



Space-based ADS-B Update

ADS-B Workshop

August 22nd, 2019





Space-based ADS-B Is Operational!

- Aireon service went live in Edmonton, Canada on March 25th and in the North Atlantic with NAV CANADA and NATS on March 27th

Complementary Surveillance Services

Sole Source Surveillance

Surveillance in regions that currently lack surveillance coverage

Augmented Surveillance

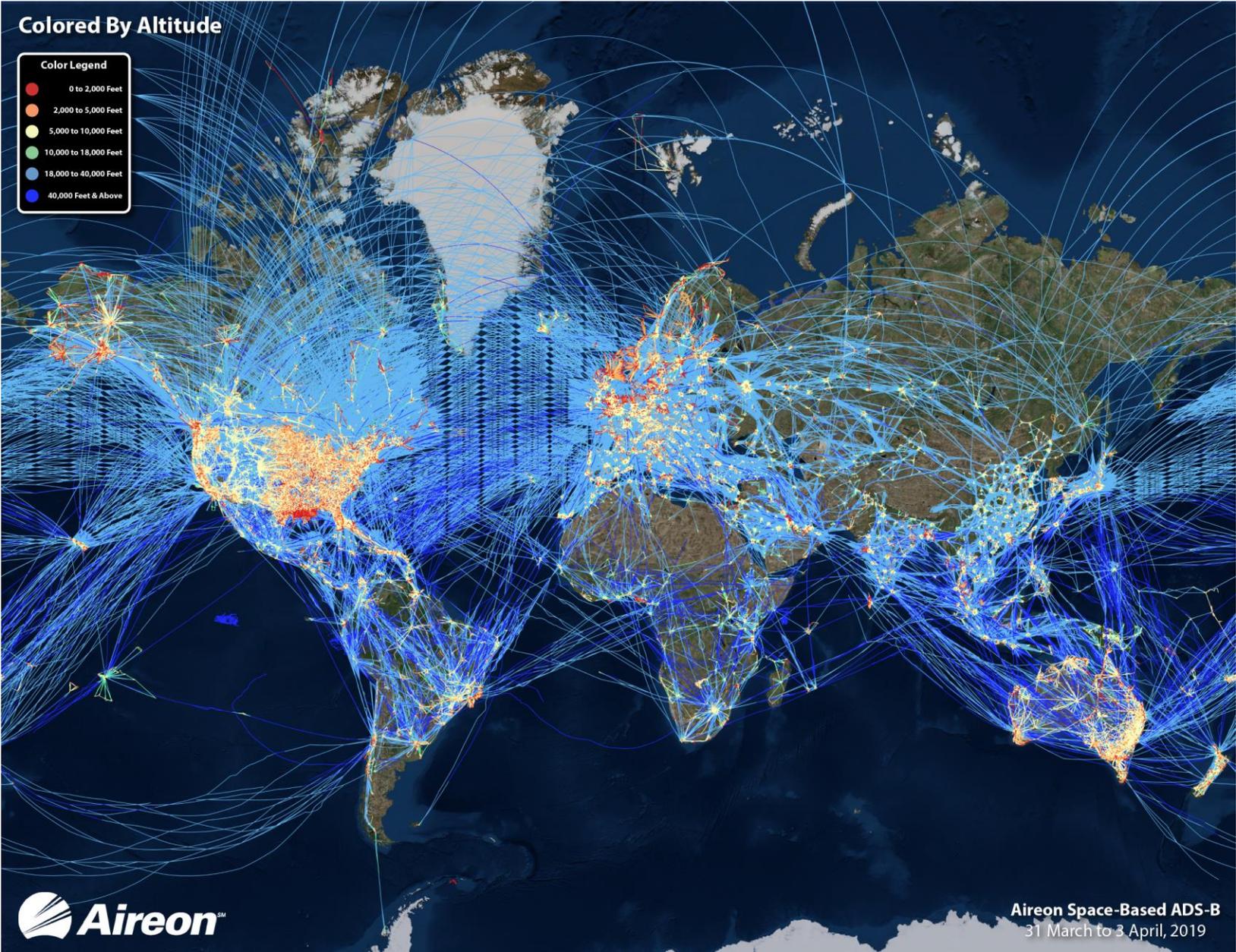
ADS-B coverage where there are gaps in current surveillance infrastructure

Contingency Surveillance

Provides an ANSP with near instantaneous transition to space-based ADS-B when an outage occurs with their primary surveillance source



Global Coverage Plot by Altitude

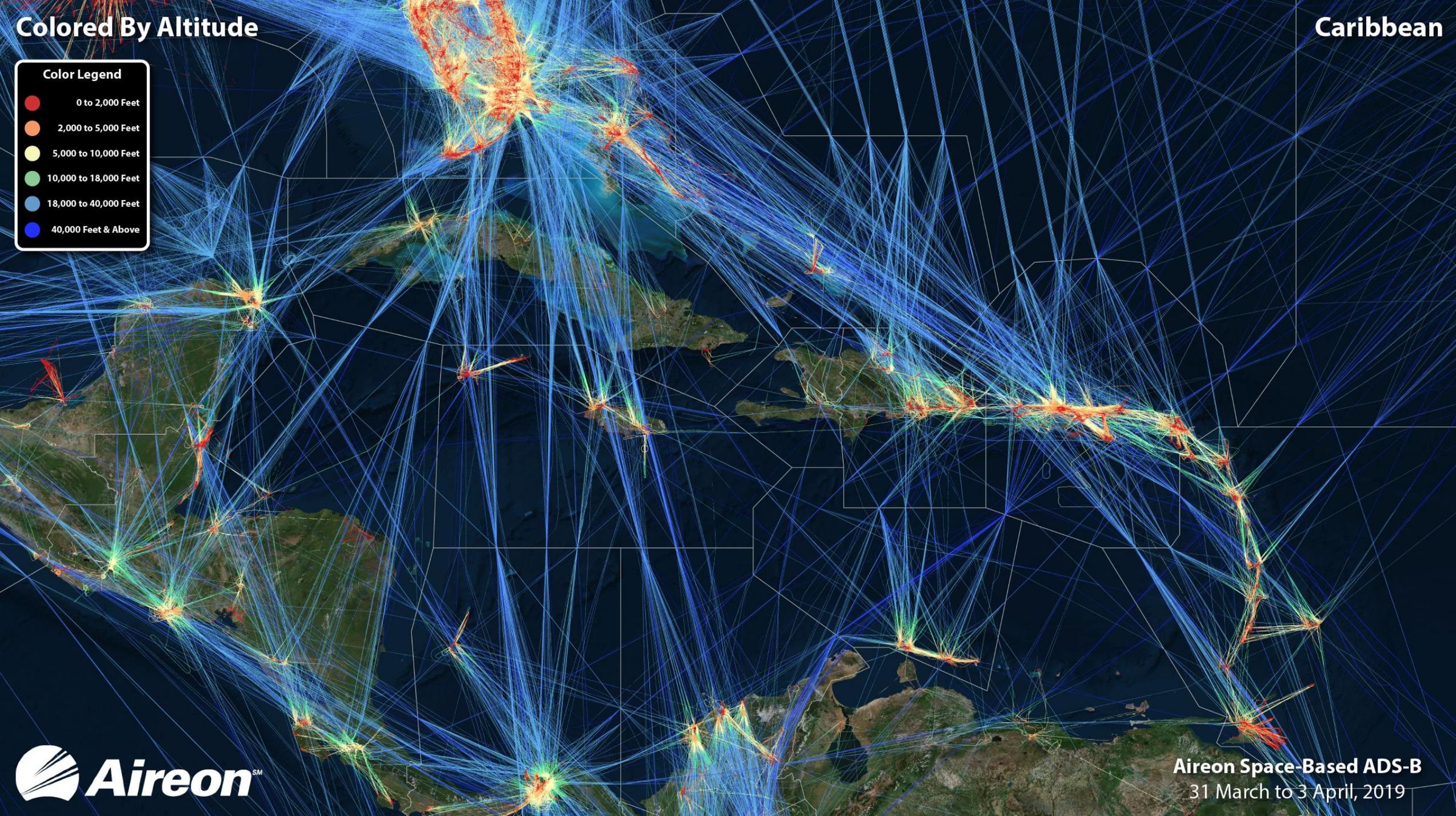


Colored By Altitude

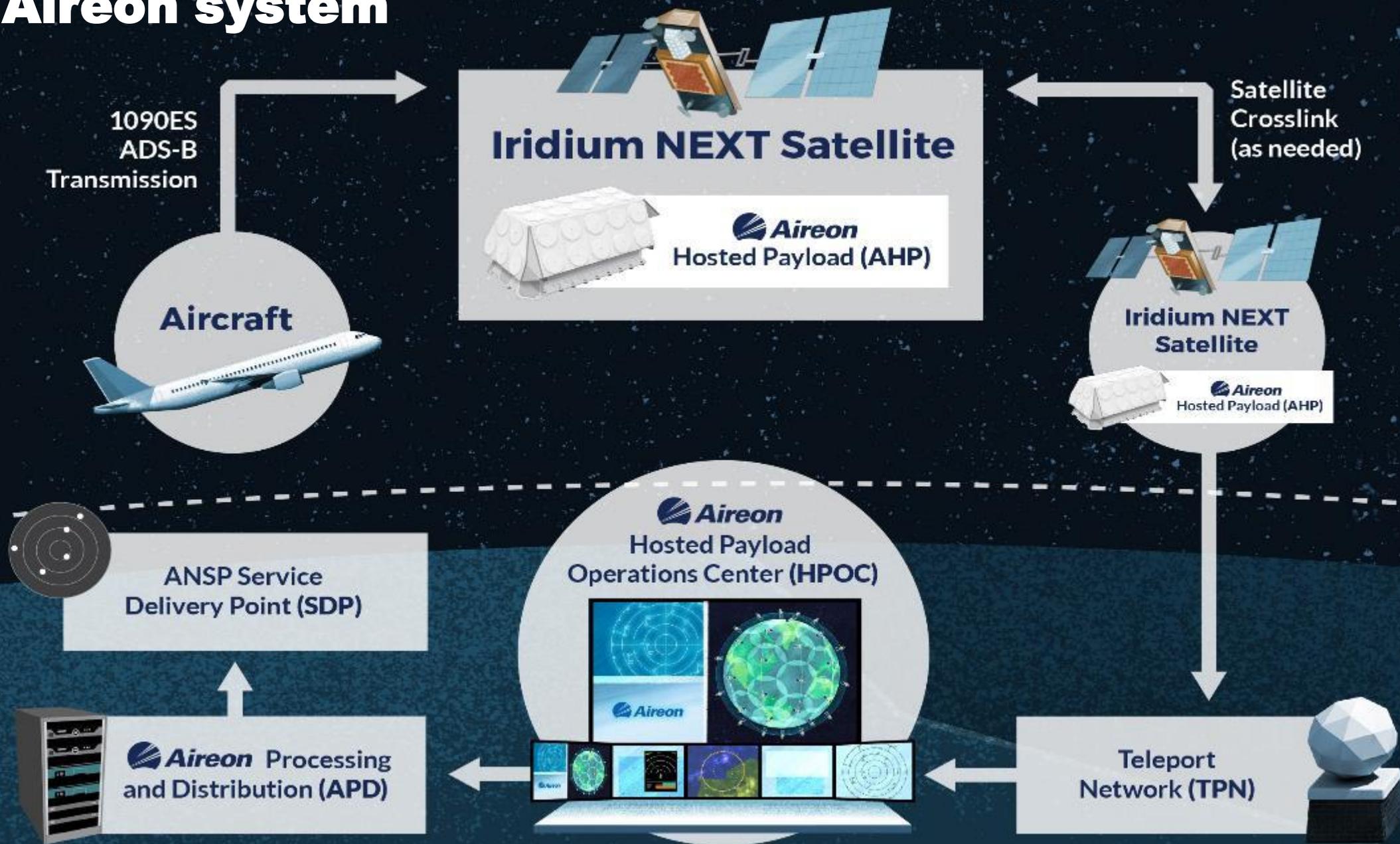
Caribbean

Color Legend

- 0 to 2,000 Feet
- 2,000 to 5,000 Feet
- 5,000 to 10,000 Feet
- 10,000 to 18,000 Feet
- 18,000 to 40,000 Feet
- 40,000 Feet & Above

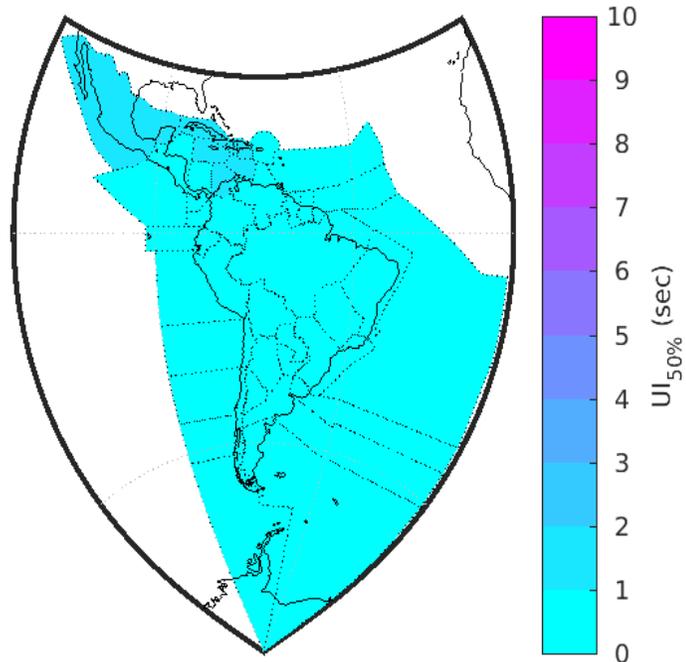


Aireon system

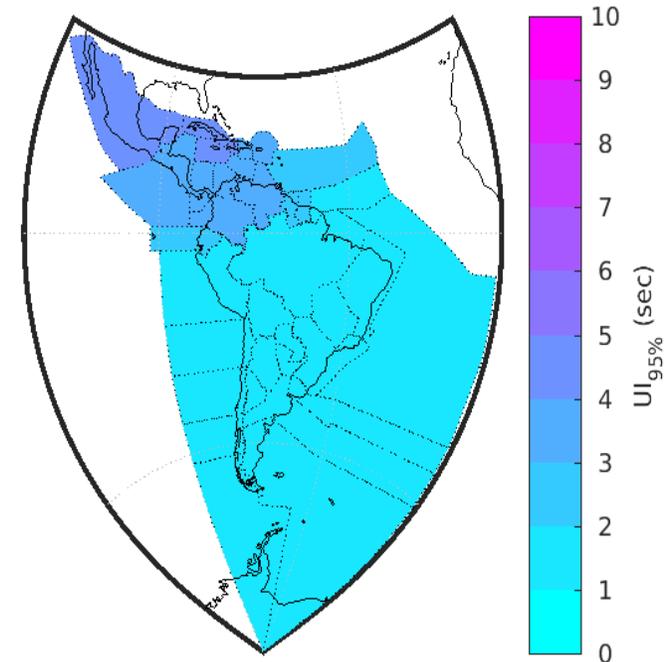


Excellent performance levels in LATAM/CAR region

Latin America Update Interval (50%)
2019-May-15, 24hrs



Latin America Update Interval (95%)
2019-May-15, 24hrs



System is EASA-Certified!

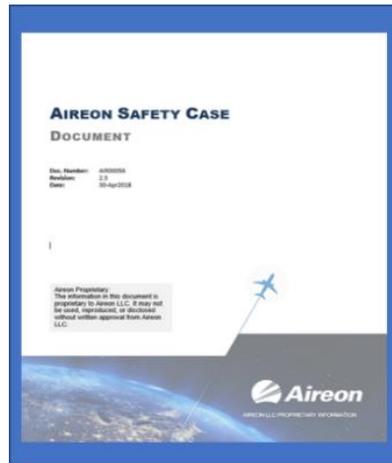
- EASA certification received May 28, 2019
 - Certification as Air Navigation Service Provider
 - Oceanic environment.
 - En-route and terminal certifications estimated approval on Sep 2019.

First and only non-ANSP who has received such a certification



The image shows a scan of an EASA Approval Certificate. The document is titled 'APPROVAL CERTIFICATE' and 'REFERENCE EASA.AOA.TRD.010'. It states that the European Union Aviation Safety Agency (EASA) certifies Aireon, located at 1750 Tysons Boulevard, Suite #1150, 22102 McLean, Virginia (VA), United States of America (USA), as an approved Air Navigation Service Provider (ANSP) Organisation. The certificate includes four conditions: 1. The approval is limited to the scope of providing Air Navigation Services as specified in the attached 'Service Provision Conditions', and 2. This approval requires compliance with the procedures and other arrangements specified in the Organisation Exposition, as presented in the Aireon Integrated Management System Manual reference AIR00169, in the latest revision, and 3. This approval is valid whilst the approved Air Navigation Service Provider organisation remains in compliance with the applicable common requirements, and the specific conditions identified for the services included in the Service Provision Conditions. 4. Subject to compliance with the foregoing conditions, this approval shall remain valid until: 31 December 2020 unless the approval is surrendered, superseded, suspended or revoked. The certificate is signed by Manfred Dieroff, ATM/ANS Standards, Implementation and Oversight Section Manager, on behalf of EASA. The date of issue is 28 May 2019.

Aireon Deliverables as Input to ANSP Safety Case



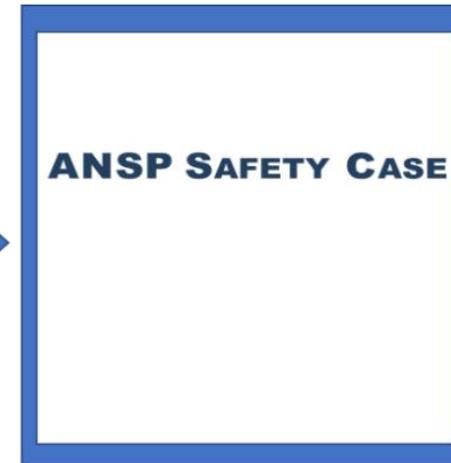
Contents:

- EASA ATM / ANS Org Cert
- Declaration of Verification
- Declaration of Suitability
- Environment Description
- Service Definition Doc
- Safety Arguments
- Safety Requirements
- Hazards Analysis



Contents:

- Installation Test Cases
- ICD / TELCO
- Security Test Cases
- Operations Test Cases
- Local Maintenance Display
- Redundancy Test Cases
- Performance Test Cases
- Aireon Dashboard
- Customer Test Cases



Contents:

- Concept of Use
- Separation Minima
- Routes
- Holding Areas
- Airspace Structure
- ATC Sectorization
- Air Traffic Management
- ATC Training

SASP Oceanic 15NM Separation Standard



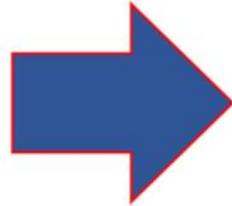
International Civil Aviation Organization

SEPARATION AND AIRSPACE SAFETY PANEL (SASP)

SECOND MEETING

Montreal, 7 to 18 May 2018

The material in this report has not been considered by the Air Navigation Commission. The views expressed therein should be taken as advice of a panel of experts to the Air Navigation Commission but not as representing the views of the Organization. After the Air Navigation Commission has reviewed this report, a supplement setting forth the action taken by the Air Navigation Commission thereon will be issued to this report.



CNS-ATM Requirements	
SUR requirements	ATS surveillance system (Radar, ADS-B or MLAT)
NAV requirements	Aircraft capable of RNP4 or RNP2
COM Requirements	RCP 240 (Performance based, could be CPDLC but not defined as ADS-C)
Contingency Requirements ... should normal COM fail	Alternative means of COM: Recognize, Intervene, Resolve conflict – Total Time 9 mins*. <u>Note: No ADS-C contingency requirement</u> <u>Note: No Next & Next + 1 requirement</u>
ATS System: Lateral Conformance- Reduced Separation	Lateral warning threshold set: 3NM
ATM System: Lateral Conformance- Basic	Lateral warning threshold set: 3NM

Completed:

- November 2018 SASP Meeting approved PANS/ ATM Doc 4444 Proposal for Amendment

Next Steps:

- November 2020 Publish Revision in PANS / ATM Doc 4444



Q3 / Q4 2019 Implementation Schedule with Launch Customers

Q1 2019
NAV CANADA / NATS
ISAT Complete

Q2 2019
IAA / NAVIAIR
ISAT Complete

Q2 2019
CAAS
ISAT Complete

Q3 2019
ATNS / DC-ANSP / ASECNA / ISAVIA
ISAT Complete

Q1 2019

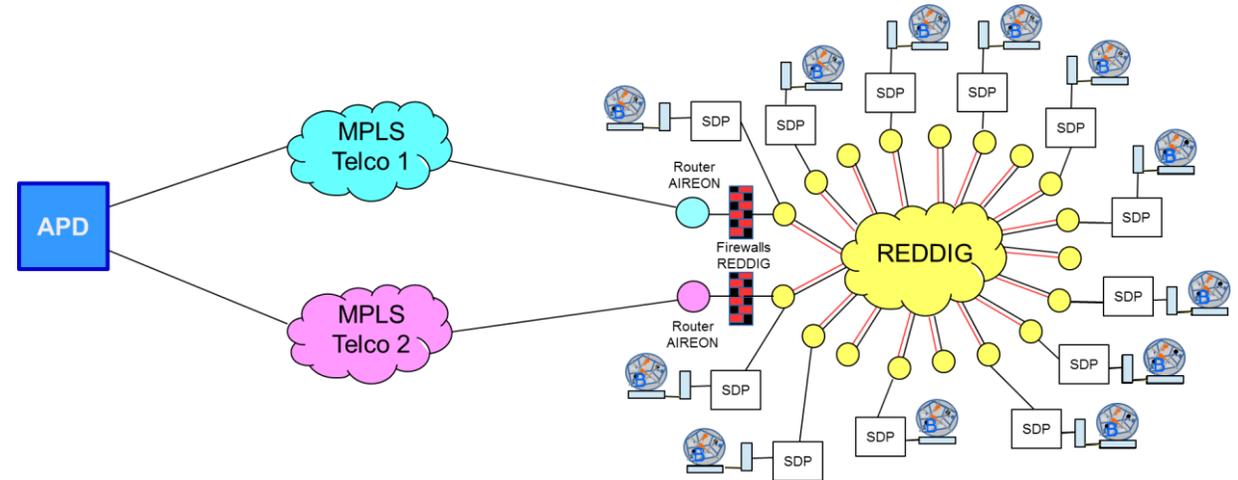
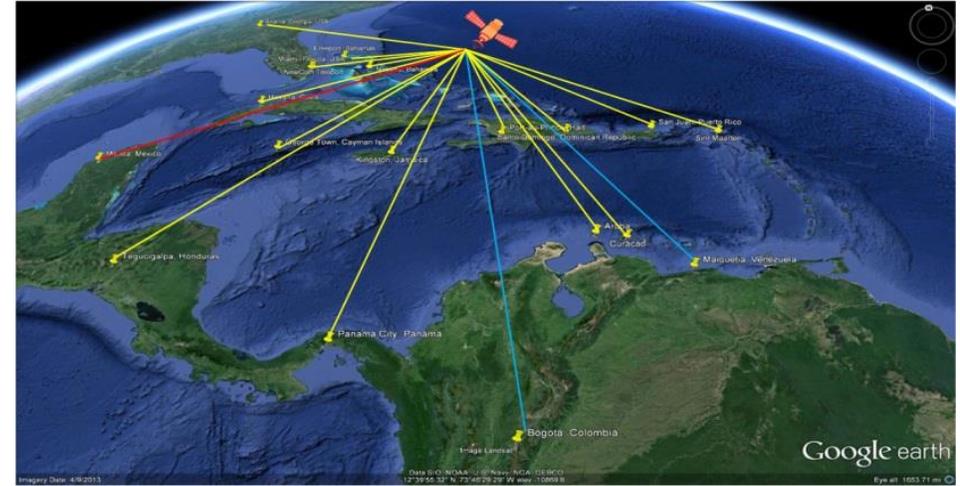
Q2 2019

Q3 2019

Q4 2019

Regional Implementation: Data distribution among Latin America & Caribbean via regional networks, MEVA and REDDIG

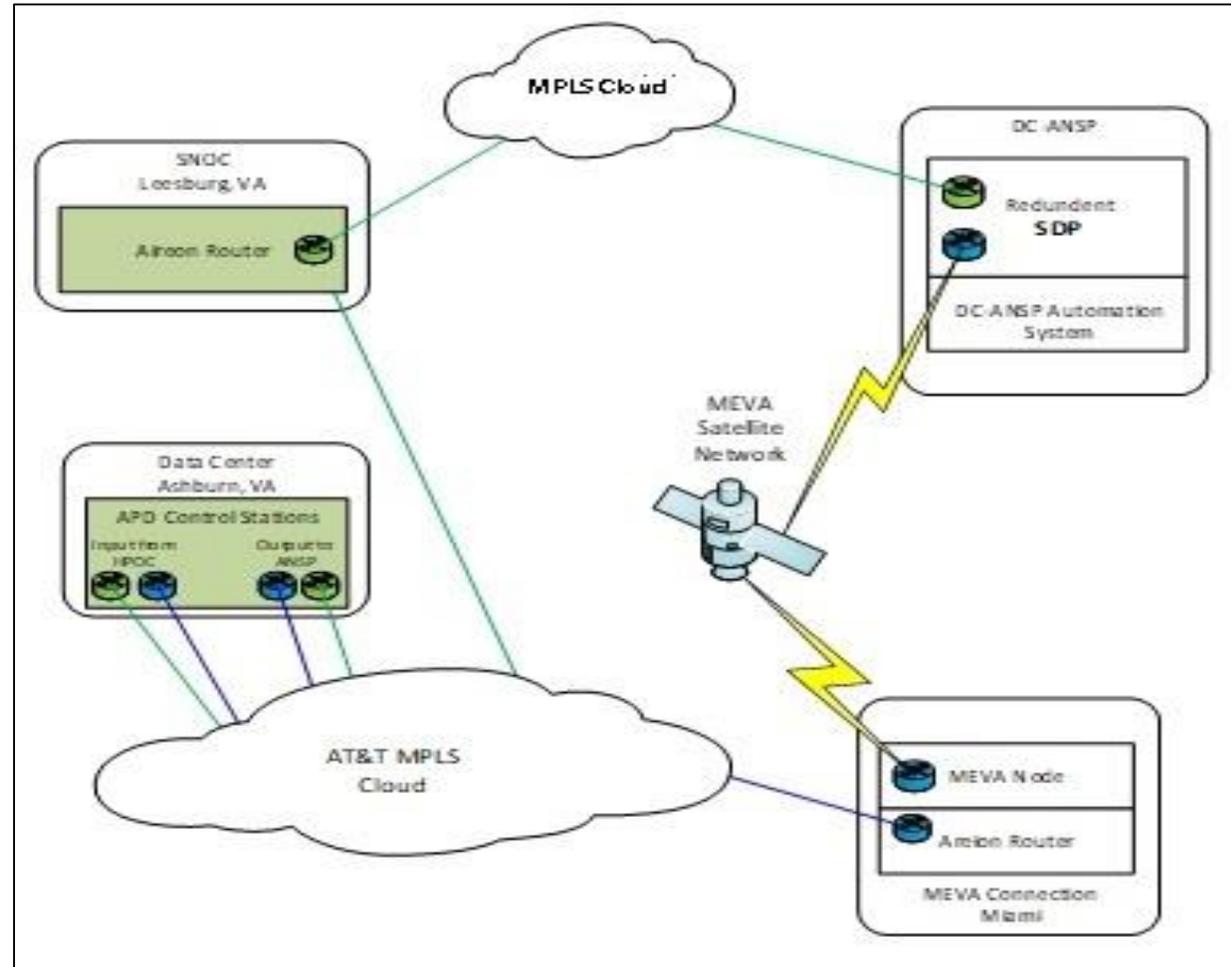
- The use of regional networks facilitates regional cooperation among States, enabling regional ATFM (Air Traffic Flow Management) and regional contingency for surveillance in the event of disasters, supporting operations continuity
- The cost of MPLS connections between each ANSP and Aireon (Virginia) can be significantly reduced, supporting cost-efficiencies in technology implementation
- The MEVA (NACC regional network) use for Aireon data distribution was approved in March 2018. Curacao first country to use MEVA to receive space-based ADS-B data
- After a positive analysis of the use of REDDIG network for Aireon data distribution, SAM States and ICAO worked in a feasibility study for the regional implementation of space-based ADS-B



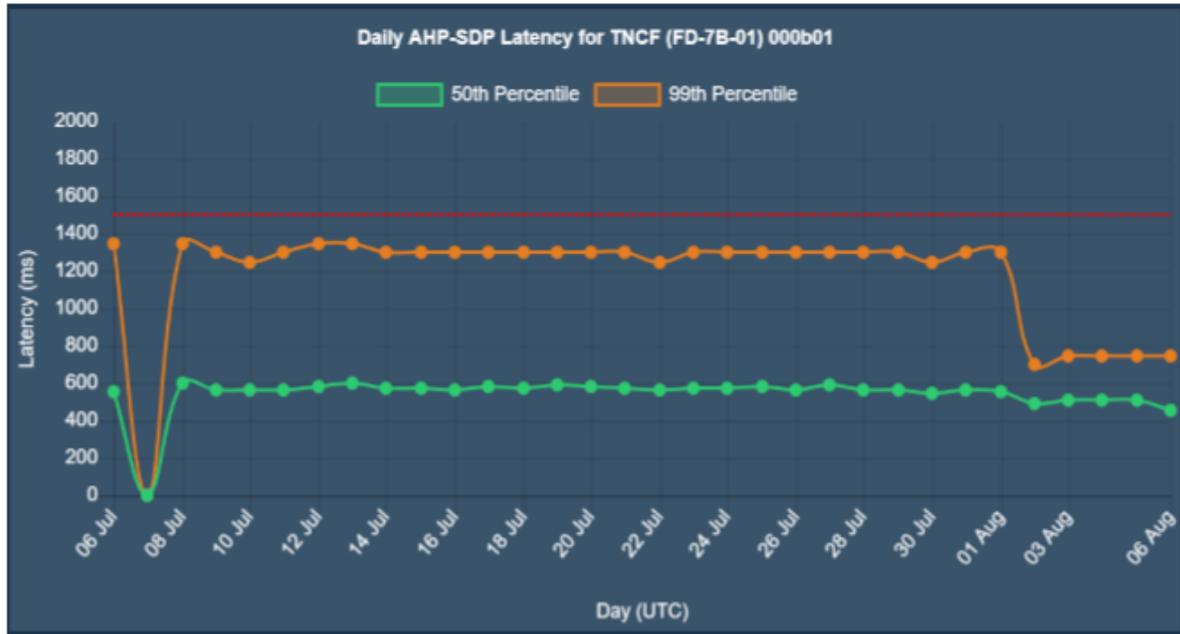
Regional Implementation: ICAO SAM WP/17 at SAM/IG/22 meeting, November 2018

- At the SAM/IG/19 meeting, States recognized the operational benefits and advantages that could be derived from the satellite-based ADS-B service, such as:
 - Coverage of existing gaps in the surveillance systems of the States in the Region;
 - Coverage in boundary areas as an alternative to the exchange of surveillance data between adjacent States;
 - Coverage in oceanic areas out of reach of ground surveillance systems;
 - Surveillance solution for non-FIR airspace;
 - Constant update of target positions, unlike periodic update provided by ADS-C.
- The study concludes that the use of the satellite-based ADS-B system in the region is feasible due to its coverage, response time in the information transfer process or latency, and availability of information, for en-route airspaces above 10,000 feet, which was the airspace analyzed in this study.

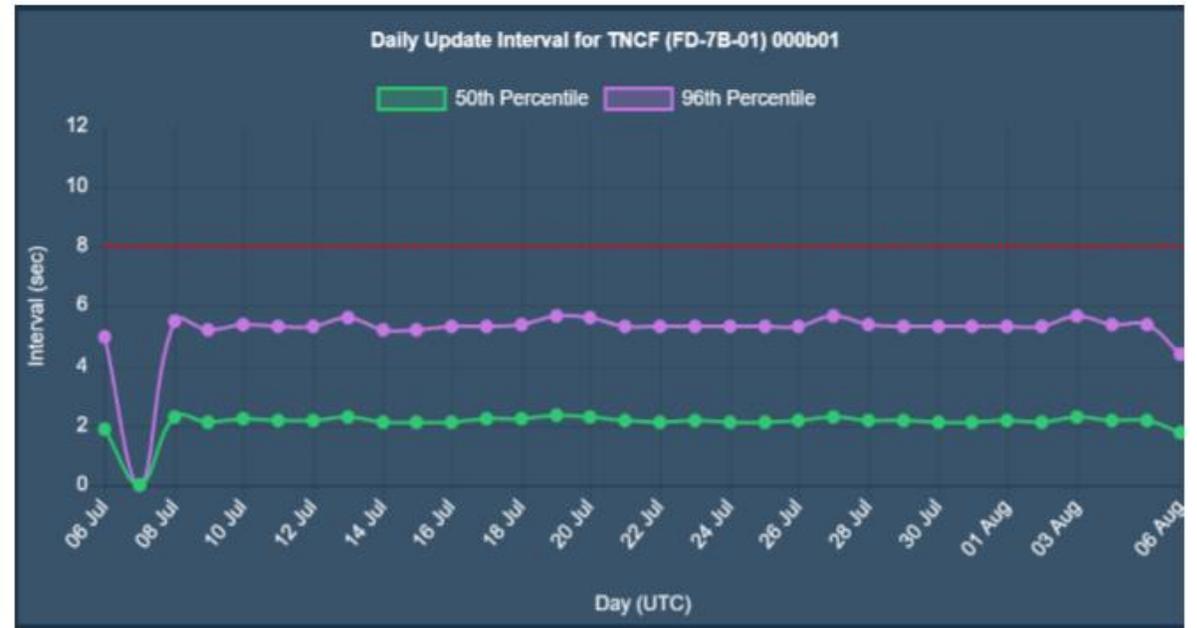
Space-based ADS-B implementation at DC-ANSP in Curacao



MEVA Performance at DC-ANSP



Latency



Update Interval

Conclusions

- Space-based ADS-B is operational and currently in use by Nav Canada and NATS from UK in the North Atlantic oceanic airspace with reduced separation minima of 14 NM and 17 NM and in the Canada-Edmonton FIR on continental airspace
- Space-based ADS-B is EASA certified in the oceanic environment. En-route and terminal certifications are expected by September 2019
- The system is reaching excellent surveillance performance parameters in the LATAM/CAR region
- Eight additional ANSPs will be operational by the end of 2019 and start using space-based ADS-B as a surveillance system
- The use of regional networks is a cost-effective and collaborative way to implement the signal. Results from the MEVA implementation in Curacao show the performance levels have reached excellent
- Space-based ADS-B can be considered in the different task forces initiatives for full airspace surveillance, contingency platform and regional ATFM as a cost-effective and global surveillance solution that will bring operational benefits to ANSPs and airspace users

Thank you!

AIREON

