



ICAO

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WORKING PAPER

ADS-B/OUT/M — WP/11
13/08/19

**Automatic Dependent Surveillance – Broadcast OUT Implementation Meeting for the
NAM/CAR Regions (ADS-B/OUT/M)
Ottawa, Canada, 21-23 August 2019**

**Agenda Item 2: Update Status ADS-B Implementation for States
2.2 Update ADS-B Status implementation and regulation development by
States**

ADS-B IMPLEMENTATION IN BRAZIL – CAMPOS BASIN

(Presented by Brazil)

EXECUTIVE SUMMARY	
This Working Paper provides an update on the implementation of ADS-B in Brazil – Campos Basin.	
Action:	Suggested actions are presented in Section 4.
<i>Strategic Objectives:</i>	<ul style="list-style-type: none">• Safety• Air Navigation Capacity and Efficiency• Economic Development of Air Transport
<i>References:</i>	<ul style="list-style-type: none">• Automatic Dependent Surveillance – Broadcast (ADS-B) Implementation and Regulation Meeting for the NAM/CAR/SAM Regions (ADS-B/LEG), Mexico City, Mexico, 2630 November 2018.

1. Introduction

1.1 Considering the vastness of the flight information regions under its responsibility, Brazil has a huge challenge, which is to provide surveillance, in order complying with the existing ATS precepts, in accordance with ICAO guidelines.

1.2 The Department of Airspace Control (DECEA) strategic program for the evolution of Brazilian air traffic management, SIRIUS BRAZIL, harmonized with the recommendations contained in Doc. 9750 and aligned with the ASBU, considers the ADS-B implementation in some of its projects in order to meet the identified operational demands, while contributing to the evolution of future ATM concepts.

1.3 One of these projects aimed at improving air navigation services in the oil basins - ocean areas, in the south eastern region of Brazil. With a broad approach to improvements, the project comprised, among others: a) the implementation of a new airspace structure based on RNAV Routes, as well as new operational procedures that envisage en-route and platform operations; b) the construction of a new building for the APP-ME; c) the expansion and modernization of the Air Traffic Control System used in the APP-ME; d) the improvement of the Aeronautical Mobile Service, through the expansion of VHF coverage in the platforms area, using stations in climax; e) the implementation of Automated Surface Weather Stations (EMS-A); and with regard to the improvement of the aeronautical surveillance service f) the Automatic Dependent Surveillance – Broadcast (ADS-B) implementation.

1.4 This paper provides an update on the implementation of ADS-B in Brazil, specifically in the offshore region of the Campos Basin, TMA-ME.

2. Discussion November 2018 represents a milestone for the Brazilian Air Traffic Management: DECEA has operationalized the Automatic dependent surveillance – broadcast (ADS-B) within the offshore airspace in the Campos Basin.



Figure 1: Campos Basin Area - offshore

2.2 The region, relevant for its oil concentration, corresponds to a remote area of approximately 100 thousand km², subordinate to Macaé Terminal Control Area (TMA-ME), extending beyond 120 NM from the coast. The air operations are performed by helicopters flying from 500ft to 4500ft between the continent and the prospection platforms for the transportation of loads and people.



Figure 2: Transportation of Loads and People in remote airspace

2.3 Due to the fact the platforms were located very far from Macaé and the fact that helicopter flights are carried out at low levels / altitudes, air traffic control in most of the ocean area was based on conventional procedures, which drastically reduces the capacity of airspace and the efficiency of air operations, especially for flights performed under Instrument Flight Rules (IFR). This condition encouraged the predominance of VFR flights, since they were more favourable for users, who normally operate with fuel restrictions.

2.4 The efficiency of ATC provision was limited by the range of PSR/SSR RADAR installed at Macaé airport and the application of conventional separations. Due to the limitations of reach and coverage, the ATS (RADAR) surveillance service was provided by the APP in part by Sector 1, which was closest to the mainland. In Sector 2, conventional surveillance was applied through position messages reports. Meteorological conditions and low visibility in high seas increased concerns regarding safety maintenance. The major air traffic concentration pointed to the necessary improvement of warning and flight information services.

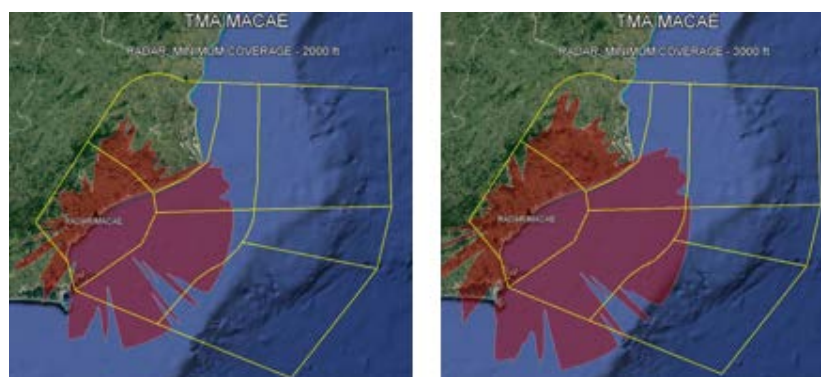


Figure 3: Macaé PSR/SSR RADAR Coverage

2.5 ADS-B OUT 1090ES (Extended Squitter) was the solution for a real operational demand. The system was strategically composed of 2 reception stations in the continent and 4 stations in the oceanic area.

2.6 The ADS-B system implanted in the TMA has the capacity to receive information according to Extended Squitter Message Version 0, Version 1 and Version 2 messages, considered in DO 260, DO260A and DO260B, respectively.

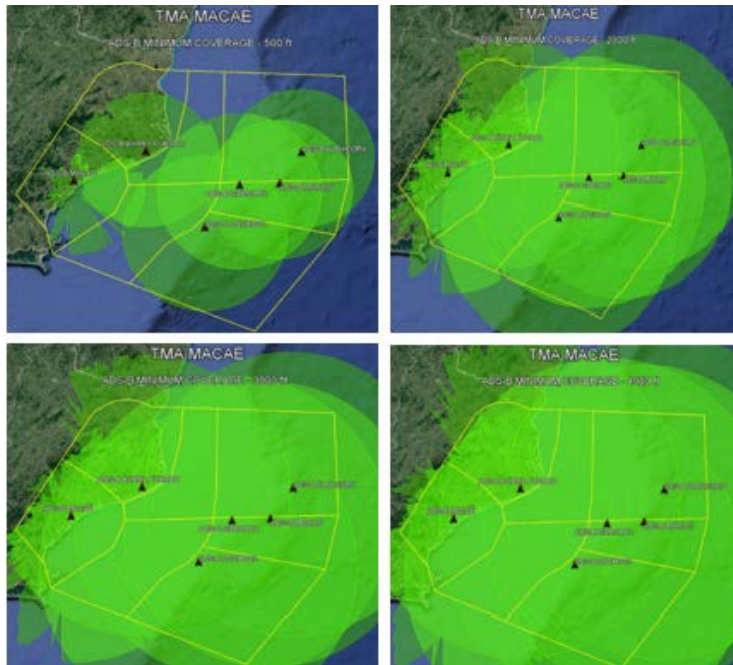


Figure 4: Campos Basin ADS-B System Coverage

2.7 In accordance with the ICAO provisions, contained in Annex 10 (Vol. III and Vol. IV) and DOC 9871 - Technical Provisions for Mode S Services and Extended Squitter, the established air-ground data link system for the ADS-B in the Macaé TMA is the 1090ES, which comprises the transmission of "Extended Mode S Squitter "at the frequency of 1090 MHz.

2.8 ADS-B, along with other automation, meteorology and communication capabilities, integrated to APP Macaé, allowed the use of minimum separations of at most 5 NM.

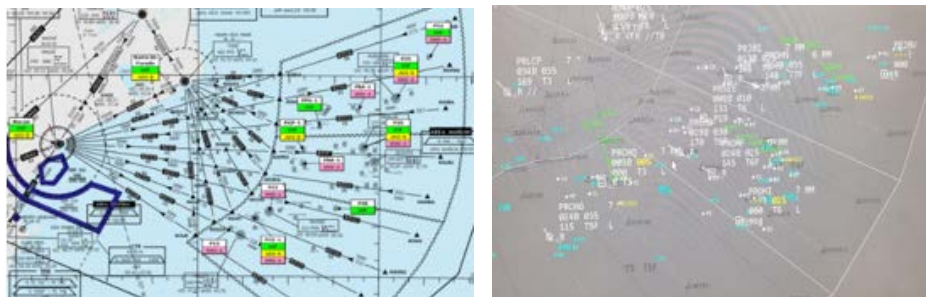


Figure 5: Air Traffic in Campos Basin

2.9 An exclusive ADS-B airspace was created to ensure ATM homogeneity. This is the portion belonging to the Macaé TMA and its projections, whose the use of the mode S transponder with ADS-B 1090 ES is mandatory for the receipt of the ATS Surveillance Service by APP-Macaé.

2.10 State aircrafts, not equipped with ADS-B 1090 ES, may be allowed to enter such airspace, for specific missions, prior coordination with APP. Likewise, aircraft not equipped with ADS-B involved in SAR missions, transport of patients or serious injuries will also be assisted, through prior coordination with APP Macaé.

2.11 An Aeronautical Information Circular (AIC 40/18) was published with the purpose of disseminating information on the application of Automatic Dependent Surveillance by Broadcasting (ADS-B) in the ATS Surveillance Service of TMA-Macaé, as well as establishing the deadlines for the start of its operation.

2.12 Another Aeronautical Information Circular (AIC 46/18) was published with the purpose of publicizing the airspace restructuring at TMA-Macaé through the application of the ADS-B system in the provision of the ATS surveillance service and the concept of exclusive airspace ADS-B in addition to the provisions of AIC N 40/17, the extension of VHF coverage and the provision of meteorological products from EMS-A.

2.13 The project was challenging because of its unprecedented nature, besides requiring coordination for embarkation in maritime units, raising awareness of users, developing new regulations, equipping more than 120 aircraft of different 7 operator models, ATC system adequacy, ATCO and maintenance personnel training, continuous security risk management and post-implementation strategy. Economic instability and catastrophes such as fires on platforms have required some rescheduling.



Figure 6: ATCO and Maintenance Personnel Training

2.14 Currently, 100% of the 122 helicopters flying in that region are already equipped with the avionics ADS-B 1090 ES.

2.15 To support the ADS-B NRA application, on-board ADS-B systems provide the following minimum set of parameters, in accordance with RTCA / DO-303 "Safety, Performance and Interoperability Requirements Document for ADS-B Non-Radar-Airspace (NRA) Application": a) Identification of the aircraft; b) Special Position Identification (SPI); c) Emergency indicator; d) Barometric altitude; e) Position of the aircraft - Latitude and Longitude; f) Emergency status; and g) Quality indicator, depending on the version of the 1090 ES adopted in the on-board ADS-B system.

2.16 The successful result was achieved thanks to synergy among representatives of ATM community, consolidating a legitimate work of collaborative decision-making (CDM) among stakeholders, such as DECEA, Brazilian Navy, PETROBRAS, INFRAERO (Brazilian Airport Infrastructure Company), all the offshore region helicopter operators, ANAC (National Civil Aviation Agency) and industry, with a common purpose: ensuring safety and efficiency of air operations.



Figure 7: Collaborative Decision Making

2.17 Benefits from the projects are: a) enhancement of situational awareness in low altitudes and users' trust; b) faster and more cost-effective SAR missions; c) reduction of workload due to significant decrease of VHF-AM use time, among which for estimates and position check requests; d) improved planning capacity at APP-ME; and e) optimized navigation allowed by direct heading clearances, reduction of flight times and consequent fuel saving, estimated in R\$ MM 1,31/year.

2.18 Delays in routes reduced 43% and flight punctuality increased 16% due to more regularity in air operations and reduction of flow control measures. RADAR system unavailability during 24h08min in 2019 had insignificant impact.

2.19 An important improvement towards Global ATM evolution was accomplished: ADS-B is the technology enabling the design of future concepts developed by ICAO, such as TBO, and allowing feasible data sharing and harmonizing within the SAM Region.

2.20 Based on lessons learned from this project, the ADS-B implementation will continue in oil basins located in Santos, Espírito Santo and the continental area of Brazilian territory.

3. Conclusion

3.1 The Operational implementation of ADS-B OUT at TMA Macaé marks the beginning of the evolution of ATS Surveillance Systems in non-radar airspace (NRA) in Brazil, with a significant increase in aeronautical surveillance coverage in the offshore region, improvement in the provision of services ATS (ATC, Flight Information and Alert) and safety in low altitude operations.

3.2 This was the first ADS-B application in Brazil.

4. Suggested actions

4.1 The Meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.