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AGENDA ITEM 4: AIR NAVIGATION

ADS-B FULL PRIMARY SURVEILLANCE MEANS IN THE CORE AREA OF TAHITI FIR

Presented by France

SUMMARY

On June 24th, 2024, the French DGAC completed the ADS-B project in French Polynesia as part of its strategy towards modern navigation and surveillance. In doing so, ADS-B becomes the full primary surveillance means in core area of TAHITI FIR: Six operational ADS-B stations have taken over the radar and provides an enhanced quality ATS to airspace users. This achievement is definitely an important milestone in the technical modernization of air navigation. Tahiti FIR becomes the first French FIR to primarily control using ADS-B and ADS-C data.

As satellite systems will become increasingly sophisticated, the benefits derived from satellite data will only continue to grow, reaffirming its critical role in the future of South Pacific aviation navigation and surveillance modernization. That is why the French DGCA suggests that the South Pacific Oceanic Air Navigation Service Providers create a task force for collaboration and coordination of the satellite data integration in the South Pacific region.

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1. INTRODUCTION

Project description

In 2009, a monopulse secondary radar was installed on Mount Marau located on Tahiti island in French Polynesia. Since its installation, it has allowed the visualization of air traffic of the Society Archipelago, concentrating 80% of regional traffic and 100% of international traffic arriving in French Polynesia. The minimum separation between two IFR flights has been 5NM, the same standard used in continental French ACCs (Aera Control Center). However, the radar's range is far from covering the entirety of the Tahiti FIR archipelagos, which spans approximately over an area of12,500,000 km².

In order to solve the latest issue, an ADS-B (Automatic Dependent Surveillance - Broadcast) project, aiming at substituting the radar by ADS-B system, has been initiated. Its objectives were identified as early as 2013 to address the following issues:

- Decommissioning of the obsolescent radar by 2025.
- Utilizing ADS-B technology, which is easier to install and less expensive than secondary radar.
- Extending a global surveillance area to other French Polynesian archipelagos.
- Significantly improving ATS (Air Traffic Services) service quality: enhance of ATCOs (Air traffic COntrollers) working methods, enhancing SAR (Search And Rescue) capabilities, and improving services to airspace users.

2. DISCUSSION

2.1 Project Constraints and Scope

The ADS-B project defined an optimal scenario for the positioning of ADS-B stations, trading-off the human and financial costs of maintaining ATM (Air Traffic Management) and CNS (Communication Navigation Surveillance) equipment and the accessibility of certain islands that are only connected by plane once a week. In doing so, the project prioritized an ADS-B coverage of the Society Islands, the northern part of the Tuamotu Archipelago (Rangiroa and Fakarava area), and finally, the Marquesas Archipelago located 1500 km northeast of Tahiti. The remaining uncovered archipelagos account only for 10% of regional traffic.

To provide control services with an optimal spacing using ADS-B, it was necessary to combine VHF coverage in the surveillance area and to require that every aircraft carried an ADS-B transponder, except for some which required a specific management. Thus, French Polynesia airspace users have been informed since 2017 of the regulatory obligation to be equipped with an ADS-B transponder. The mandate became effective for all users on January 1st, 2022. The only ADS-B transponder equipment exemption was related to some military aircrafts, which are now fully commissioned with the appropriate transponders to operate in French Polynesia and New Caledonia.

2.2 Project Timeline

As the first objective in using ADS-B surveillance is to provide primarily flight information and alert services, the first step, in validating an ADS-B station, consists in an operational evaluation of the air surveillance image provided by the ADS-B station followed by the implementation of the ADS-B surveillance to provide control service. Since its launch in 2013, the project has gone through the following stages:

- 10/03/2017: issuance, into two phases, of a request mandating ADS-B carriage for all aircraft,

except those exempted from January 1, 2019, for all flights above FL 195; and from January 1, 2022, for all flights within the Tahiti FIR.

- 11/21/2018: installation of 5 ADS-B stations in Rangiroa, Bora-Bora, Moorea, and Tahiti (2 stations) and use of ADS-B to provide flight information and alert services.

- 06/28/2019: use of ADS-B (in addition to radar information) to provide control service, including guidance with a minimum separation of 5NM, equivalent to the radar separation.

- 05/12/2022: use of ADS-B in the Marquesas Archipelago for flight information and alert services.

- 10/06/2022: use of ADS-B in the Marquesas Archipelago for control service.

- 06/24/2024: stoppage of Mont Marau radar as a data feeder of the French Polynesian ATM system. Publication of new minimum vectoring altitudes, ADS-B becoming the primary means of surveillance in Tahiti FIR.

2.3 Benefits to Users

The deployment of ADS-B improves service quality to airspace users. The ADS-B surveillance image coverage area is far more extended that the radar one and allows airspace users to benefit from optimized control service such as 5NM separation and improved vectoring possibilities. The ADS-B minimum vectoring altitudes are lower than those of the radar, which, due to its geographical location, is subject to terrain masking in many places of the Society Archipelago. ADS-B stations are also spread over multiple sites, filling some airspace coverage gaps and provide guidance to more extensive zones, well beyond the radar one.

The ADS-B MGA (Minimum safe Grid Altitude) is also lower than the radar one which provides aircraft trajectories optimization in all phases of flight. This optimization results in financial, environmental and time gains for airlines. In terms of SAR, the higher coverage of ADS-B enhances the effectiveness of the alert and rescue phases. Last but not least, the multiplicity of ADS-B sensors provides better resilience and robustness than the radar alone. Indeed, in the event of a radar failure or maintenance, controllers' working methods were previously based on a return to procedural separation. Today, in case of such events for an ADS-B station, a surveillance image is still presented to controllers, with modified MGAs.

2.4 Future Benefits

The deployment of 6 ADS-B stations and the decommissioning of the Tahiti radar end up the so-called ADS-B project. This project is fully included in the strategy towards modern navigation and surveillance based on satellite sources. The next step of this strategy will consist in improving the Tahiti ATC capacities and in strengthening its resilience. The ADS-B strategy will be complemented with the commissioning on July 1, 2024, of an "SAR Locate" ADS-B image, provided by Aireon, throughout the Tahiti FIR and fully independent from ground station coverage. This service will definitely strengthen SAR capabilities of French Polynesia. A 7th ADS-B station will be commissioned in 2025 and installed within the air navigation services technical building located at Tahiti Faa’a airport. The installation objective is dual: to provide an independent connection from operator networks, thus reducing the risk of outages during severe weather conditions (tropical storm, cyclone) and to control the power supply of this ultimate station, thus ensuring the safety of the Tahiti approach under all circumstances. A situation awareness image will be deployed in 2025 for the controllers of Bora Bora, Raiatea, and Moorea aerodromes. This represents a significant safety improvement for Bora Bora aerodrome, the second busiest one in French Polynesia. Last but not least, studies are underway to prepare for the arrival at the end 2026 of satellite-based ADS-B in addition to existing stations, covering all or selected parts of the Tahiti FIR.

2.5 **Conclusion**

The implementation of ADS-B as the primary means of surveillance in French Polynesia is the result of a the French DGCA strategy started 10 years ago. It strengthens the robustness and quality of ATS services provided to airspace users in French Polynesia, in a context of increasing traffic, while maintaining a rational approach for cost control. As explained in this document, this strategy has been based, so far, on a rational terrestrial distribution of ADS-B stations across French Polynesia. The French DGCA is now examining the possibility of complementing this terrestrial coverage with a satellite one.

As a matter of fact, in the long run, the integration of satellite-based data in the surveillance of aviation in the Pacific South will be probably beneficial as it bridges the gap created by traditional systems, offering a seamless, reliable, and comprehensive solution for ensuring aviation safety, efficiency, and operational excellence. As technology advances, the benefits derived from satellite-based data will only continue to grow, reaffirming its critical role in the future of South Pacific aviation. That is why the French DGCA suggests that the South Pacific Oceanic Air Navigation Service Providers create a task force for collaboration and coordination of the satellite data integration in South Pacific region.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

a) take note that the ADS-B is now the full primary surveillance means in the core area of TAHITI FIR

b) assess the opportunity of creating a South Pacific task force for collaboration and coordination of the satellite data integration in South Pacific region.

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