



Agenda Item 6: Assessment of operational requirements in order to determine the implementation of communications and surveillance (CNS) capabilities improvement for en-route and terminal area operations

INTRODUCTION TO AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B) IN BRAZILIAN AIRSPACE

(Presented by Brazil)

SUMMARY

This information paper presents the current scenario of ATS Surveillance in the Brazilian Airspace, and the planning for its evolution, with the introduction of the Automatic Dependent Surveillance - Broadcast (ADS-B).

1. INTRODUCTION

1.1 Admittedly, air traffic has shown a remarkable growth in the world, though at varying rates, depending on each region. Likewise, the demand for increased operational safety and flexibility has grown, seeking to improve the efficiency of aircraft and of airspace use while striving to reduce the impact of air transport on the environment.

1.2 The expected increase in air traffic, with the consequent increasing demand of airspace, will lead to the need for expanding ATS surveillance coverage, with the introduction of other technologies, among which ADS-B stands out, in line with the rest of the CNS/ATM infrastructure, encompassing ground-air communications, control positions, processing and previewing systems, automation tools, specialized personnel etc., so as to preserve the balance between the ATM system and user needs, while maintaining the required safety and efficiency levels.

2. Current Air Surveillance Scenario in Brazil

2.1 In Brazil, radar surveillance for en-route and TMA use is currently provided by Primary Surveillance Radars (PSR), Secondary Surveillance Radars (SSR) or by a combination of PSR/SSR. In terms of operating system for use in ATS, the PSR/SSR set, combined with the automation tools developed in Brazil (X4000 and SAGITARIO) are currently the pillars of ATS surveillance nationwide.

2.2 During the past years, the Department of Airspace Control - DECEA has promoted radar upgrade programs and complemented the coverage with the installation of new stations. The result of these initiatives is that the radar network in Brazil is pretty new (less than eight years) and secondary radar coverage is complete for the entire Brazilian territory (above FL250).

2.3 Due to the abovementioned infrastructure, the criteria for the application of minimum horizontal separations in the Brazilian Airspace complies with the provisions of ICAO, varying according to the ATS surveillance available, the structure and complexity of the airspace where it is applied.

2.4 The high accuracy and update rate of the information provided by the ADS-B has the potential to enhance operational safety applying the separation between aircraft in current environments covered by radar, as well as reducing the large separations applied to aircraft in non-radar environments, where the installation of such type of surveillance is not justified in the cost/benefit perspective, such as the Campos Basin, an oil exploration ocean area, located on the coast of the Rio de Janeiro state.

3. Campos Basin - First ADS-B application in Brazil

3.1 ATS surveillance based on ADS-B will initially be implemented in Brazil in the scope of the Restructuring Project for Air Navigation Services of the Campos Basin. The ADS-B system will be deployed aimed at increasing ATS surveillance at low altitudes in the oceanic airspace, particularly in the area where the oil rigs and drilling vessels are located, outside the coverage of the radar system installed at the Macaé aerodrome (SBME).

3.2 The ADS-B system designed for that region is in deployment phase, scheduled for operation, including equipped aircraft, in mid-2013. The operation model considers the possibility of implementing a restricted airspace to aircraft equipped with ADS-B.

3.3 The performance requirement set for the ADS-B will be at least equal to the Monopulse SSR and will ensure coverage for helicopter flights from 500 ft MSL, in the oceanic airspace considered.

3.4 Lessons learned during the deployment of ADS-B in the Campos Basin will be the basis for the evolution of surveillance in the Brazilian Continental Airspace, planned to be executed in four phases, which are described below.

4. Introduction of the ADS-B in the Brazilian Continental Airspace

4.1 **Phase 1 (2011-2014)** - Deployment of ADS-B OUT in a limited volume of continental airspace (Southeast-Northeast corridor), in order to confirm the operational benefits of ADS-B in the national airspace, identify the system's specific requirements, including the feasibility of using ADS-B for aircraft separation in up to 5NM, both en-route and in TMA. Key milestones for Phase 1 are:

- Deployment of the initial ground infrastructure of the ATS surveillance system based on ADS-B, consisting of:
 - a) “ADS-B Processing Center” to be installed at CINDACTA III, Recife-PE,
 - b) “Remote ADS-B Stations” to provide the desired coverage; the remote ADS-B stations should take advantage of existing infrastructure at the current sites of radar or telecommunications systems.
 - c) “Data Network” corresponding to the segment of the National ATN/IPS necessary for the interconnection of Remote ADS-B Stations, ADS-B Processing Center, ACC-RE and APP-RJ.
- Establishment of coverage in a selected part of the UTA RECIFE which comprises the international ATS routes structure, corresponding to the continuity of the EURO/SAM corridor, as well as domestic routes related to them. Additionally, it should also provide coverage in the routes that converge to the TMA-RJ, as shown in the diagram below:

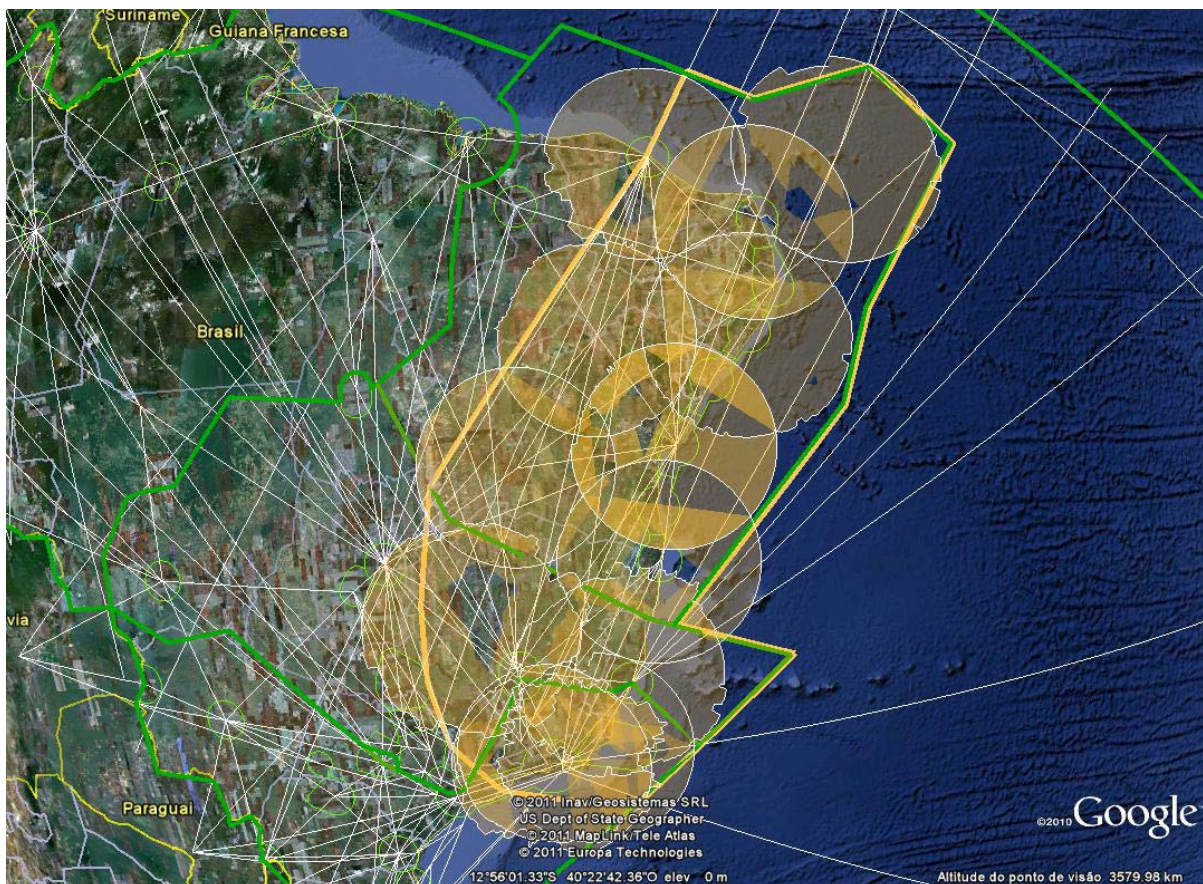


Figure 1 - ADS-B Coverage Planned for Phase 1 - Southeast-Northeast Corridor FL310

- Update of the ACC-RE and APP-RJ Automation Systems to support ADS-B system information and implement data merging with other existing ATS surveillance sensors.

This feature is essential for comparative assessments of ADS-B with the reference system.

- Development and dissemination of information to aircraft operators about the availability of the surveillance service, based on ADS-B OUT and coordination of actions for achieving a more effective participation of the ATM community.
- Establishment of procedure for collecting and storing data with a view to a comparative analysis with radars available in the same volume of airspace. The period of data collection should include the next peak period of solar interference (2013).
- Establishment of methodology for assessing the performance of the ADS-B system, including comparative analysis with data from radar systems in the scenarios of interest: route and arrival. Includes the participation of flight inspection aircraft certified for ADS-B OUT.
- Training of operators and technical staff in order to acquire the skills needed to perform the analysis and validation of the ADS-B system.
- Development and application of ATC procedures for use of ADS-B operationally in the ACC-RE and APP-RJ, considering the possibility of providing early benefits to ADS-B certified aircraft.
- Preparation of additional documents for adjustments of the operational concept of ATS surveillance and main technical features that will support the remaining phases of the deployment of the Automatic Dependent Surveillance System - Broadcast in the Brazilian Continental Airspace.

4.2 **Phase 2 (2014-2018)** - Based on the experience gained in Phase 1, the ground infrastructure will be complemented in order to ensure the proper fulfillment of the requirements to provide ATS surveillance based on ADS-B across the national airspace above FL310. Key milestones for Phase 2 are:

- Deployment of the ground infrastructure, established in the supplementary document derived from Phase 1 to support ATS surveillance based on ADS-B throughout the upper continental airspace.
- Update of the ACC-CW, ACC-BR and ACC-AZ Automation System to support ground infrastructure information established for ADS-B and implement data merging with other existing surveillance sensors.
- Development and dissemination of information to aircraft operators about the availability of the surveillance service, based on ADS-B OUT, throughout the upper national airspace, at FL310 and above, as of 2018, and establishment of the mandatory nature of ADS-B to fly in given airspaces on a date to be defined later.

- Deployment of the ADS-B functionality in the simulators of the Airspace Control Institute - ICEA, aiming at training of ATCO.
- Development and publication of specific regulations for operational use of ADS-B OUT, as appropriate, as regulatory support for the activation of the ADS-B requirement in the airspace provided for Phase 2.
- Development and application of specific training for all controllers operating area control.

4.3 **Phase 3 (2018-2025)** - The coverage volume of the ADS-B system will be expanded to enable the ATS surveillance service in other selected areas. Key milestones for Phase 3 are:

- Identification and designation of additional airspaces (FIR, TMA etc.) that must be addressed with the surveillance infrastructure based on ADS-B.
- Deployment of the ground infrastructure including ADS-B and ATC automation systems.
- Early disclosure that the aircraft must be ADS-B-certified, considering proper time to allow operators to meet the new requirement.
- Proper training of controllers and maintainers.

4.4 **Phase 4 (from 2025)** - Deployment and operational use of on-board applications based on ADS-B IN. The approval of these applications will be subject to the existence of specific SARP as well as the existence of demand duly supported by a cost-benefit analysis, for its activation in certain airspaces. Key milestones for Phase 4 are:

- Identification of ADS-B IN applications of interest for use in specific airspaces, based on technical/operational and cost-effective analysis.
- Deployment of additional features in ATS units, as needed.
- Deployment of ADS-B IN capability in flight inspection aircraft to support evaluation tests of systems and procedures.
- Development and publication of appropriate rules.

5. **Conclusion**

5.1 In Brazil, radar surveillance for en-route and TMA use is currently provided by Primary Surveillance Radars (PSR), Secondary Surveillance Radars (SSR) or by a combination of PSR/SSR, which provides complete coverage for the entire Brazilian territory, above FL250 and enables the use of horizontal minimum separations in accordance with the ICAO provisions.

5.2 The ATS surveillance based on ADS-B will be initially deployed in the Campos Basin, to broaden the ATS surveillance at low altitudes in the oceanic airspace, particularly in the region where oil rigs and drilling vessels are located.

5.3 The development and deployment of applications based on ADS-B in the Brazilian Continental Airspace will follow an evolutionary process, consisting of four well-defined phases, allowing a safe transition from ATS surveillance and providing real operational benefits in the medium to long term.

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