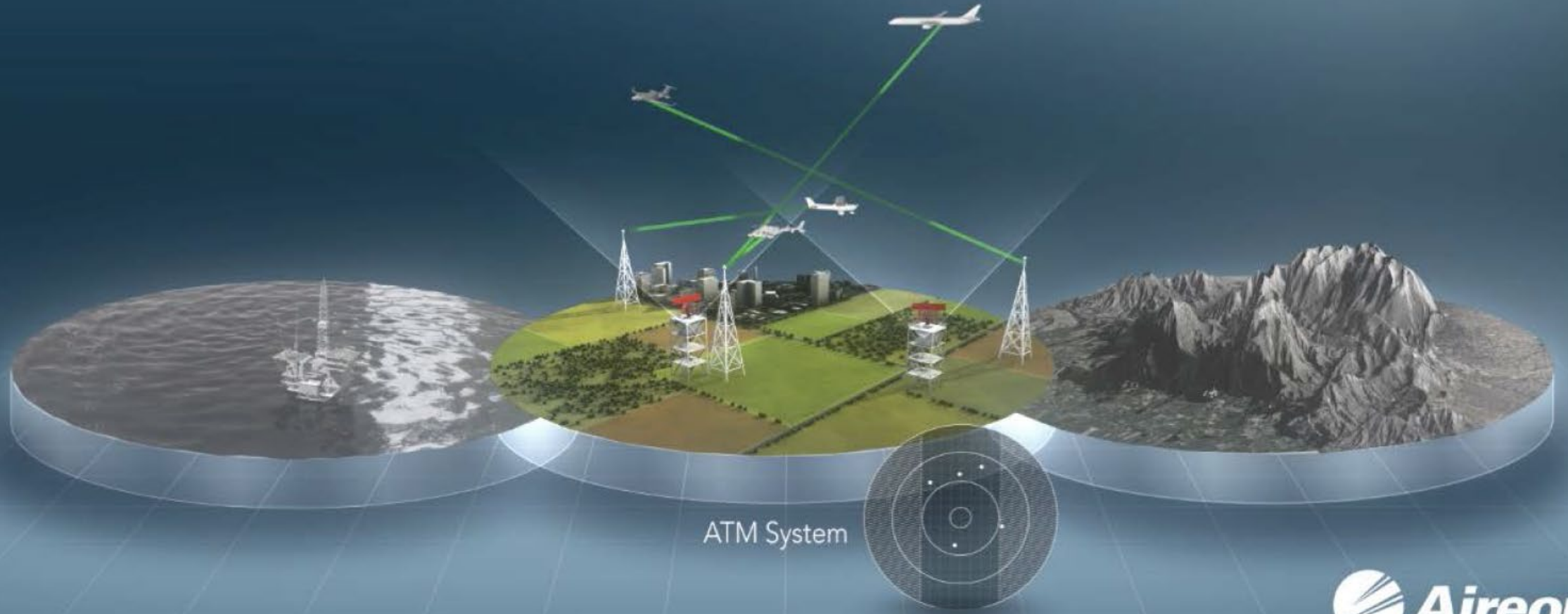# Space-based ADS-B update and Service Implementation in Curacao

MEVA/TMG/34 – Miami, June 11th - 13th 2019

Current Surveillance is NOT Limited to Line of Sight Anymore

ATM System

Aireon

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.

Global Coverage Plot by Altitude

Colored By Altitude

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 Space-Based ADS-B
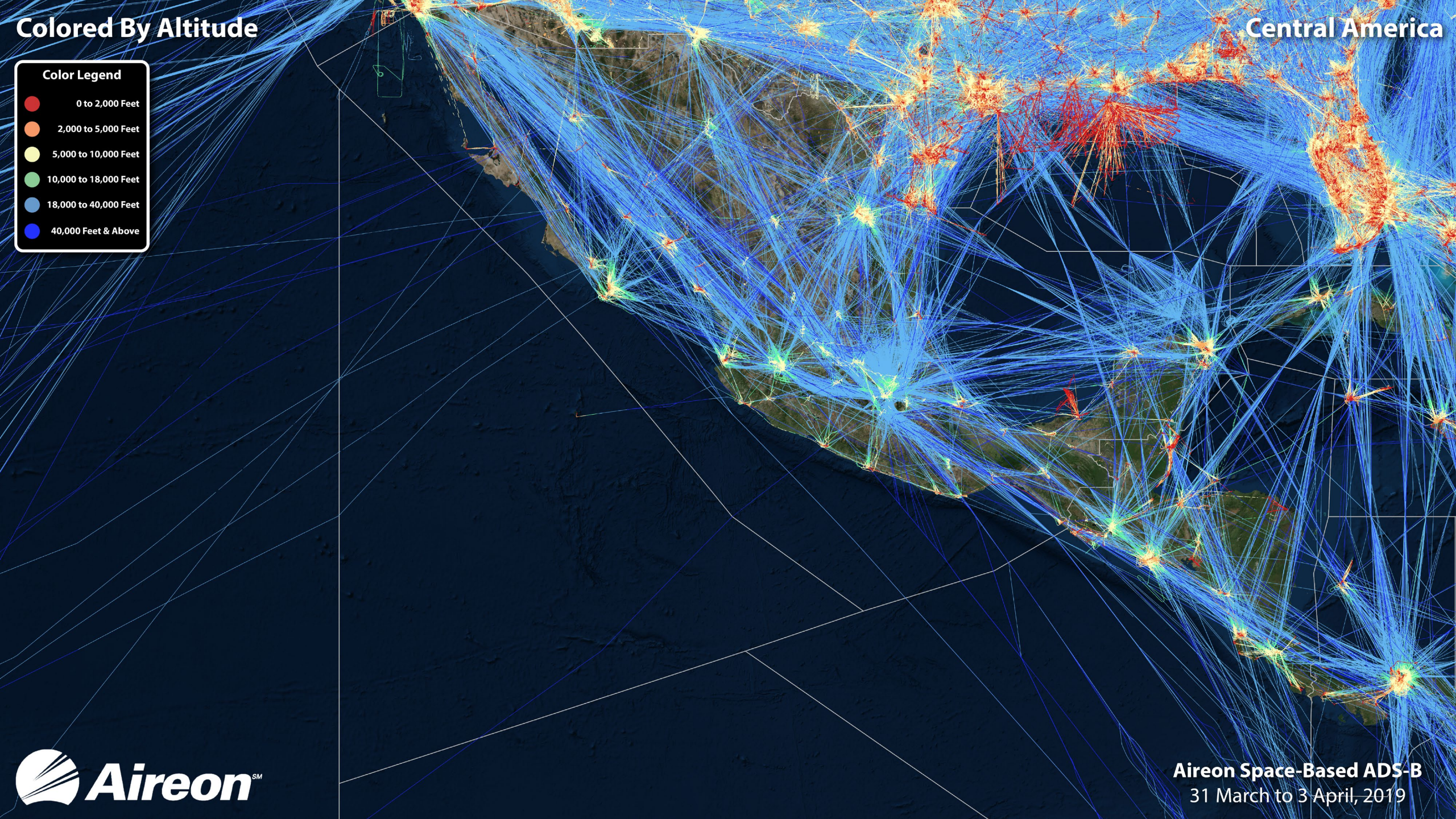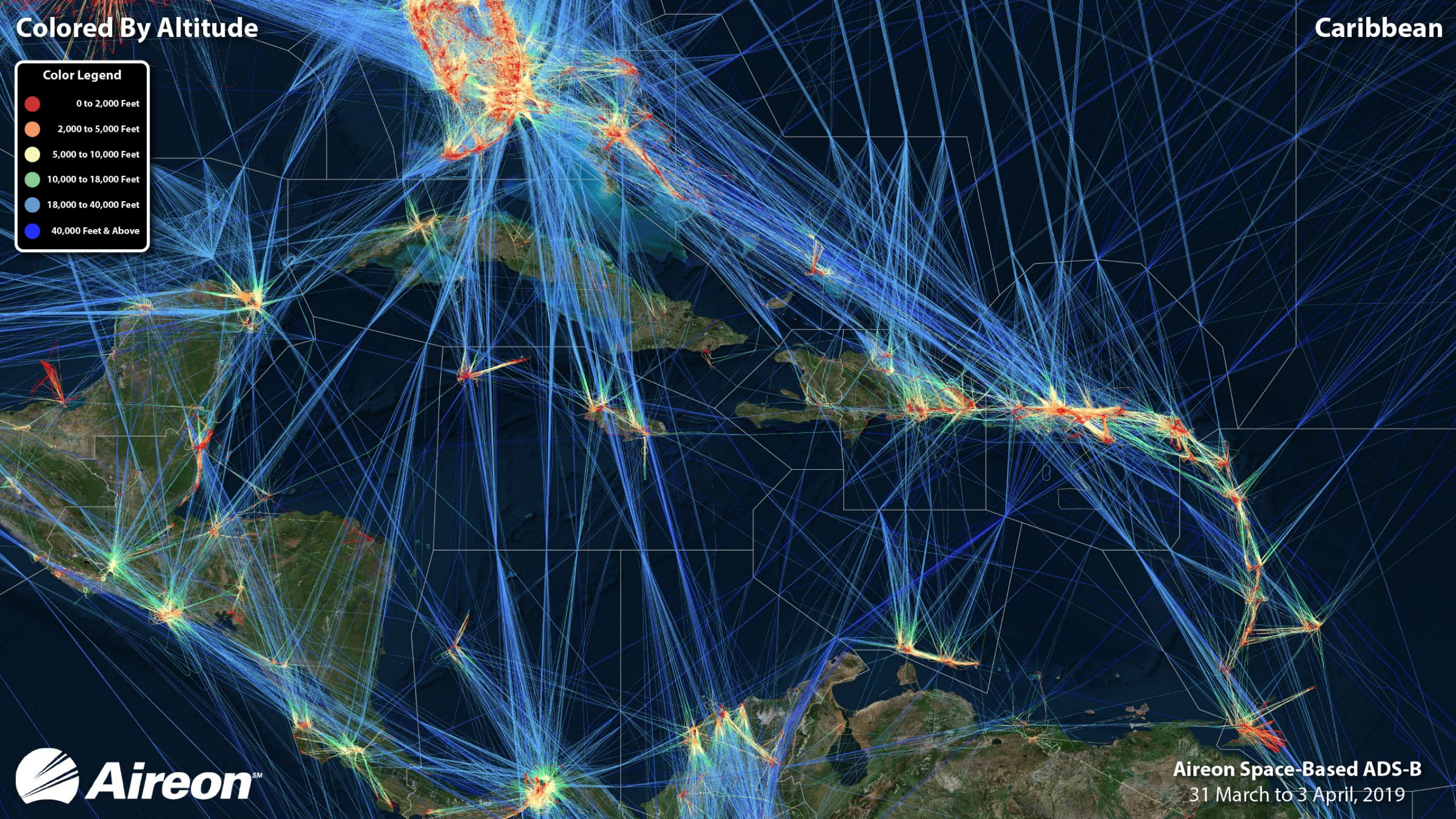31 March to 3 April, 2019

Aireon

Colored By Altitude

Central America

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™

Aireon Space-Based ADS-B
31 March to 3 April, 2019
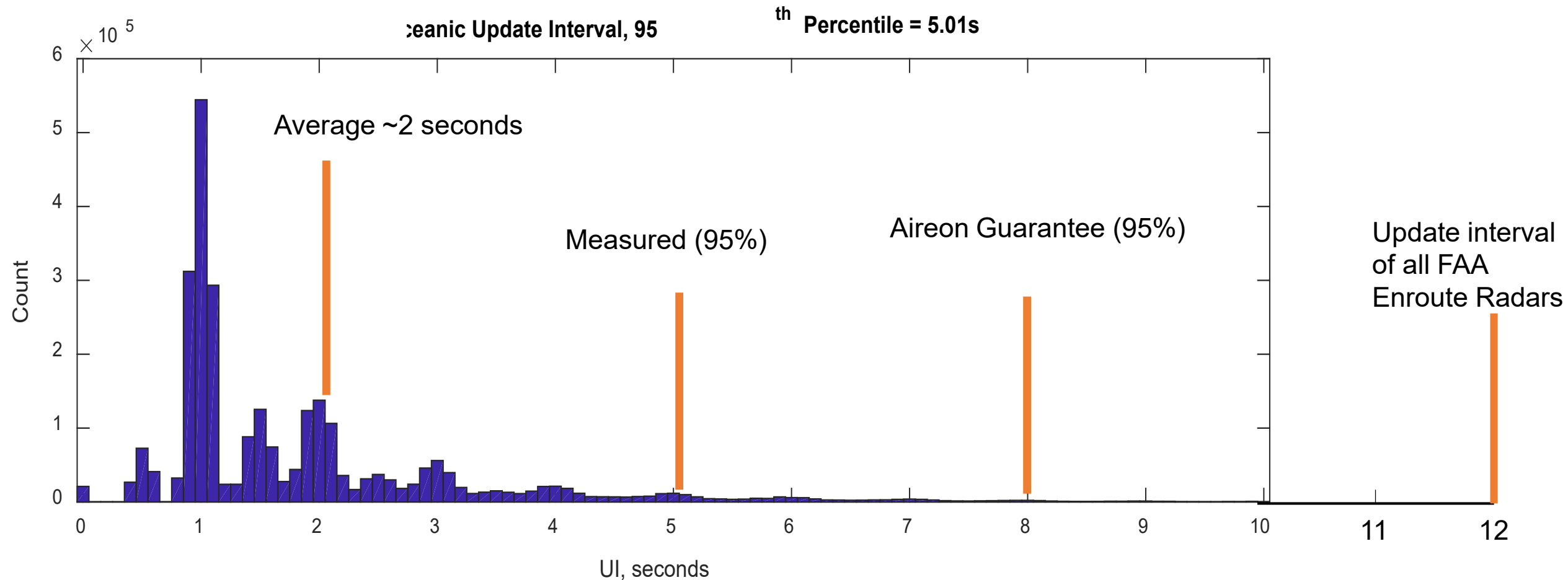
Colored By Altitude

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

Aireon Space-Based ADS-B
31 March to 3 April, 2019

Measured Performance - Update Interval (in seconds)

Oceanic Update Interval, 95th Percentile = 5.01s

Average ~2 seconds

Measured (95%)

Aireon Guarantee (95%)

Update interval of all FAA Enroute Radars

UI, seconds

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

Space-based ADS-B implementation worldwide

NAV CANADA and NATS are the first Air Navigation Service Providers (ANSP) to deploy Space-Based ADS-B for ATS surveillance in the en-route environment.

They have incorporated Space-Based ADS-B in oceanic airspace and started operations with reduced longitudinal separations of 14 NM or 17 NM, plus 5 NM opposite direction, using CPDLC for communication.

NAV CANADA has also incorporated Space-Based ADS-B using a 5 NM standard in airspace with VHF communication, in the Edmonton FIR in Northern Canada.

All other launch customers are in the process of integrating and certifying the system and expect to be operational by IV2019.

Aireon℠

Aireon's EASA Certification Journey

- Aireon and EASA have been working through the certification process since March 2016.

- Aireon engaged the European Aviation Safety Agency (EASA) to acquire **Air Traffic Management (ATM)/Air Navigation Services (ANS) organization** certification.

- The certification process is a rigorous, holistic endeavor that ensures the integrity of the Aireon data and company is suitable for the critical safety-of-life application of ATC separation of aircraft.

- Once Aireon has EASA certification, the certificate is valid for all EU member states and ensures that, for Aireon, once approved, no additional certification activities are necessary.

- This certification can support the implementation for non-EU ANSPs.

- The EASA certification covers the following operations:
  - **Oceanic – Granted June 4th, 2019**
  - En-route – Estimated by July 2019.
  - Terminal – Estimated by July 2019.

Aireon Deliverables as Input to ANSP Safety Case

AIREON SAFETY CASE
DOCUMENT

Doc. Number: AIR00056
Revision: 2.3
Date: 30-Apr2018

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AIREON SYSTEM
TEST REPORT, ANSP IMPLEMENTATION
SERVICE ACCEPTANCE TEST (ISAT)

Doc. Number: 6.7
Revision:
Date: 2018-09-28

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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
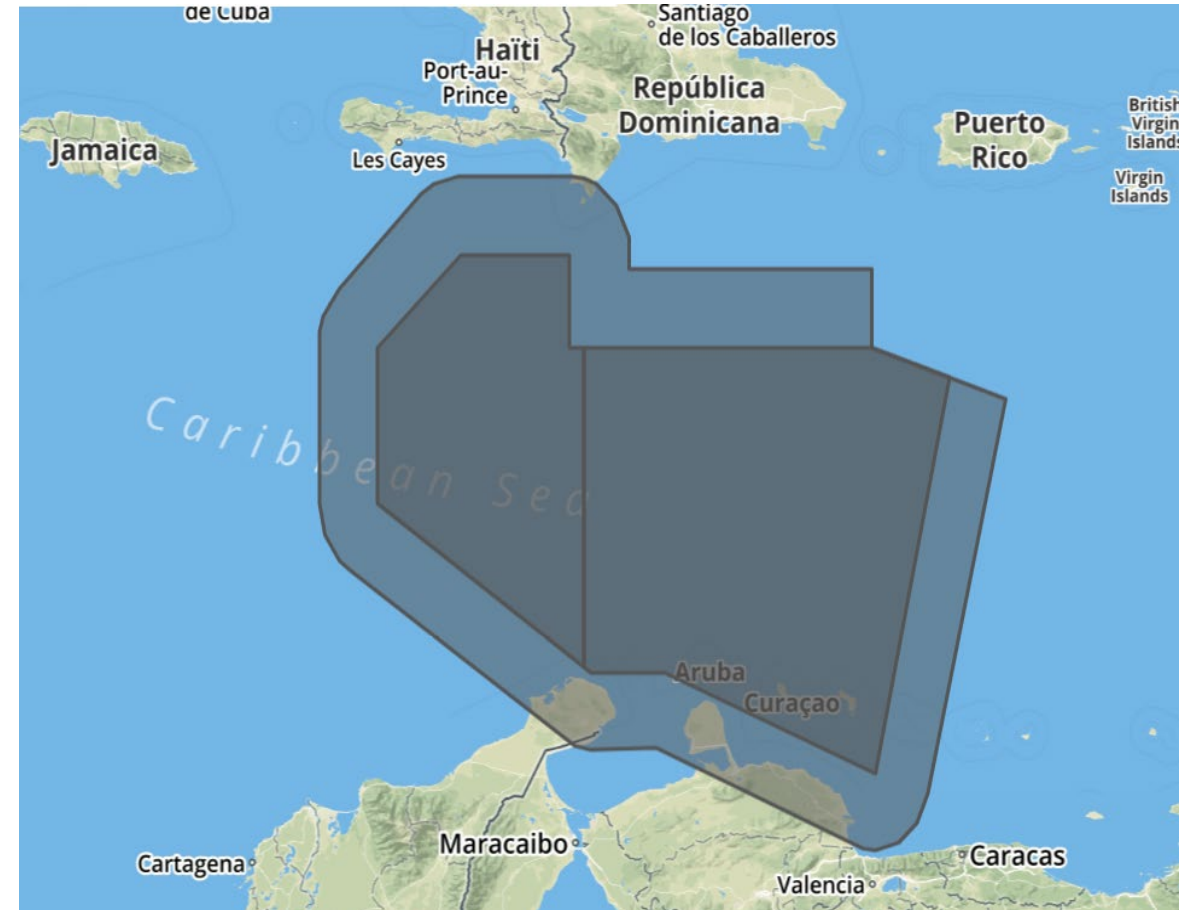- Air Traffic Management
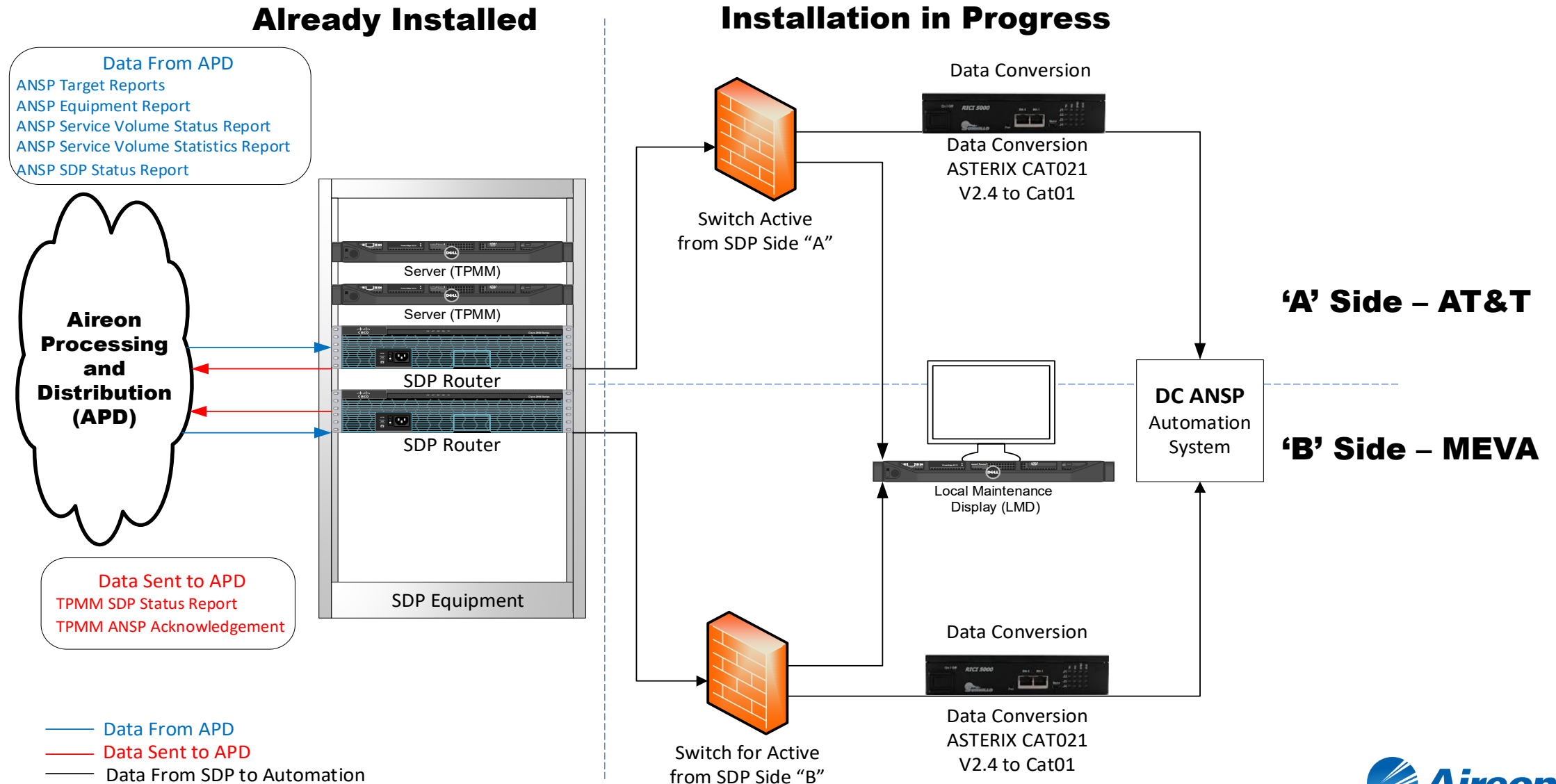- ATC Training

Curacao Implementation Status
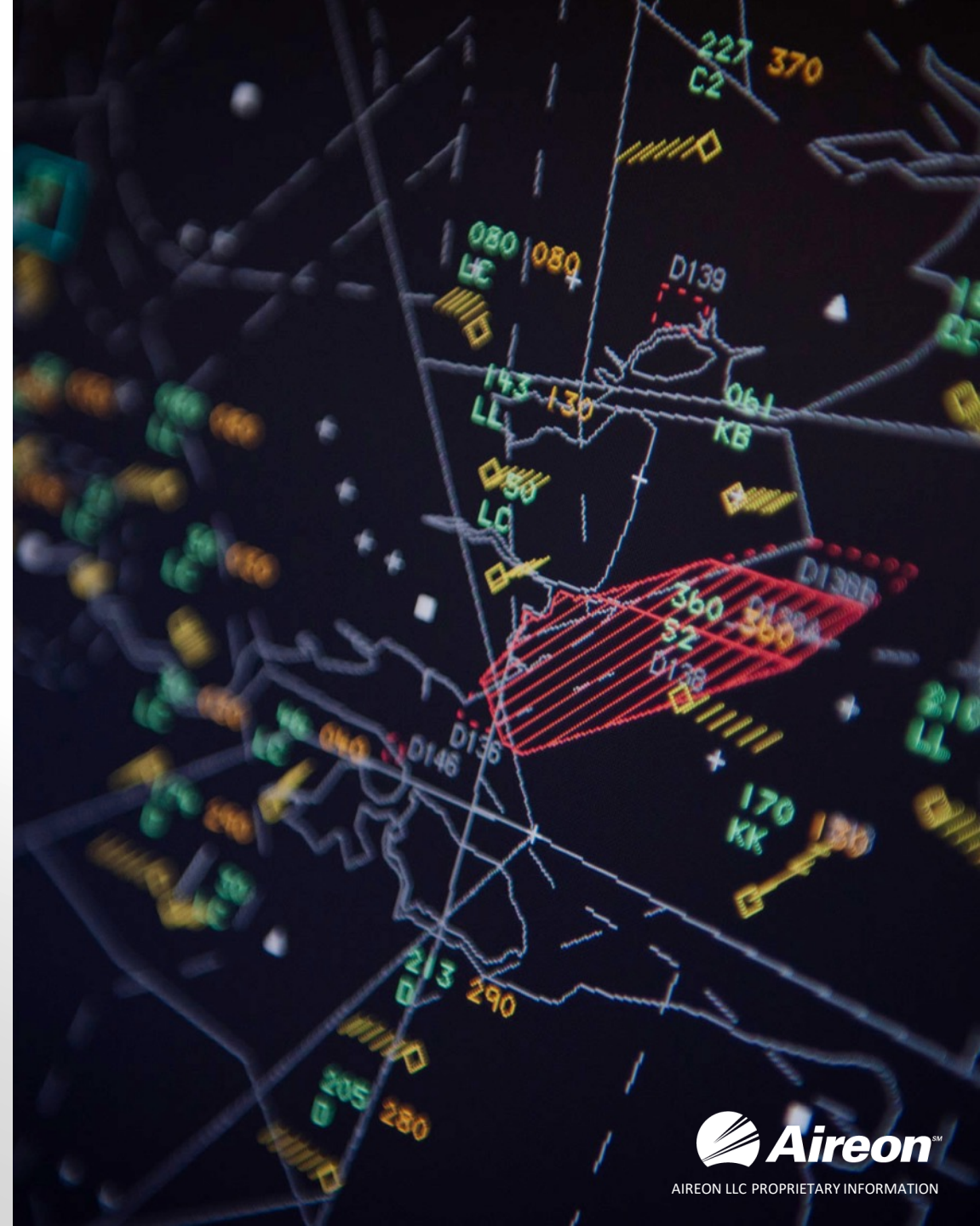
TNCF – Service Volume Definition

✓ **Service Volume Description Document (SVDD)**

❑ Configured parameters necessary for Aireon service delivery

  ✓ Configured update intervals and surveillance parameters

  ✓ Service Volume Floor and Ceiling

  ✓ Added **50 nmi** buffer around TNCF FIR except airspace adjacent to US airspace

  ✓ Network Service Multicast Address established

    ❑ Network Address Example: ddd.SAC.SIC.SID

  ✓ Redundant SDP parameters established

❑ TNCF configuration added to Aireon APD

Service Delivery Equipment Installation

Already Installed

Installation in Progress

Data From APD
ANSP Target Reports
ANSP Equipment Report
ANSP Service Volume Status Report
ANSP Service Volume Statistics Report
ANSP SDP Status Report

Aireon Processing and Distribution (APD)

Server (TPMM)

Server (TPMM)

SDP Router

SDP Router

SDP Equipment

Data Sent to APD
TPMM SDP Status Report
TPMM ANSP Acknowledgement

Switch Active from SDP Side "A"

Data Conversion

Data Conversion
ASTERIX CAT021
V2.4 to Cat01

Local Maintenance Display (LMD)

Switch for Active from SDP Side "B"

Data Conversion

Data Conversion
ASTERIX CAT021
V2.4 to Cat01

DC ANSP
Automation System

'A' Side – AT&T

'B' Side – MEVA

———— Data From APD
———— Data Sent to APD
———— Data From SDP to Automation

Curacao Activity Summary – May 2019

SDP A-SIDE

✓ Activate ADS-B Service Delivery

✓ Installed Local Maintenance Display (LMD) and integrate A-side Data

✓ Capture pcap data and analyze ASTERIX message format / structure

✓ Configure RICI adaptation for data conversion (CAT021 v2.4 – CAT01)

✓ Integrate the A side data from Curacao's SDP, through the RICI, to Curacao's test automation system (figure to the right)
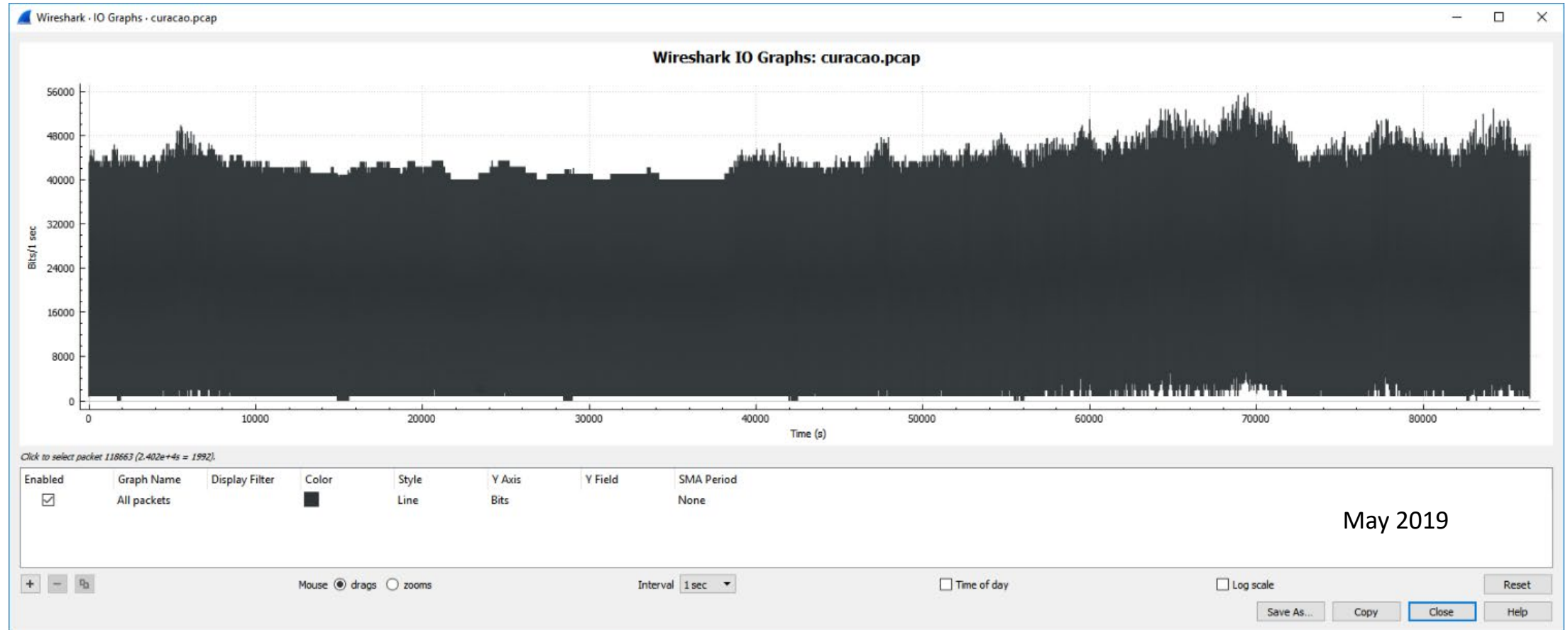

Demonstrate data continuity in the message formats, LMD air situational display, RICI display, and Curacao Automation System (i.e., Cat01)

DC ANSP 'A' Side Performance Summary
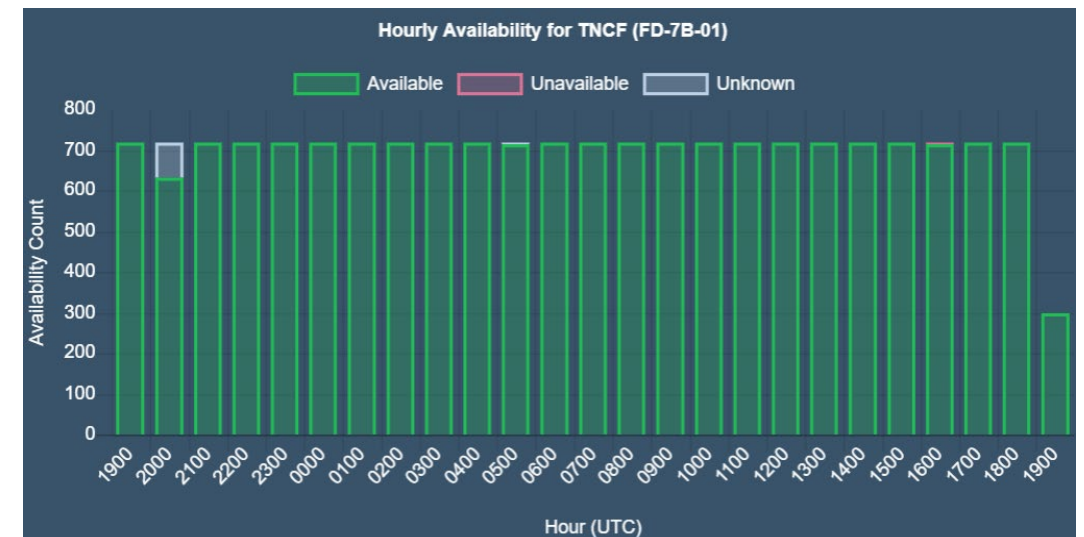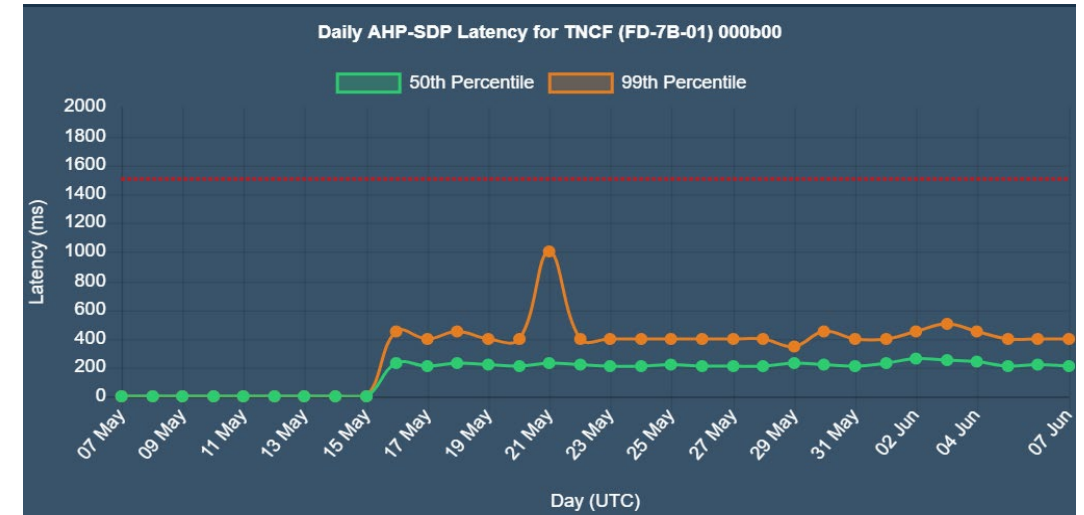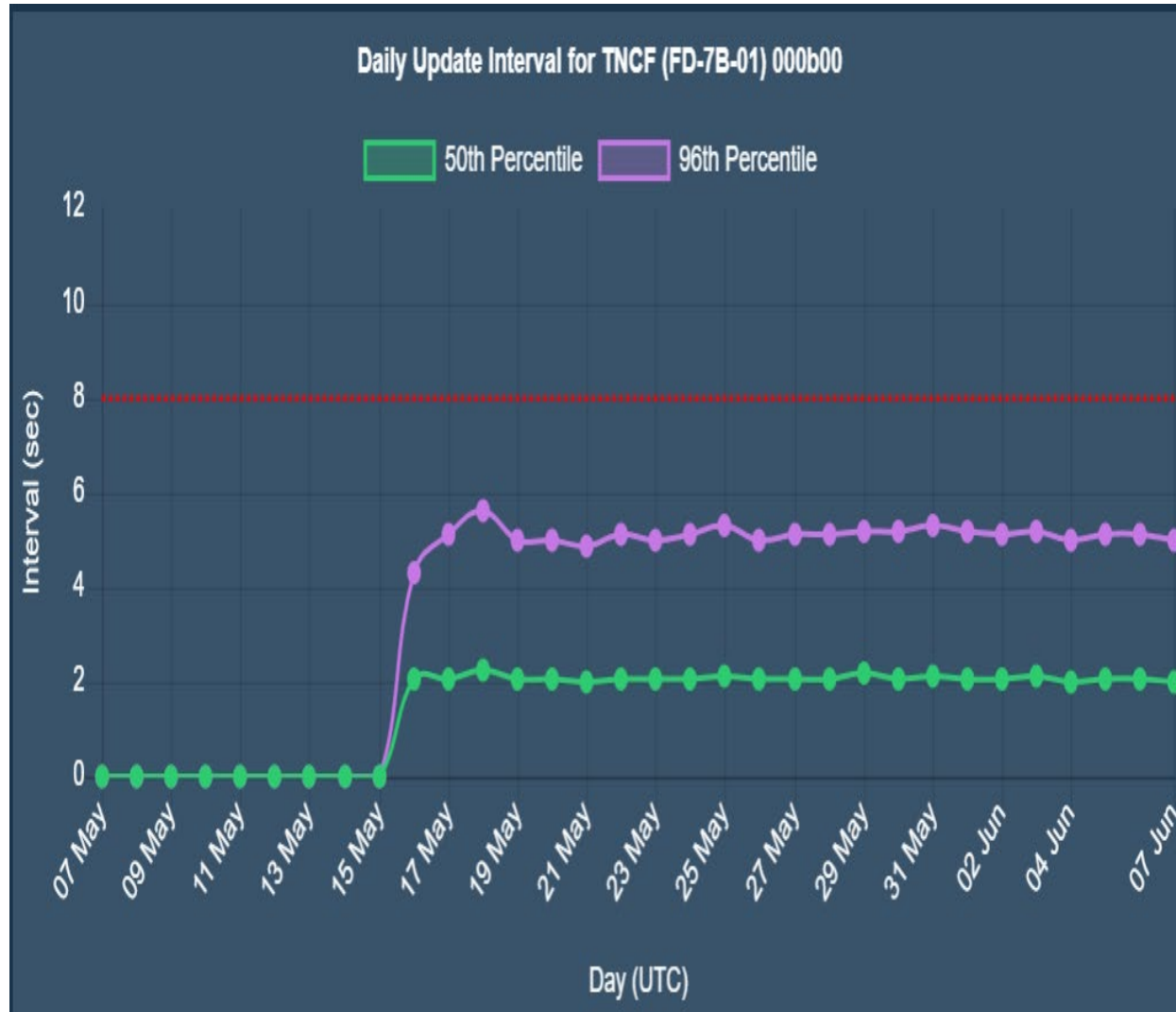
# DC ANSP 'A' Side Performance Summary – Cont.

May 2019

➤ **Peak traffic bandwidth for the Curacao FIR over a 24hr period is ~ 56kbps**

  ▪ Bandwidth calculations are derived from aggregate ASTERIX messages being sent to the Service Delivery Point

Estimated bandwidth for MEVA members

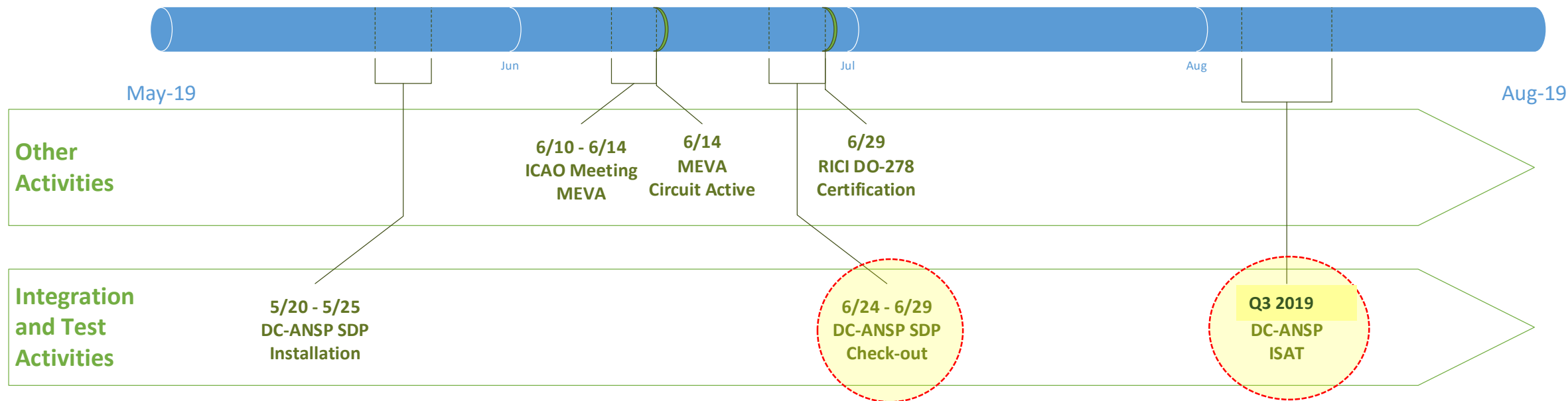| FIR Name	FIR	CAT021		CAT025		CAT238		CAT253		Total	
		Mean	Max	Mean	Max	Mean	Max	Mean	Max	Mean	Max
Havana	MUFH	13	30	0	1	0	17	6	32	19	80
Mexico	MMFR	37	69	0	1	0	39	6	32	43	141
Tegucigalpa/Toncontin	MHTG	18	34	0	1	0	32	6	32	24	99
Kingston	MKJK	8	23	0	1	0	17	6	32	14	73
** Curacao	**TNCF**	**6**	**17**	**0**	**1**	**0**	**16**	**6**	**32**	**12**	**66**
Port-au-Prince	MTEG	1	9	0	1	0	15	6	32	7	57
Santo Domingo	MDCS	5	15	0	1	0	15	6	32	11	63
San Juan	TJZS	11	27	0	1	0	18	6	32	17	78
Bogota	SKED	25	51	0	1	0	22	6	32	31	106
Piarco	TTZP	9	23	0	1	0	29	6	32	15	85
Total (kbps)	**Total**	**133**	**298**	**0**	**10**	**0**	**220**	**60**	**320**	**193**	**848**

MEVA High Level Network Connectivity
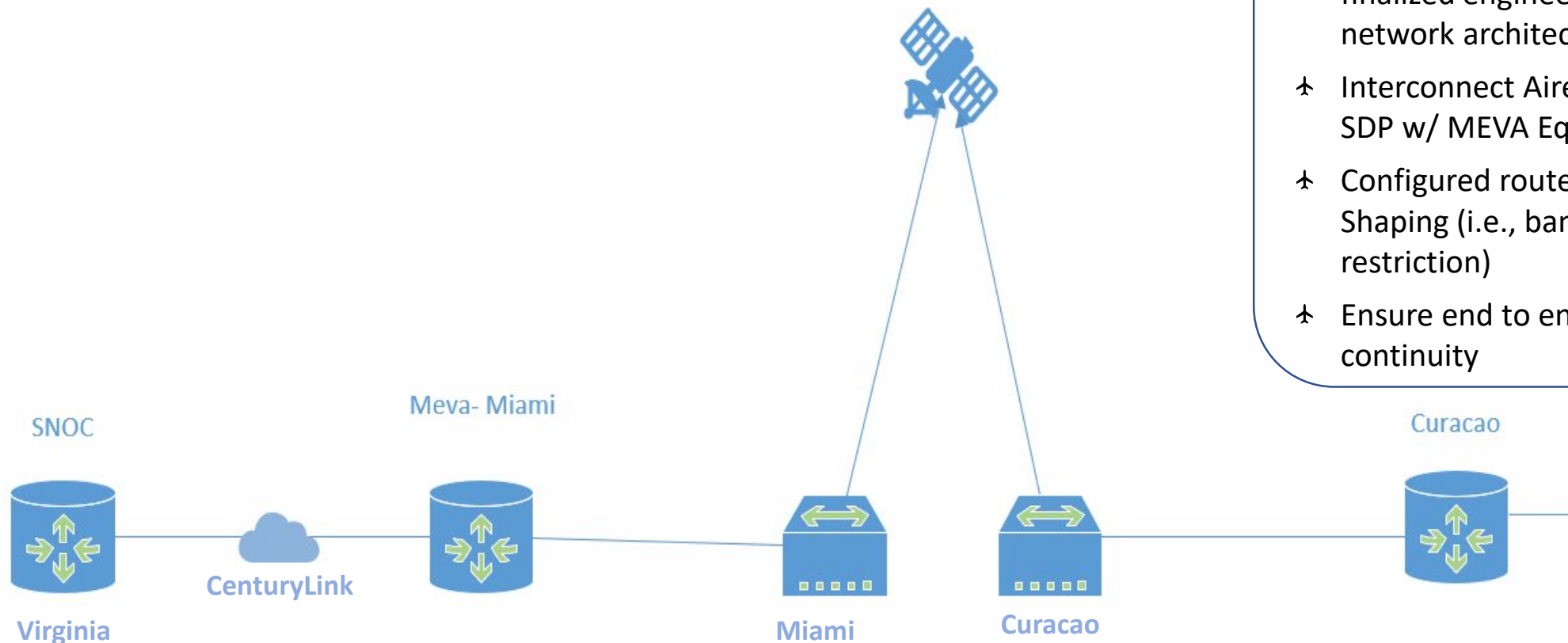
- ✈ Partnered with Frequentis to finalized engineering / network architecture
- ✈ Interconnect Aireon Router & SDP w/ MEVA Equipment
- ✈ Configured routers for "Traffic Shaping (i.e., bandwidth restriction)
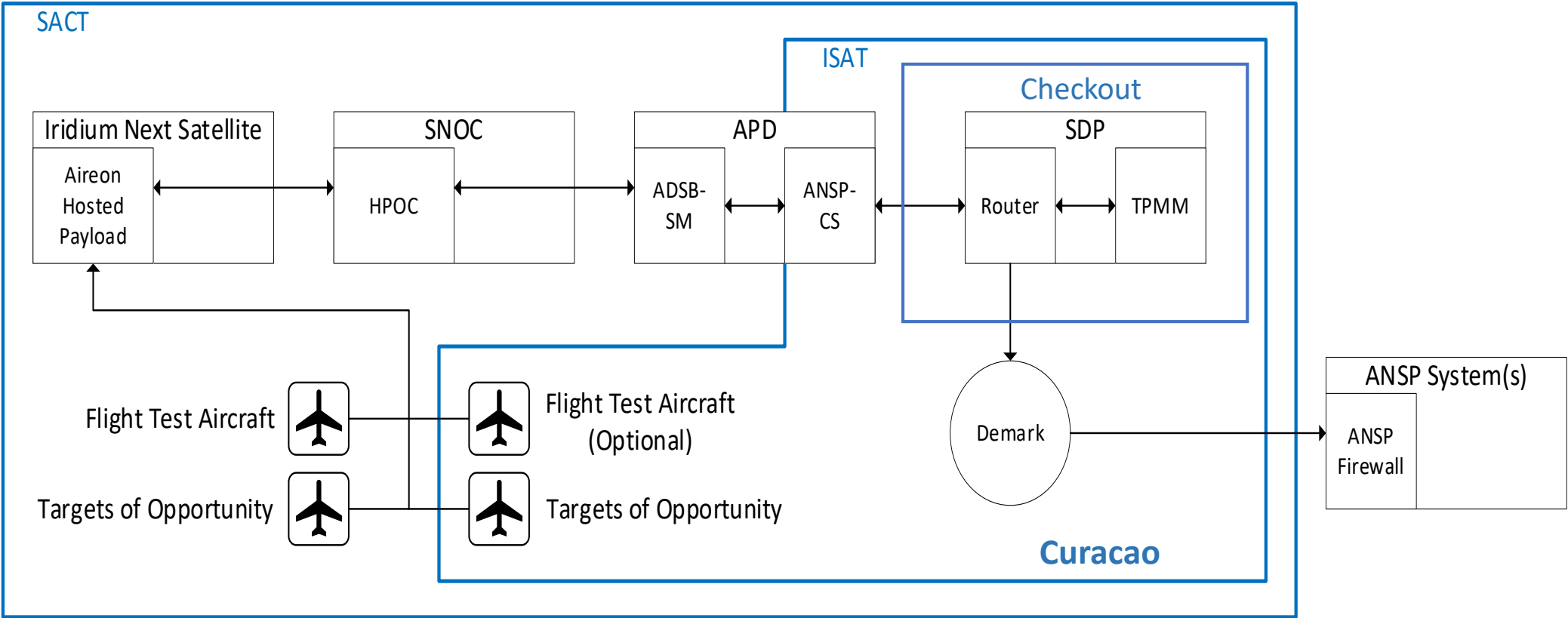- ✈ Ensure end to end network continuity

SNOC

Meva- Miami

Curacao

CenturyLink

Virginia

Miami

Curacao

On track to activate the Data Delivery via MEVA in June 2019

Aireon℠

Near Term Milestones and Projected Dates (what's next!)

DC-ANSP ISAT Implementation

May-19 ... Jun ... Jul ... Aug ... Aug-19

Other Activities

6/10 - 6/14
ICAO Meeting
MEVA

6/14
MEVA
Circuit Active

6/29
RICI DO-278
Certification

Integration and Test Activities

5/20 - 5/25
DC-ANSP SDP
Installation

6/24 - 6/29
DC-ANSP SDP
Check-out

Q3 2019
DC-ANSP
ISAT

19

Implementation Service Acceptance Test & Evaluation

Objective: Ensure Service Delivery Equipment meets system level and customer specific requirements

In summary

❑ Upon activation of the MEVA Telco line and system evaluation, the Aireon team will turn its focus towards successful completion of Acceptance Testing.

❑ Partnership with Frequentis and Curacao has been essential to our success to date.

❑ Curacao is currently on schedule to become operational by **Q4 2019**

Thank you!

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