



INTERNATIONAL CIVIL AVIATION ORGANIZATION
ELEVENTH MEETING OF THE NAFISAT SUPERVISORY COMMITTEE (NAFISAT-SVC/11)
(NAIROBI, KENYA, 10-11 OCTOBER 2016)

Agenda item 10(b): NAFISAT Network Upgrade

The distribution of Space based ADS-B (SB ADS-B) data in the NAFISAT network

(Presented by Seychelles CAA)

SUMMARY
This working paper presents information on the possibility of distributing space based ADS-B data in the NAFISAT network
Reference: <ul style="list-style-type: none">• CNS SG/6 Report, 'WP08.Status_Imple._AS'• APIRG 20 Final Report• APIRG20 Conc09 PBCS GOLD• Report of the CANSO Airspace User Seminar (Zanzibar 14 and 15 May 2013)
Related ICAO Strategic Objectives: A: Safety; B: Environment; C & D : Air Navigation Capacity and Efficiency; E: Cost Effectiveness Related ASBU Block 0, Performance Improvement Area: <ul style="list-style-type: none">• PIA 2 – Globally Interoperable Systems and Data: BO FICE• PIA 3 – Optimum Capacity and Flexible Flights: BO ACAS; BO ASEP; BO ASUR; BO OPFL; BO SNET;• PIA4 – Efficient Flight Path: BO TBO

1. Introduction

1.1. This working paper presents a new surveillance technology, space based ADS-B that Aireon Company intends to have operational by 2018.

1.2. ADS-B is a surveillance technique that relies on aircraft broadcasting their identity, a precise GPS position and other information derived from on-board systems. ADS-B is automatic because no work is required from the pilot or Air Traffic Controller (ATC). It is also dependent because it relies on on-board avionics to provide surveillance information to other parties. The data is broadcast every half a second from the aircraft and can be received without a contract. Aireon's Space-Based global surveillance system is simply Automatic Dependent Surveillance-Broadcast (ADS-B) on a satellite.

1.3. Aireon is a company in partnership with leading Air Navigation Service Providers (ANSPs) such as NAV CANADA, ENAV (Italy), Irish Aviation Authority (IAA), Naviair (Denmark) and Iridium Communications to enable the operational use of Space-Based ADS-B in 2018.

2. Discussion

2.1. A Space Based ADS-B presentation was conducted in Seychelles on 25th April 2016 whereby Aireon presented their company and the possibility of providing Space Based ADS-B worldwide and the benefits that this will bring as opposed to the conventional ground ADS-B systems.

2.2. The main benefits of extending air traffic surveillance over oceans, mountains, remote areas and polar regions are:

- a) Eliminate global surveillance blind spots ([Appendix 1](#)) and delays
- b) Allow increased safety
- c) Precise real-time location and information of aircrafts;

- d) Improve search and rescue response;
- e) Reduction in gross navigation errors;
- f) Improved cross-border safety; and
- g) Faster pilot/controller communication.

2.3. Space-Based ADS-B surveillance will enable the optimization of flight paths and altitudes, increasing operational and fuel efficiency for **airlines**; significantly reducing infrastructure costs for the world's **ANSPs**; Provide real-time surveillance data to **countries** with dense oceanic or remote airspace where infrastructures for ground based surveillance systems are limited or too expensive.

2.4. Space base ADS-B technology faces some major challenges. Since the technology is still new, performance and reliability information are yet to be demonstrated. There is no ADS-B mandate for AFI region and aircraft equipage is a challenge for airlines. The space base concept business model is new, no guarantee of cost/benefit estimate. State has to conduct feasibility studies to compare space base ads-b verses current surveillance means to ensure maximize benefit as per operational requirement of the FIR. The process of safety assessment, safety case and regulatory approvals are yet to be conducted.

2.5. The proposed data pricing from Aireon is based on the current traffic density, surveillance capabilities and the location of the airspace. It is charged per flight hour basis. Basically, a high traffic terrestrial airspace with adequate redundant surveillance ground base systems may cost as low as approximately USD3 per flight hour. A high traffic remote airspace with no current surveillance means can attract as high as approximate USD20 per flight hour.

Seychelles CAA current Surveillance status

2.6. Seychelles is made up of 115 islands, most of which is scattered over a large area, uninhabited and difficult to get access to. This limitation makes it difficult to install and maintain ground base surveillance systems. At the moment, ADS-C is the only means of providing surveillance capabilities for situational awareness purpose. The space base ads-b is the best solution for Seychelles in terms of complete real time surveillance coverage of their 2.63 million sq km of oceanic airspace.

2.7. One of the main and immediate advantage for Seychelles is in search and rescue, whereby the estimated search area is decreased significantly from 52,102 sq km using ADS-C (15 mins) for a Boeing 777, cruising speed 493 knots, to only 4.1 sq km using space base ads-b (8 secs) as per [Appendix 2](#).

2.8. ANSPs that have already signed data agreements (in April 2016) are Nav Canada, ENAV, NAVIAR, Irish Aviation Authority, UK-NATS, Curacao, ATNS & CAAS. Seychelles signed data agreement with Aireon in September 2016.

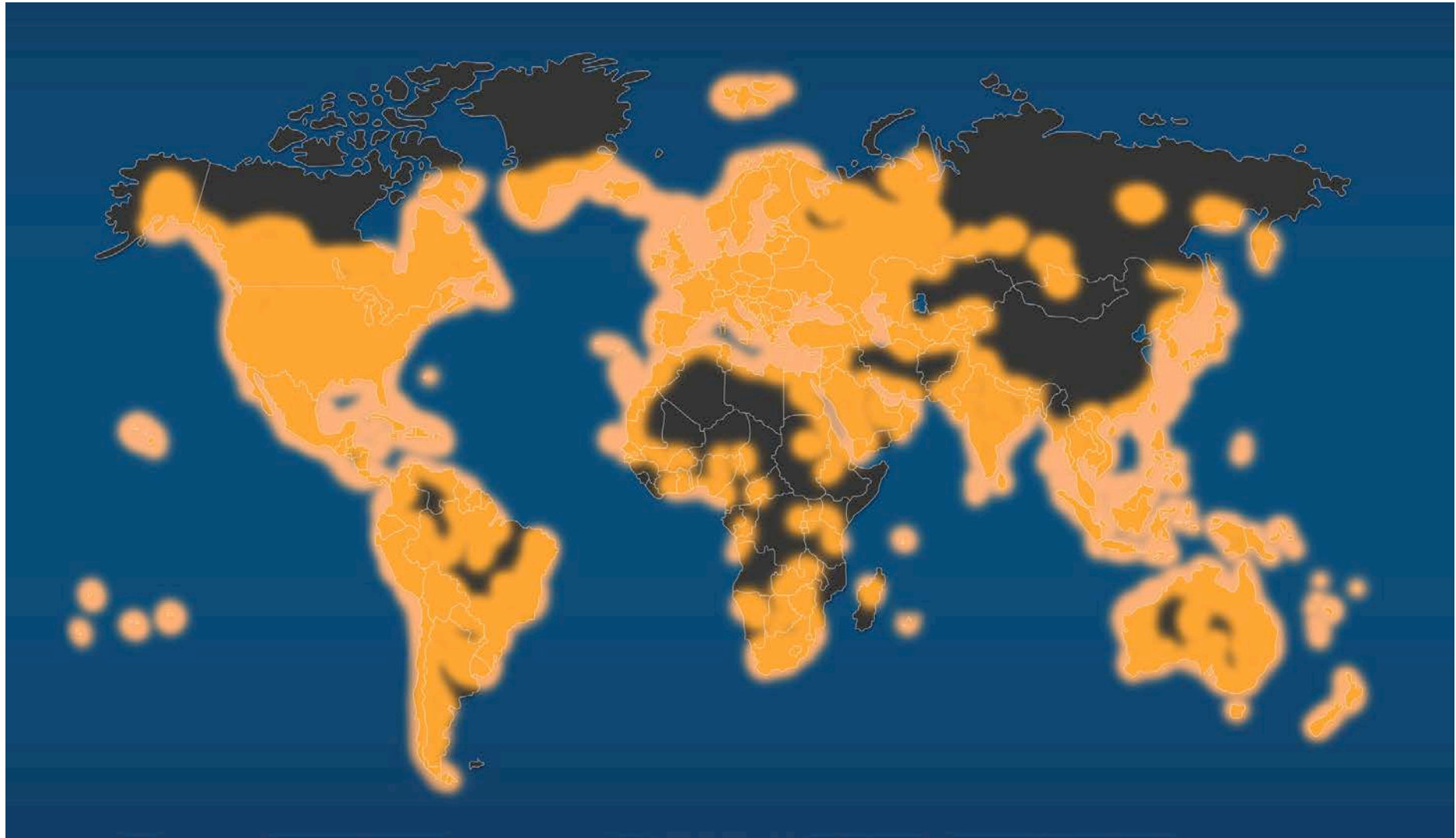
3. Recommendation

3.2 It is suggested that the following actions be taken by the Meeting:

- a) States to take note of this new surveillance technology;
- b) The NAFISAT Network Service provider to assess the technical and financial feasibility of distributing space base ads-b surveillance data within the NAFISAT network to enhance surveillance capability in the region.

Appendix 1

Figure 1: Global status of surveillance coverage (Source: Aireon presentation - Seychelles)



Appendix 2

Figure 2: Search and Rescue data (Source: Aireon presentation - Seychelles)

		Example Prop aircraft	Common Turboprop in ASECNA airspace	Common Jet in ASECNA Domestic airspace	Common Jet in ASECNA Oceanic airspace
		Cessna C172	Bombadier Dash 8	Boeing 737	Boeing 777
	cruise speed (knots)	122	360	444	493
Potential search area (sq km)	PIREP (30min)	12,763	111,129	169,039	208,409
	ADS-C (15min)	3,191	27,782	42,260	52,102
	SB ADS-B (8sec)	0.3	2.2	3.3	4.1

Additional References

- [1] First satellites with space-based ADS-B payloads near ship date: <https://www.runwaygirlnetwork.com/2016/05/03/first-satellites-with-space-based-ads-b-payloads-near-ship-date/> [Sept 2016]
- [2] Aireon and ATNS Sign First Regional Commercialisation Agreement: <http://www.airport-technology.com/contractors/consult/atns/pressregional-commercialisation-agreement.html> [Sept 2016]
- [3] 'Space-based ADS-B Benefits', Aireon: <http://aireon.com/resources/brochures-guides/space-based-ads-b-benefits/> [Sept 2016]
- [4] Aireon Space based ADS-B presentation (Seychelles)
- [5] Aireon company information: <http://aireon.com/company/> [Sept 2016]
- [6] World Radiocommunication Conference allocates spectrum for future innovation, Key outcomes of WRC-15, 'Global flight tracking for civil aviation' http://www.itu.int/net/pressoffice/press_releases/2015/56.aspx#.V-iyjfl97IU [Sept 2016]
- [7] Aireon Iridium: <https://www.iridium.com/company/industryleadership/aireon> [Sept 2016]

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