



ICAO

*International Civil Aviation Organization***Fifth Meeting of the Surveillance Implementation Coordination Group (SURICG/5)**

Web-conference, 22 – 24 September 2020

Agenda Item 3: Review of regional requirements for Surveillance in the e-ANP, Seamless ANS Plan and the reported implementation status**SPACE BASED ADS-B UPDATE**

(Presented by Aireon (a member of ICCAIA))

SUMMARY

This paper provides an update on the Implementation of Space Based ADS-B.

1. Introduction

Space-based Automatic Dependence Surveillance-Broadcast (ADS-B) has been operational for more than one year (since March 2019).

2. Constellation Deployment

All 66 satellites of the Iridium NEXT operational constellation are online, and their ADS-B receiver payloads are providing an operational ADS-B service. Nine satellites other satellite serve as on-orbit spares, with 6 additional satellites available for future launch if required on the ground.

3. System Test, Certification and Integration into Air Traffic Management (ATM) Systems

3.1 Aireon's formal certification test program has demonstrated that space-based ADS-B performance is consistent with the requirements for use as an Air Traffic Service (ATS) surveillance system. Independent testing by NAV CANADA has confirmed this performance for the initial Canadian service volumes and supported operations.

3.2 NAV CANADA has updated and certified its domestic and oceanic ATM suites, as well as its IP-based surveillance data distribution service, to use space-based ADS-B data. This includes processing of ASTERIX Category 21 target reports and Category 25 system status reports. Air Traffic Control (ATC) decision-support tools based on Advance Surveillance Enabled Procedural Separation Standards (ASEPS) has been incorporated into systems supporting oceanic control.

3.3 On March 25, 2019, NAV CANADA Engineering certified Aireon's space-based ADS-B service as an ATS surveillance source for use with NAV CANADA's ATM systems in Gander and Edmonton.

4. Aireon Support Services

The Aireon service desk is staffed H24 by technicians with extensive experience in network operations, service monitoring and customer support. The service desk is the entry point to a four level service concept. It will handle all incidents, service requests, engineering escalations and problem tracking, as well as all basic inquiries and requests for assistance.

There are tools available which give both customer and the service desk complete insight into system performance and status. The includes a maintenance dashboard. Figure 1 below shows a single page for a selected (de-identified) ANSP. It allows on line hourly and daily graphs of latency and update interval amongst its many functions.

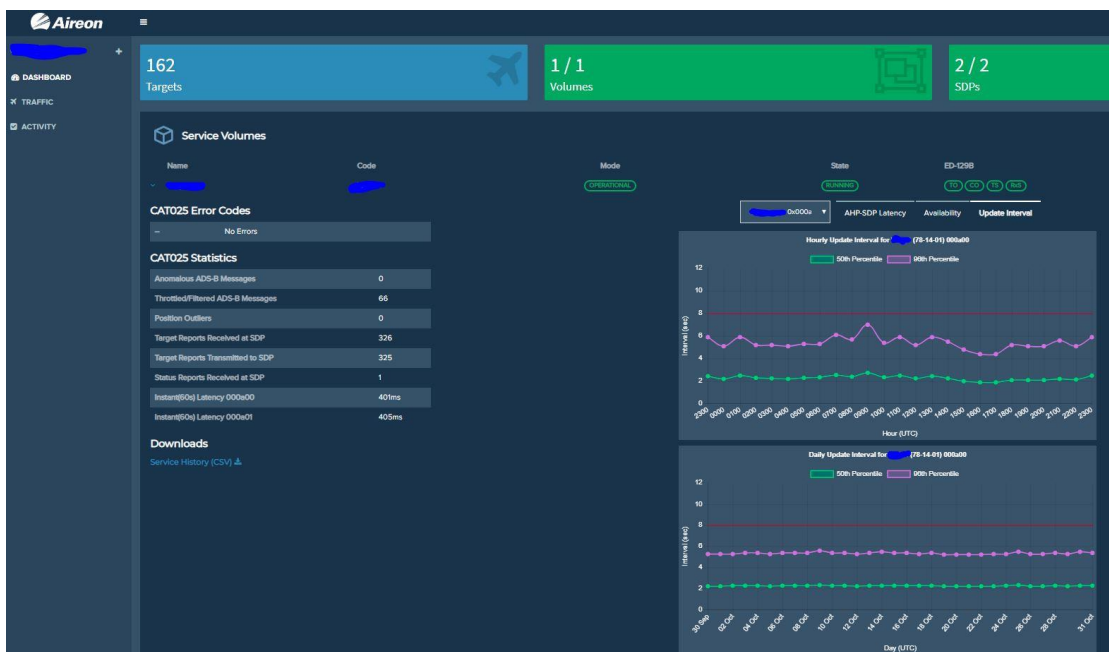


Figure 1. De-identified Maintenance Dashboard – Daily & Hourly latency display

5. EASA Certification

In June 2019, the European Union Aviation Safety Agency (EASA) certified Aireon as an ANSP Organization to provide Air Traffic Management (ATM)/Air Navigation Service (ANS) surveillance services, to support the separation of aircraft. This certification is for the organisation including the system, personnel, procedures, and safety aspects.

EASA also provides continuous oversight.



6. Operational Implementation in Canada

6.1 NATS and NAV CANADA have enabled the space-based ADS-B feeds to the operational Fusion trackers in the Shanwick and Gander Oceanic FIRs. NAV CANADA, NATS then initiated use of ASEPS using space-based ADS-B longitudinal separations of 14 NM for same track and 17 NM for crossing track eligible aircraft pairs over the North Atlantic. Lateral separation minima have been reduced to 19 nautical miles

6.2 NAV CANADA is in the process of incorporating space-based ADS-B as a surveillance source in all Canadian FIRs. Operational implementation for high-level airspace is expected to be substantially complete by Q1 2020

7. Development of New ICAO Separation Standards

7.1 The ICAO Separation and Airspace Safety Panel (SASP) completed development of proposed separation standards for ASEPS. ASEPS is intended for application in airspace where VHF air-ground communication is not available.

7.2 A Proposal for Amendment to ICAO Doc 4444, PANS ATM to incorporate the ASEPS standards has been approved, intended for publication and applicability in November 2020.

8. Implementation progress in Asia/Pacific

8.1 **Singapore:** Space based ADS-B is now operational in the Singapore FIR.

8.2 **India:** Airports authority of India signed an agreement with Aireon in July,2019, to implement Space based ADS-B surveillance in oceanic airspace. Since a large volume of oceanic airspace is managed by Mumbai and Chennai ATC, 2 Service Delivery points (SDP), one each at Mumbai and Chennai have been

Agenda Item 3

22 – 24/09/2020

installed, communication links have been established. Service Acceptance Tests have been successfully conducted at some sites and are expected to be completed in October 2020. Live Aireon data has been successfully integrated into Mumbai, Chennai and Kolkata ATC systems.

AAI has been carrying out test and evaluation of data and data links. The results are found to be well within the system specifications and operational requirements. Aireon has been extending its technical support to AAI in the installation and testing process. Having successfully completed the ISAT, Aireon is now in the process of conducting training to AAI personnel and supporting development of the safety case for regulatory approval for commissioning of space-based ADS-B for ATS services.

8.3 Papua New Guinea (PNG) : Space based ADS-B has been installed in Port Moresby and is expected to commence serving the whole PNG FIR in 2020. Service acceptance and training are the next steps. Another paper at this meeting provides further details.

8.4 Hong Kong: Contract awarded to Aireon. Procurement of hardware is in progress and telecommunications ordered.

8.5 Indonesia: IMT (as local prime for the Aireon system) have been awarded a contract to conduct a trial with DGCA in 2021 at Makassar and Jakarta effectively covering the whole FIR

9. Other Implementation progress

9.1 Aireon has completed acceptance tests with the following non-Asia Pac ANSPs:

| Customer | ISAT Completion Date |
|--------------------------------|----------------------|
| NAV Canada | March 2019 |
| NATS (UK) | March 2019 |
| IAA (Ireland) | May 2019 |
| DC-ANSP (Dutch Caribbean) | September 2019 |
| ASECNA (Africa and Madagascar) | October 2019 |
| ENAV (Italy) | November 2019 |
| ISAVIA (Iceland) | November 2019 |
| FAA (USA) | March 2020 |
| COCESNA (Central America) | May 2020 |
| NAVIAIR (Denmark) | August 2020 |

9.2 Aireon has contracted with and plans the following service acceptance tests

| | |
|-------------------|---------|
| Nav Portugal | Q1 2021 |
| ATNS South Africa | Q2 2021 |

10. Asia Pacific CRV

In June 2020 Aireon received approval to connect to the ICAO Asia Pacific CRV to deliver Space based ADS-B to ANSPs.

This means that if an ANSP already has a CRV connection, that same connection can be used instead of a direct MPLS link to the Aireon node in USA.



Commonwealth VPN
Operation Group

Mr Greg Dunstone, FRAeS
Sales Engineer
Aireon LLC, 1750 Tysons Blvd, Suite 1150
McLean, VA, USA 22102

17 June 2020

Dear Mr Dunstone,

Approval for Aireon LLC to connect to the CRV network.

We are happy to inform Aireon that their application "Aireon LLC connection to CRV to support PNG ASLV3.4" to connect to the CRV network as a Service Provider has been approved. This connection will enable all CRV member States to consume Air Traffic Control Quality ADS-B surveillance data from Aireon over the CRV.

Aireon must take all reason steps as outlined in their application to ensure that Aireon protects the CRV from the Aireon network.

Please do not hesitate to contact either the Co-Chair (Asia) or Co-Chair (Pacific) if you have any questions.

Yours Sincerely

Terence Palmer
CRV OG co-chair (Asia)

Kekepi Dainaki
CRV OG co-chair (Pacific)

11. Aireon Flexibility

Aireon is very flexible in the way in which it supports ANSPs including different applications, different environments, and different commercial arrangements:

11.1 Use of Aireon data

Aireon data can be provided to support a variety of applications. Each application might have different design solutions and different costs. The applications envisaged include:

- Tier 1 ATC separation services
- Tier 2 Supporting procedural ATC
 - Position reporting, reached level, definite passing, remove stepped climb/descents
 - Safety nets
 - Situational awareness
- Tier 3 Position reports and Flight Service support
- Backup existing surveillance
- Situational awareness, FIR boundary, Remote towers
- Search & rescue
- Air Traffic Flow management

11.2 Flexible configurations and process

Each Aireon deployment is tailored for the ANSP as required. Some examples follow:

- Different media solutions (MPLS, CRV, VPN)
- Different update rates, coverage volumes, site monitor solutions
- ANSP installation & Remote acceptance testing in response to COVID-19

11.3 Optional additional support to ANSPs

Aireon can support ANSPs with the associated activities such as :

- Integrating ADS-B into ATC automation
- Safety case work related to Space based ADS-B

Agenda Item 3

22 – 24/09/2020

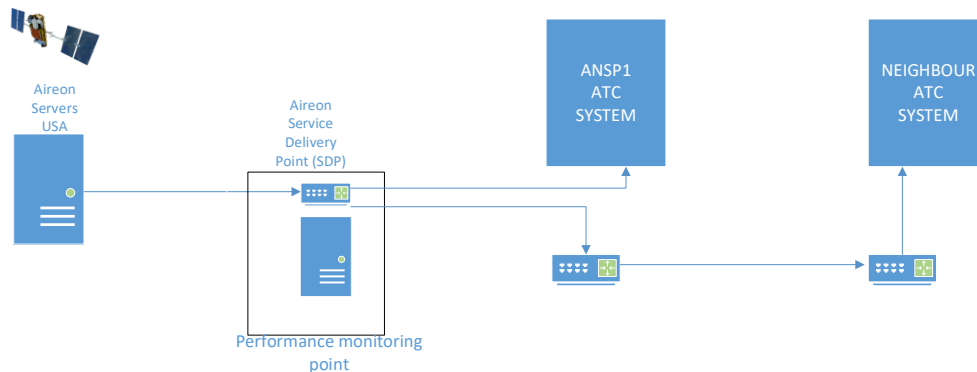
11.4 Flexible Commercial proposals

Aireon is flexible in the way it contracts with customers such as :

- Capital cost or Service cost
- Fixed cost per month (If traffic climbs you don't pay more)
- Fixed per flight hour (If traffic drops – you pay less)
- Price depends on operational use case

12. Aireon Data sharing

Some ANSP have asked if they can share the Aireon Space based ADS-B data with their neighbours in a manner similar to that shown below.



Aireon's position on this is as follows :

- a) Aireon needs to be paid for the service provided. If data is to be provided to the neighbour, then that needs to be included in the agreement between the ANSP and Aireon.
- b) To protect both security and intellectual property Aireon needs to be in contract with the party that the data is being supplied to.
- c) The incremental cost of Aireon initiating a service directly to the neighbour is moderate. It includes :
 - Purchase and installation of the SDP. This is simply a router (needed in all cases) and a low end server which monitors the delivered service performance.
 - The establishment of the customer service volumes and “set up”.
 - The purchase and maintenance of the data links.
- d) If the neighbour did not contract with Aireon, there would be no guarantee of service quality at the ATC system. The service would depend on the design and maintenance support of the datalink between neighbours. Aireon monitor and support data delivery to the Aireon SDP only. Aireon sees no real advantage for a neighbouring ANSP to add another “actor” between Aireon and their facility

- e) For neighbouring ANSPs with a CRV connection, data can be delivered without the cost of new data links.
- f) Notwithstanding the above, Aireon is flexible and is willing to discuss this further with individual ANSPs if required.

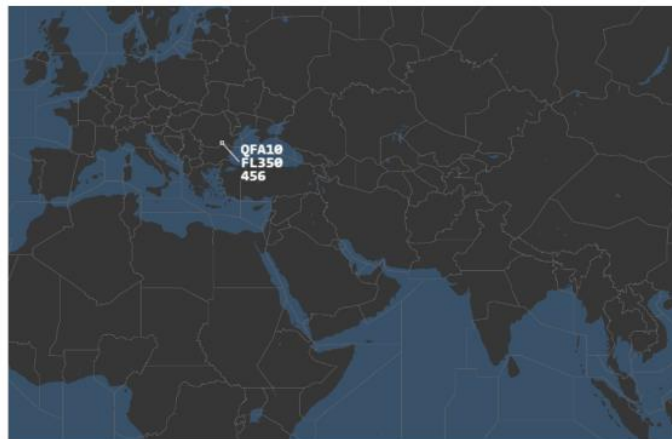
13. Air Traffic Flow Management (ATFM)

13.1 Space based ADS-B surveillance provides enormous potential to support Air Traffic Flow Management (ATFM) systems, because continuous surveillance is available from departure to destination worldwide through a single data source. This has been presented to previous SURICG & SEABOB meetings since 2018 (eg: SEA/BOB ADS-B WG/14 – WP/05 in 2018)

The key benefits are :

- The ability to provide very “up to date” estimates of the time an aircraft is expected to reach any point or boundary (of course still dependent on what other ANSPs do to the trajectory of that aircraft).
- Detection of aircraft becoming airborne. This is important because of the high rate on no DEP message being received in the Asia Pac region.

Singapore could receive data on QF10 London to Singapore whilst over Europe !



13.2 Typically Aireon would curate the surveillance data within Aireon’s Azure cloud capability before transmittal so that additional data such as estimates can be added and the data is tailored for the specific interest of the ANSP such that the ANSP system is not swamped with irrelevant data. Aireon would encrypt and deliver this data via the public internet to the ANSP ATFM system or SWIM Node. For ATFM applications, updates each minute or so are generally acceptable but could be further tailored based on distance to run or following specific events during a flight.

Agenda Item 3

22 – 24/09/2020

The surveillance data itself will be complemented by estimates based on flight plans, schedule information, other industry contextual data using machine learning and archival referencing. The estimate accuracy will depend on Aireon access to valid flight plan information.

13.3 Aireon has contracted with Eurocontrol to improve ATFM into European destinations. Aireon data will be integrated into the EUROCONTROL's enhanced tactical flow management system (ETFMS), which provides data to European aviation stakeholders, regardless of operational borders, in real time. Space-based ADS-B data will enrich ETFMS's complex traffic demand and slot allocation calculations, which currently rely on ground based surveillance data and flight plan processing systems. As a result, Aireon's data will support Europe's primary flow management system to be more accurate in its trajectory predictions and unlock an otherwise unavailable operational capacity.

13.4 Aireon is keen to work with other ANSPs, and groups of ANSPs where relevant, and their ATFM vendors towards integration of relevant worldwide surveillance into their ATFM systems.

14. Action by the meeting

14.1 The meeting is invited to take note of the ongoing implementation of the Space-Based ADS-B system and associated operational services.

- a) discuss any relevant matter as appropriate.
- b) urge States to consider the use of new technologies to improve ATM.
