAT system for TMA-PA, which benefits from the expertise and existing contracts of Continental ADS-B, includes the installation of four receivers to ensure complete coverage. The operational needs that MLAT must meet include the ability to determine the instantaneous geographic position of the target, monitor displacement history (track), present speed and course, and collaboratively provide aircraft identification and altitude.

2.11 Currently, the administrative process for the implementation of MLAT in TMA-PA is underway at the Airspace Control System Implementation Commission (CISCEA). The expectation is that the MLAT system will be implemented in TMA-PA by the end of 2026.

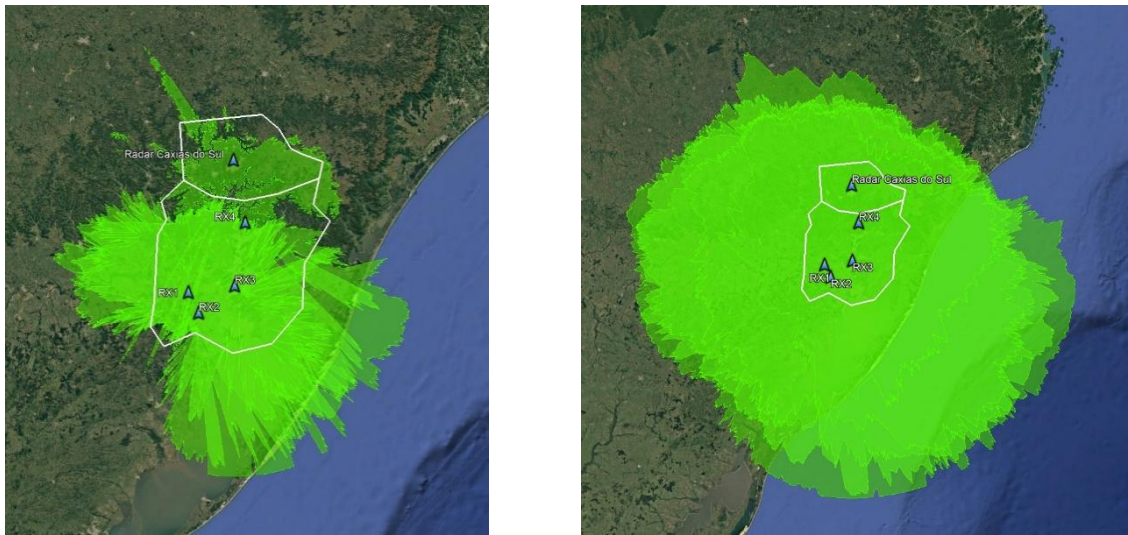


Figure 3 – Estimated ATS surveillance coverage in TMA-PA with MLAT - FL 010 (left) and FL 100 (right).

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