



ICAO

International Civil Aviation Organization

**Twenty Fifth Meeting of the Communications/
Navigation and Surveillance Sub-group (CNS SG/25)
of APANPIRG**
Video Tele-Conference, 18 – 22 October 2021,

Agenda Item 6: Surveillance

6.2 Other surveillance related issues

**IMPLEMENTATION OF SPACE-BASED ADS-B SURVEILLANCE
FOR THE OCEANIC REGIONS OF INDIAN FIRS**

(Presented by India)

SUMMARY

This paper provides an update on Implementation of Space-based ADS-B Surveillance over the Oceanic Regions of Indian FIRs

1. INTRODUCTION

1.1 Airports Authority of India (AAI) has been entrusted with the responsibility to provide the Air Navigation Services (ANS) in India. AAI is responsible for provision of air navigation services over an air space of 2.8 Sq NM (9.5 million sq Km), which includes 1.04 million sq. NM continental airspace and 1.76 million Sq NM oceanic airspace.

1.2 To support future growth in air traffic, new programs and technologies are vital for Communication, Navigation and Surveillance/ Air Traffic Management. These modern programs and systems require much more safety, reliability than what have been desirable in the past. To keep sync with this rapid growth, AAI signed a contract with M/s Aireon on 25th July 2019 to overcome the coverage and range limitations of ground-based ADS-B receivers and Radars.

1.3 SADS-B is a satellite-based technology to provide air traffic surveillance over entire oceanic region of Indian Flight Information Region. This advanced satellite-based technology will enable real-time delivery of ADS-B information broadcasted by aircrafts at regular intervals to Air Traffic Control (ATC) centers to support aircraft surveillance across all Indian FIRs.

1.4 The primary goal of Implementation of SADS-B in India is to provide improved situational awareness and enhanced safety of Air traffic using the space-based ADS-B data in the areas where there is no Radar surveillance coverage.

Agenda Item 6.2

18-22/10/21

2. DISCUSSION

2.1 Space-based ADS-B provides unparalleled global surveillance coverage to receive and process ADS-B signals broadcast from aircraft equipped with 1090 MHz ADS-B transponders, which operate on the same frequency as traditional Mode A/C/S transponders.

2.2 SADS-B provides Service Volume Availability of > 99.9% in accordance with the ICAO Global Operational Data Link Document (GOLD), Latency < 2.0s (99th percentile) in accordance with the EUROCONTROL Safety & Performance Requirements Document for a Generic Surveillance System Support Air Traffic Control Services and Probability of Update > 95% for an Update interval of 8 seconds in accordance with the EUROCAE Technical Specification for an 1090 MHz Extended Squitter ADS-B Ground System.

2.3 SADS-B Implementation in India contains three phases to implement and operationalize SADS-B data service for the oceanic regions of Indian FIRs (Mumbai, Chennai & Kolkata FIRs). The two-phases related to establishment of required infrastructure and evaluation & testing of SADS-B have been completed successfully on 28th January 2021. The third phase called as operational phase has been commenced from 29th January 2021 for situational awareness of the aircraft flying over oceanic regions of Mumbai, Chennai & Kolkata Flight Information Regions (FIRs).

2.4 The below Fig -1 depicts the typical architecture of SADS-B system implemented in India. The typical architecture of Space Based ADS-B consists of Low Earth Orbit (LEO) satellite constellation with inter satellite communication links. These LEO satellites receive the ADS-B aircraft transmitted signal and down links the data to ground based infrastructure. The ground-based infrastructure comprises of control segment and data processing center. The data processing center process the ADS-B data of aircrafts received from the satellite constellation. The processed ADS-B data from Aireon Processing and Distribution (APD) system at M/s Aireon Facility in USA is being delivered to Service Delivery Point (SDP) of Air Navigation Service Provider through redundant data links. AAI has established SDP's at Chennai and Mumbai to receive the Space Based ADS-B data. Through firewalls, the data from the SDP has been integrated into the CNS/ATM automation systems of Chennai and Mumbai. The data of Kolkata oceanic FIR has been forwarded to Kolkata automation system from Chennai & Mumbai SDP's through telecom data links by AAI.

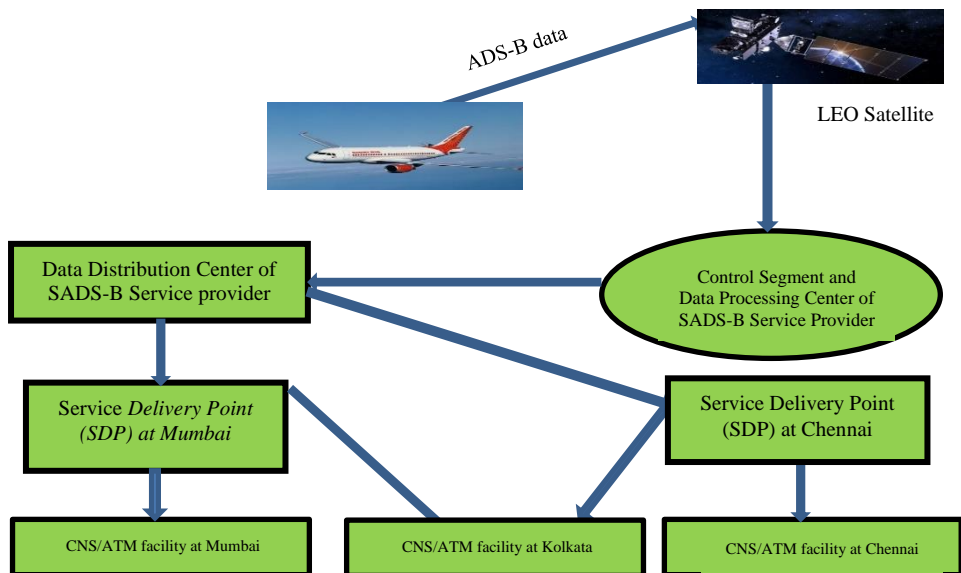


Fig 1: SADS-B Architecture

2.5 AAI has implemented SADS-B data service for the following service volumes of the oceanic regions of Indian FIR.

- a) Service Volume A: Mumbai Oceanic, defined as: The part of the Mumbai (VABF) FIR that is 100 NM and greater outside the Indian landmass.
- b) Service Volume B: Chennai Oceanic, defined as: The part of the Chennai (VOMF) FIR that is 100 NM and greater outside the Indian landmass.
- c) Service Volume C: Kolkata Oceanic, defined as: The part of the Kolkata (VECF) FIR that is 100 NM and greater outside of the Indian landmass.
- d) Service Volume D: The oceanic part of the Mumbai (VABF), Chennai (VOMF) and Kolkata (VECF) FIRs between the Indian landmass and 100 NM.
- e) Service Volume E: Full Indian FIR coverage plus transition boundaries and service volumes. Transition Boundaries to Indian FIRs should cover all available targets up to 50 NM outside of the boundaries of the Service Volumes of A, B & C for situational awareness and handoffs (“Transition Boundaries”).

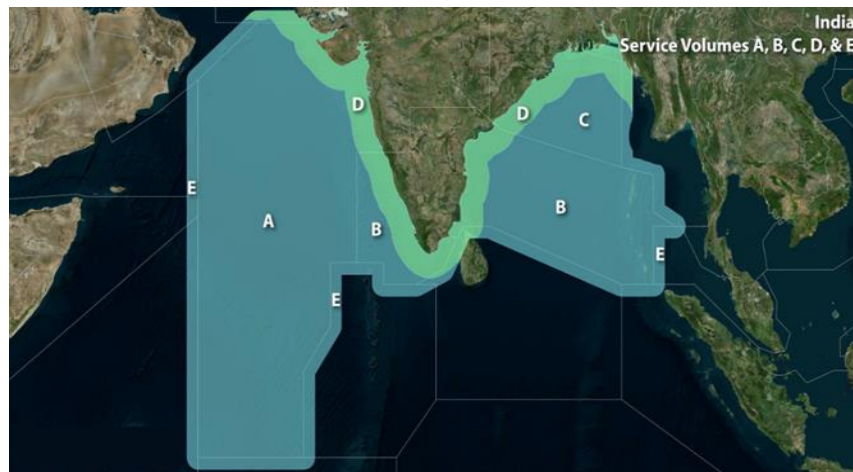


Fig -2 : SADS-B Service Volumes - Oceanic regions of Indian FIRs

2.6 Space-based ADS-B provides coverage for the six million square kilometers of airspace in Mumbai, Chennai and Kolkata oceanic regions. SADS-B data services are currently utilized for situational awareness of the aircraft flying over Indian Oceanic regions. AAI is currently working on to design separation standards for Space-Based ADS-B in order to utilize the same for providing separations to the aircraft flying over Indian Oceanic regions.

2.7 Implementation of space-based ADS-B enables ATC to utilize enhanced safety tools and reduce separation of aircraft in this dense airspace, allowing for the efficient growth of capacity, while substantially reducing risk through the availability of real time air traffic surveillance services.

2.8 Over time, AAI expects that the use of space-based ADS-B will improve operators’ flexibility to fly user preferred, better routes and offer optimal altitudes and speeds to maximize flight efficiency. This will allow for enhanced coordination and collaboration with neighboring countries and an improved handoff between the domestic and oceanic sectors and quicker response time to emergency and distress situations with search and rescue.

2.9 Using real-time air traffic surveillance over the oceans, paired with AAI’s advanced communications capabilities, will allow AAI to safely reduce aircraft separation to 15 Nautical Miles (NM) longitudinal and lateral separation for Controller-Pilot Data Link Communications (CPDLC) equipped aircraft. In situations where aircraft operate with Direct Controller-Pilot Communications (DCPC) over VHF, the standard separation minimum of five NM will remain applicable.

Agenda Item 6.2

18-22/10/21

2.10 Some of the expected benefits from SADS-B implementation are the Real time surveillance and situational awareness, enhance safety, improve efficiency and allow for greater flight predictability and air traffic flow management, Support airspace capacity enhancement by reducing separation standards. Safety alerts and timely intervention for conflict resolution by controllers, improves cross-border ATC co-ordination and safe hand-offs and acceptance of traffic between adjacent ATC centres, Timely detection of various emergency and distress situations, Improved Search and Rescue response with better location information to reduced search radius and shortened response time etc.

2.11 **Regulatory ADS-B usage mandate:** In order to promote the ADS-B usage in India, the Director General of Civil Aviation (DGCA), India has issued ADS-B Avionic mandate that from 01.01.2020 onwards, all aircrafts flying over Indian continental airspace at or above FL-290, are to be equipped with on-board ADS-B equipment. Also, the regulator is contemplating to provide priority in landing to the aircrafts equipped with ADS-B at airports where ADS-B based approach surveillance services are being provided.

3. CONCLUSION

3.1 India continues to augment its capabilities for surveillance of its airspace as well as airfield ground movements and is now making greater use of Space Based & Ground based ADS-B and Mode S Radar.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

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