Current Surveillance is NOT Limited to Line of Sight Anymore

Aireon System is Live!

www.aireon.com/live

The Washington Post

Data From This Company Helped Convince the FAA to Ground the Boeing 737 Max

Their official launch wasn't planned for weeks, but Aireon, a McLean, Va.,-based company made headlines in March after it provided critical flight data to the Federal Aviation Administration that led to the agency's decision to ground all Boeing 737 Max jets.

Amelia Earhart – Disappeared in 1937

Malaysia MH 370 – Disappeared in 2014

OBJECTIVE

Space-based ADS-B Upadate

SAM/IG/24

4 – 8 November 2019

AGENDA

- **INTRODUCTION**
- **DISCUSSION**
- **CONCLUSION**

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Complementary Surveillance Services

Sole Source Surveillance

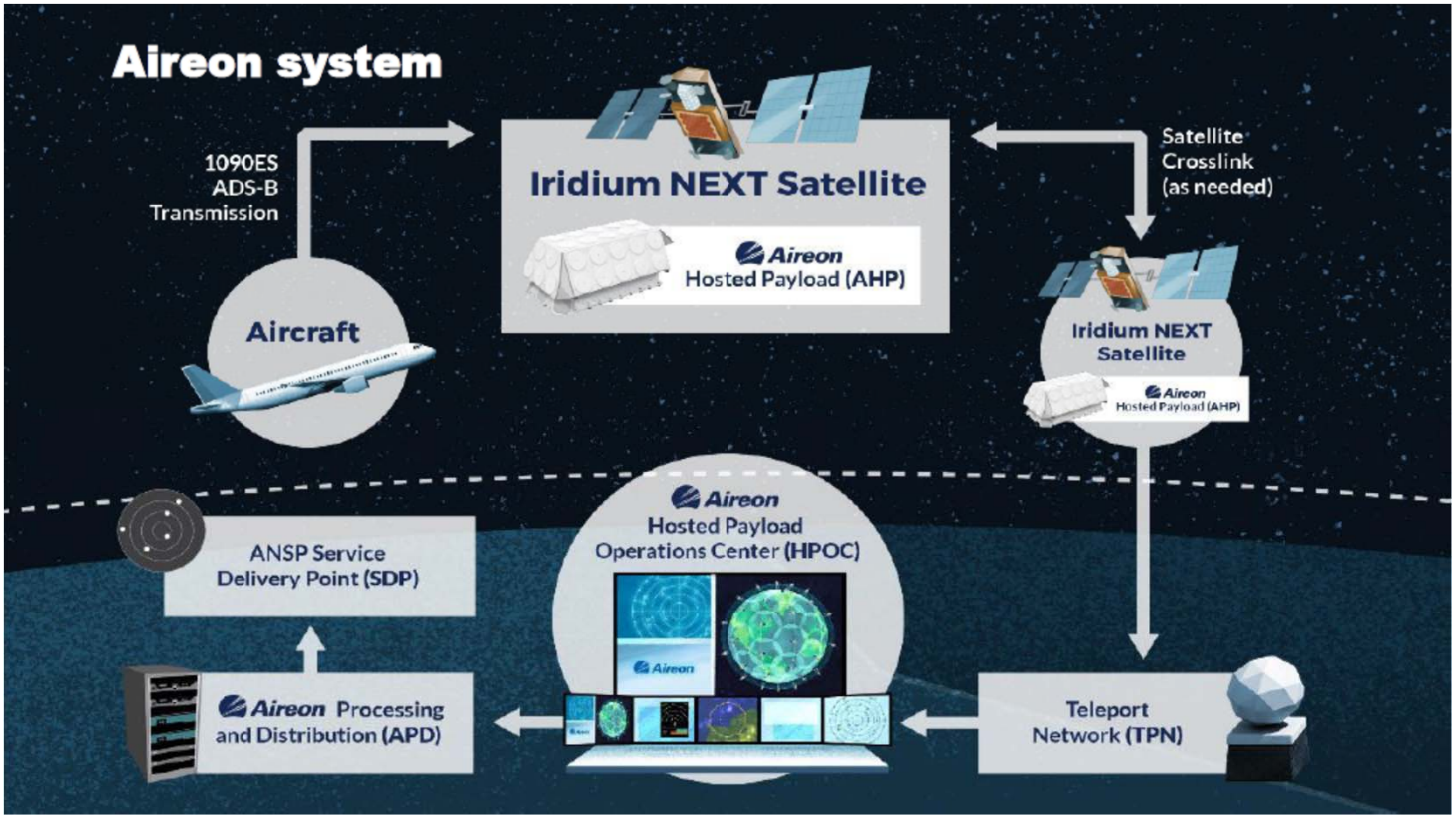
Surveillance in regions that currently lack surveillance coverage

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



Iridium NEXT Constellation Overview

66 Total satellites in the Iridium NEXT Constellation

- 11 satellites per plane Plus
- 9 in-orbit spare satellites
- 6 ground spare satellites
- **Orbital Planes: 6**
- **Availability: ≥ 0.9999**
- **Typical Lifecycle: 14 Yrs**
- **Operational Altitude: 485 miles (780 km)**
- **Final launch January 2019**
- **Operational 1st Quarter 2019**

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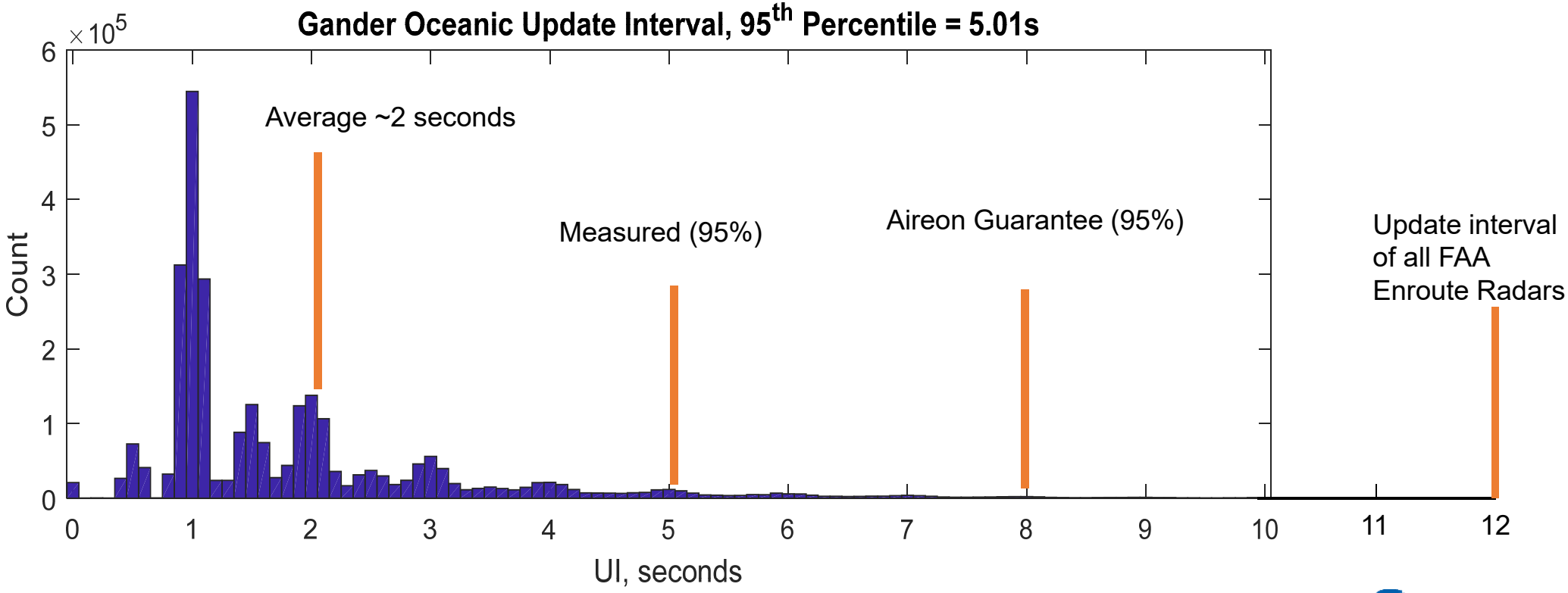
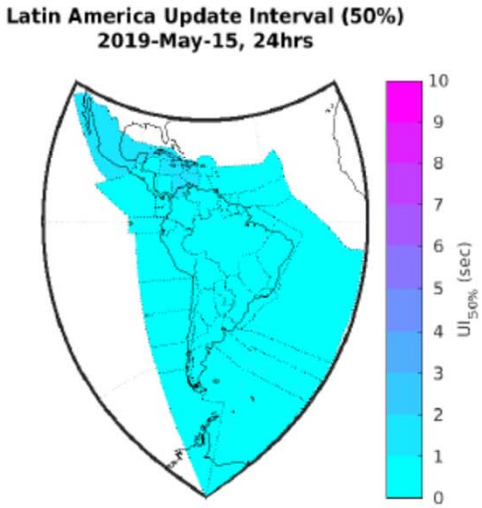
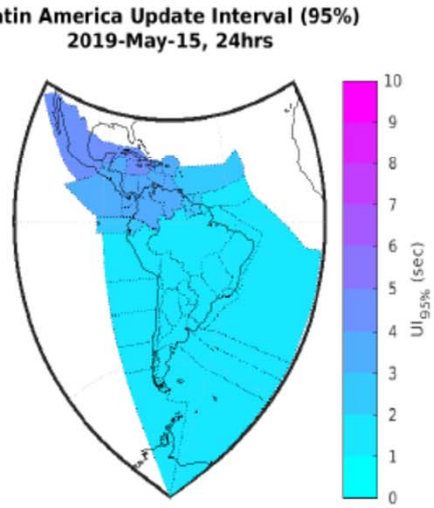
Measured Performance - Update Interval (in seconds)



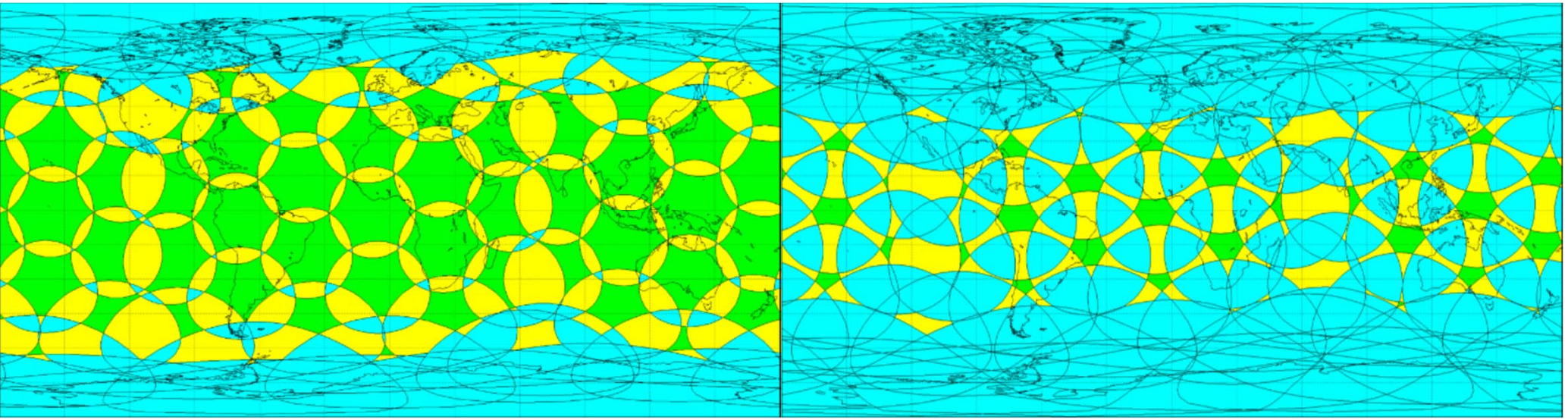
* Using 44 out of 66 payloads and pre-operational constraints. Expected to further improve

Excellent performance levels in LATAM/CAR region





Space-Based Coverage

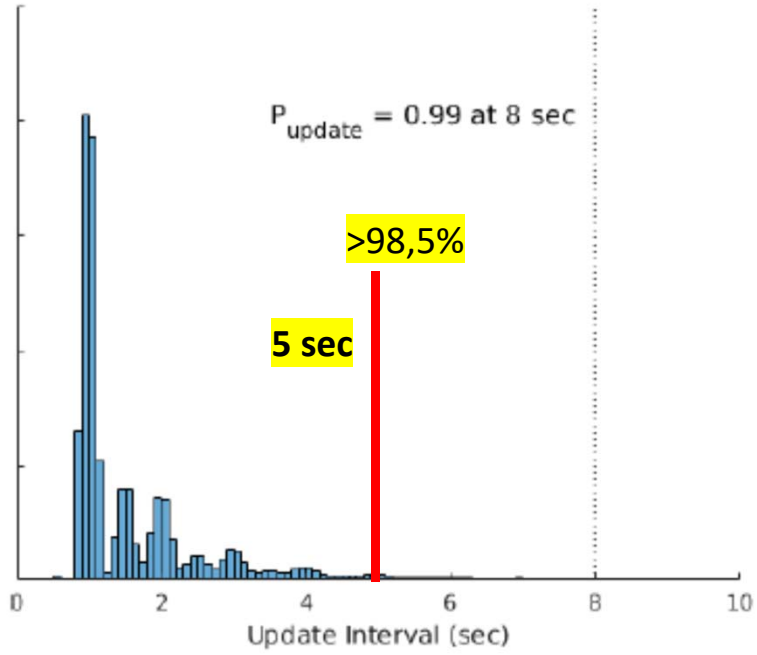


Predicted **Actual**

Operational Performance (Measured with 55 satellites) – ESAV Paper – October 2018

One mitigation to the temporary limitations in bandwidth (which will be resolved by routing changes in Nov 2018) was to reduce the number of payloads providing service to 55 (only 5 out of 6 orbital planes) and allocate all available bandwidth to this "mini-constellation". With only 55 payloads in use, the UI was measured over the Reykjavik FIR showing near uniform results throughout the airspace at a P_{UI} of approximately 99% for an 8s UI (see Figure 8). Figure 9 shows the full histogram of UI results as an aggregate over the 3-hour window the service volume had full coverage.

over a 24 hour period. The aggregate P_{UI} (5s and 8s) is 99%, which is aligned with the results from the whole FIR shown in Figure 8 and Figure 9. The combined performance would provide a seamless continuity of service from en-route (8s) to terminal/approach (5s) to surface (although surface would require a UI of 1s).



Operational Performance (Required Ed 129B)

TABLE 3: PU TABLE FOR RESPECTIVE UPDATE INTERVALS

ATC Sector Type	Update Interval (s)	Horizontal Position
Low-Density ER	8	96,0%
Medium-Density ER	8	97,5%
High-Density ER	8	98,5%
Low-Density TMA	5	96,5%
Medium-Density TMA	5	97,5%
High-Density TMA	5	98,5%
High-Density APP2.5	5	99,0%
High-Density APP2.0	5	99,0%
ADS-B APT (moving)	1	90,0%
ADS-B APT (stationary)	10	90,0%

Operational Performance (Experienced)

- Joint NAT POG/08 – IP/14, presented by Nats UK, Nav Canada and Portugal
- NAT/POC Meeting, Brest France, 16 to 20 September 2019
- “133 million ADS-B reports at an update rate of 8 seconds (Gander figures indicate similar performance)”

Metric	Units	Mean Daily Result	Target
Probability of Update (ED129b)	%	99.53	>96
Probability of long gaps (ED129b)	%	0.174	< 0.222
Average Latency (ED129b)	Seconds	0.18	< 1.5
95th Percentile of Update Interval between consecutive messages for a target	Seconds	2.48	< 10

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

EASA

APPROVAL CERTIFICATE

REFERENCE EASA.AOA.TRD.010

Pursuant to Regulation (EU) 2018/1139 and Commission Regulation (EU) No 1035/2011 and subject to the conditions specified below, the European Union Aviation Safety Agency hereby certifies:

AIREON

1750 Tysons Boulevard, Suite #1150
22102 McLean, Virginia (VA)
United States of America (USA)

as an approved AIR NAVIGATION SERVICE PROVIDER (ANSP) ORGANISATION certified to provide ATM/ANS as listed in the attached 'Service Provision Conditions'.

CONDITIONS :

1. This 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 AIR00103, 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:

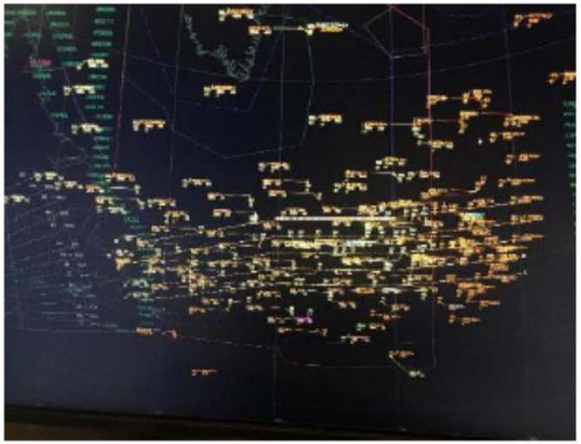
31 December 2020

unless the approval is surrendered, superseded, suspended or revoked.

For the European Union Aviation Safety Agency,

Date of issue : 28 May 2019

Manfred DIERKOFF
ATM/ANS Standards, Implementation and Oversight Section Manager

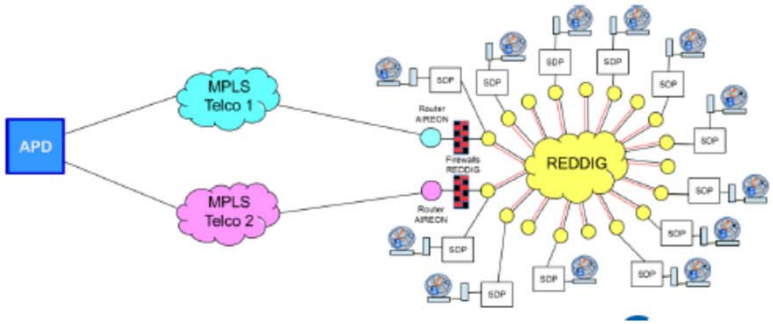


Space-based ADS-B Is Operational!

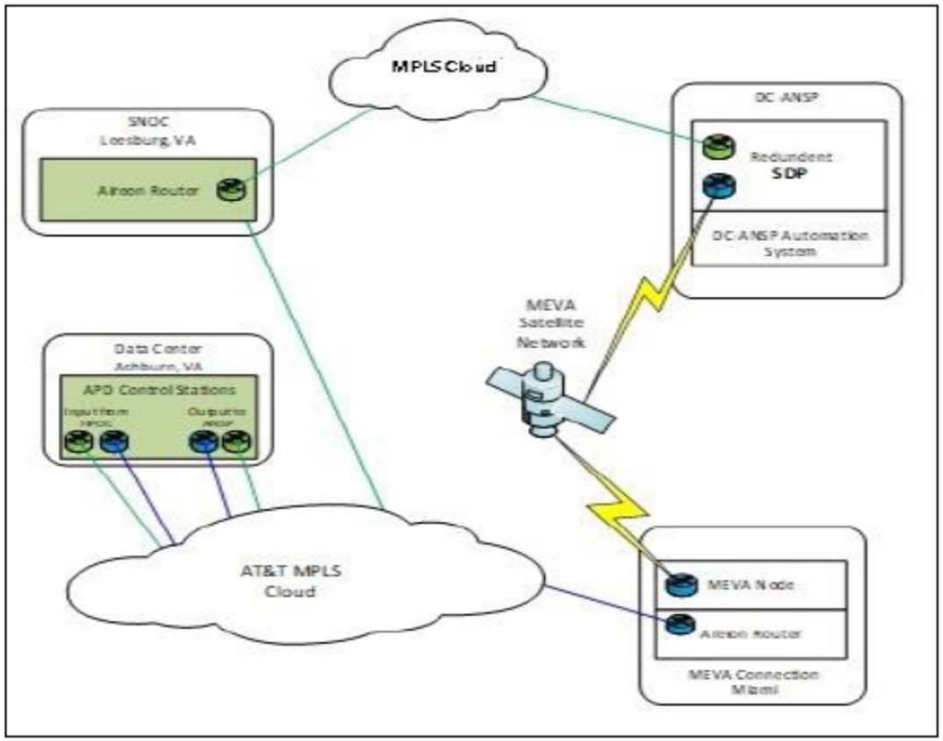
- Aireon service went live in Edmonton, Canada on March 25th and in the North Atlantic with NAV CANADA and NATS on March 27th

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



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



TRIALS DECEA – Agreement Objective

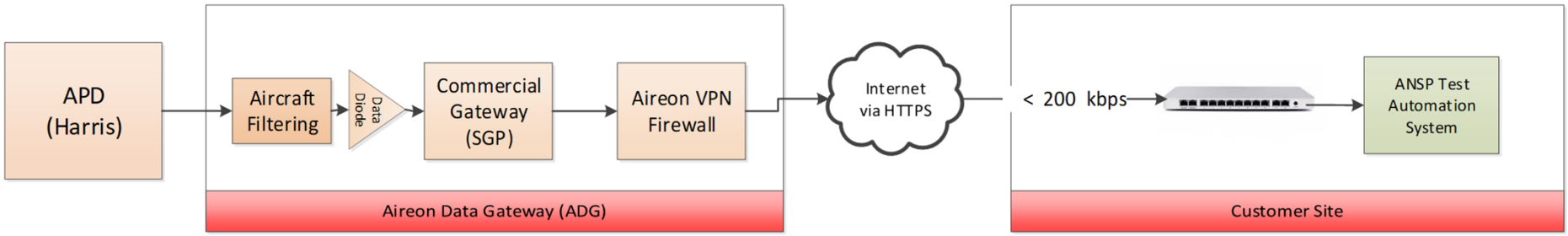
❖ Phase 2: Live Data Gathering and Reporting

- **Action: Testing of Aireon's space-based ADS-B data services in Brazil using a Virtual Private Network ("VPN") server connected to the internet.**

- **Objective: Expand from Phase 1 by providing "live-data" while analyzing system performance data to support DECEA ADS-B acquisition strategy.**

The VPN Connection

- Customers will be need to have an <200 kbps internet connection for a single Service Volume
- Aireon will provide hardware to connect to the VPN
  - Meraki MX65 firewall and Advanced Security License with 3 year cloud support



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Conclusions

- Space-based ADS-B is operational and currently in use by Nav Canada and NATS from UK in the North Altanticoceanic 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

- 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,aumengtation and/or contingency

- Brazil is making trials for possible implementation


Thank you!
Demetrius Zuidema
Sales manager
Demetrius.zuidema@aireon.com
Athayde Frauche
CNS Consultant
Athayde.frauche@aireon.com
NAV CANADA
iridium Everywhere
enav
NATS
IAA
NAVIAIR
Aireon
AIREON LLC PROPRIETARY INFORMATION