

Regional Focus



# Space-Based ADS-B Applications in Asia-Pacific: A More Dynamic, Collaborative and Harmonized Future

Tuesday 25 May 2021

08:00 – 10:00 CEST

REGIONAL FOCUS

# Space-Based ADS-B Applications in Asia Pacific

A More Dynamic, Collaborative  
and Harmonised Future



25 MAY 2021 @ 08:00 TO 10:00 CEST



WEBINAR



# Moderator



**Mr. Hai Eng Chiang**  
Director Asia Pacific Affairs

**CANSO**



Adam Burford  
Business Development, Asia Pacific  
Aireon



Greg Dunstone  
Sales Engineer  
Aireon



Herman Rai  
Chief Engineer  
NiuSky Pacific Limited



Vincent Wong  
Acting Chief Electronics Engineer  
Hong Kong CAD



Christopher Devlin  
Director, Product Management  
Aireon

# Workshop Agenda

## Technical Overview

- What is space-based ADS-B
- Status update
- Performance outside of en route
- CRV use

## Benefits & Use Cases

- ADS-B with and without separation reduction
- NiuSky Pacific Limited use case
- Hong Kong use case

## Aireon's Commercial Products

## Challenges and Solutions

## Q & A

# Speaker



**Adam Burford**

**Business Development, Asia Pacific**

**Aireon**

# A Quick Aireon Overview

## 2011

Aireon created in 2011 to provide global, real-time air traffic surveillance, regardless of location

## IRIDIUM CONSTELLATION

Cutting-edge constellation with Aireon's ADS-B receivers on each satellite, completed in January 2019

## ALL PAYLOADS IN ORBIT AND OPERATIONAL

- All 66 Aireon ADS-B payloads active and operational as of April 2019
- Over 413,582,875,283 ADS-B position messages received.

## ANSPs

- A total of 20 ANSPs making up 40 countries have signed agreements to deploy space-based ADS-B.
- NATS and NAV CANADA, DC-ANSP, ASECNA, Airports Authority of India (AAI), Isavia and Singapore are already operational

## Commercial Services

- Launched three new products in October 2020:
  - AireonSTREAM™
  - AireonINSIGHTS™
  - AireonFLOW™

# Colored By Altitude

Pacific

**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



The Aireon satellite based system detects all ADS-B equipped aircraft worldwide for ATC separation purposes @ ATC Quality



Aireon Space-Based ADS-B  
01 to 05 March 2018 - 32 Payloads

# Our Growing Global Customer Base



ISAVIA





# Aireon Facts and Figures

**100%**

Global, Real-Time Coverage

**20**

ANSPs Signed Contracts to Deploy Aireon

**+40**

Countries using/to use Aireon

**~130,000**

Average Amount of Unique Aircraft Tracked Globally  
Nov 2020 – Jan 2021

**38,174,164,827**

Average Monthly Accumulated ADS-B Messages  
Nov 2020-Jan2021

**83**

Times Aireon Data was used for Accident Investigations  
*Aireon ALERT*

**49%**

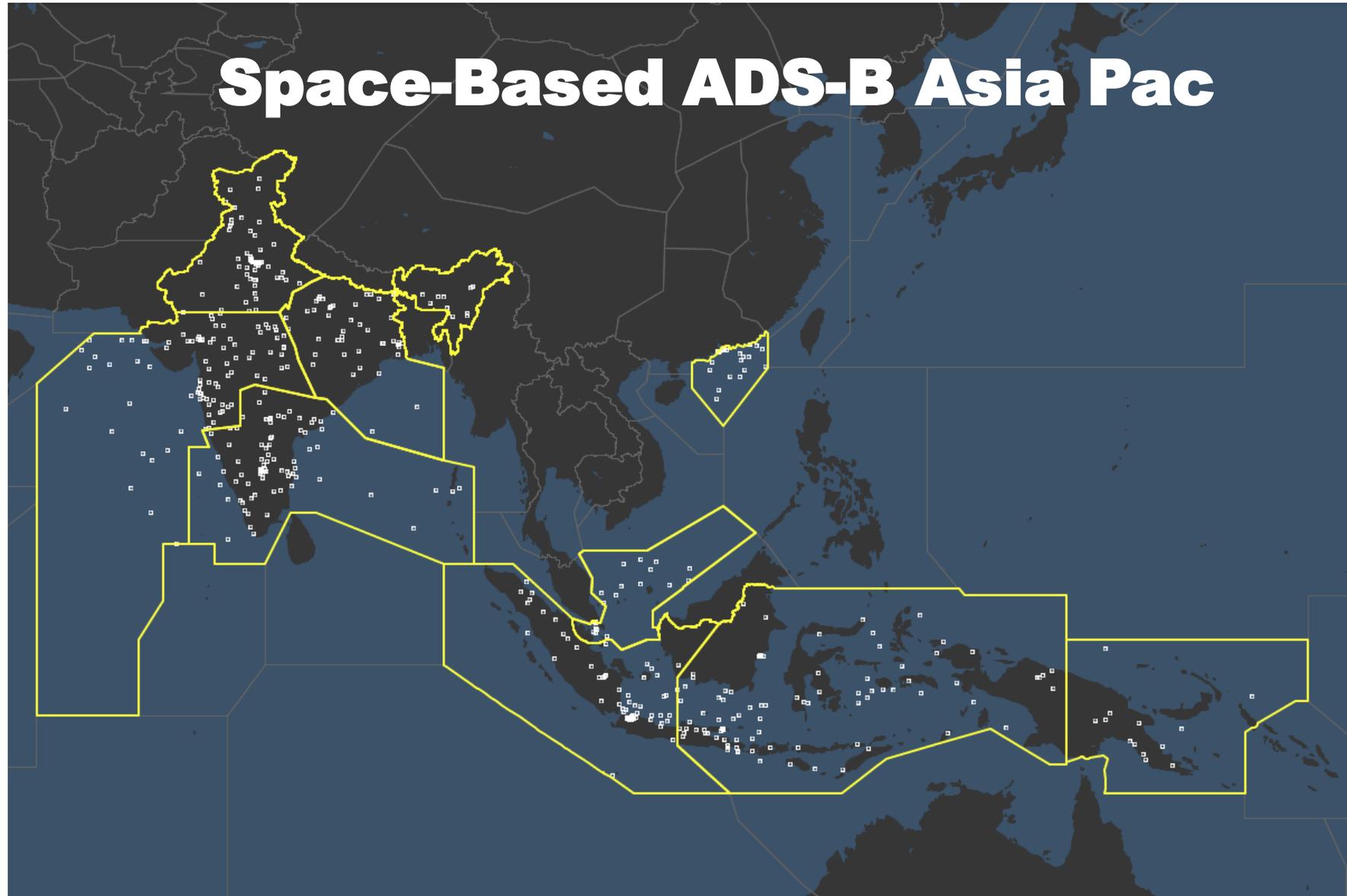
Global Airspace Under Contract

**< 2**

Time for ADS-B Message to go from Satellite to Customer

# Space-Based ADS-B Asia Pac

- Singapore : Operational
- PNG : Operational
- India : Operational
- Hong Kong : SAT complete
- Indonesia : SAT complete



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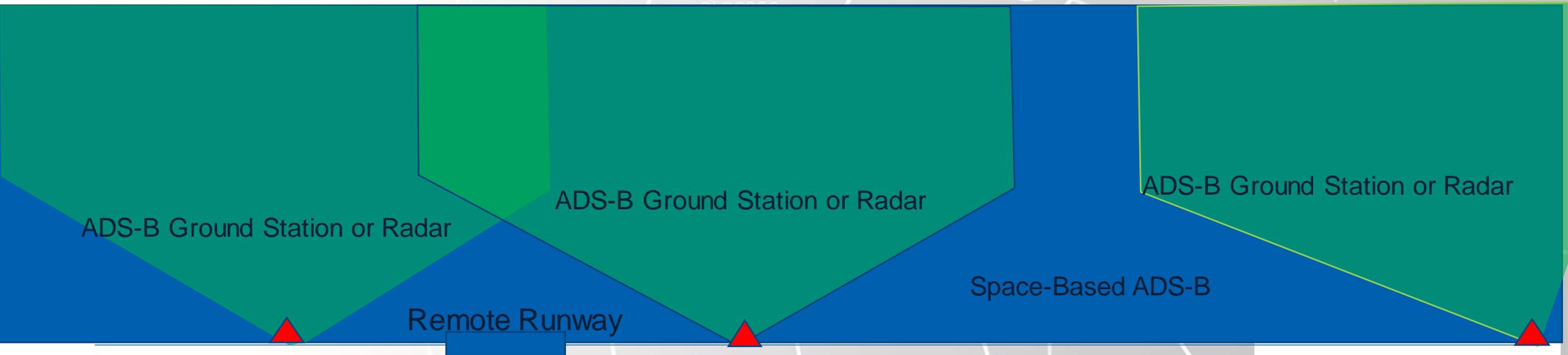
**Greg Dunstone**

**Sales Engineer**

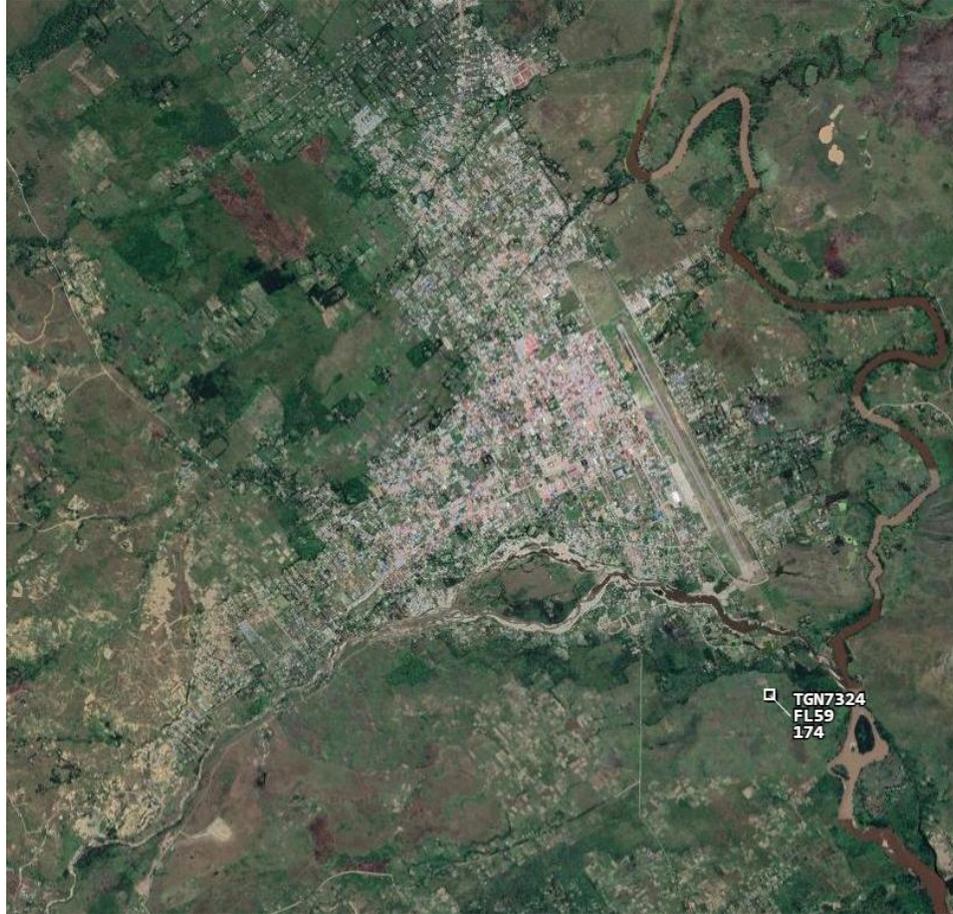
**Aireon**

# Space-Based ADS-B Completes the Coverage

- Remote terrestrial and oceanic airspace
- Below and between radar and ADS-B ground stations
- At all runways and airports - even remote dirt strips
- For all equipped aircraft
  - 125 watt and top antenna



# Coverage to the ground



Bandar Udara Wamena (West Papua)



Kaimana Airport (West Papua)

JWC6543  
CRJX  
310 525

MAG7521

SLB3256  
A388  
400 520

# Royal Flying Doctor on dirt strip in remote Australia





VH-XUW EC135 on ground @ Port Headland amongst buildings



Jakarta- on ground aircraft

# Loss of Terrestrial Surveillance

Space based ADS-B can support loss of traditional ground-based service

- ADS-B ground station or radar failure
- Environmental impacts like fire, cyclone, flood etc

*Or*

Aircraft unexpectedly leave traditional coverage

# Qantas Airbus A330 Suffers Depressurization At 40,000 Feet

by Andrew Curran · February 5, 2021 · 3 minute read

Connectivity

A Qantas A330-200 flying from Sydney to Perth diverted to Adelaide on Thursday following a depressurization incident. The flight was heading out over the Great Australia Bight when the incident occurred, necessitating an emergency descent and a diversion to Adelaide.



An example :



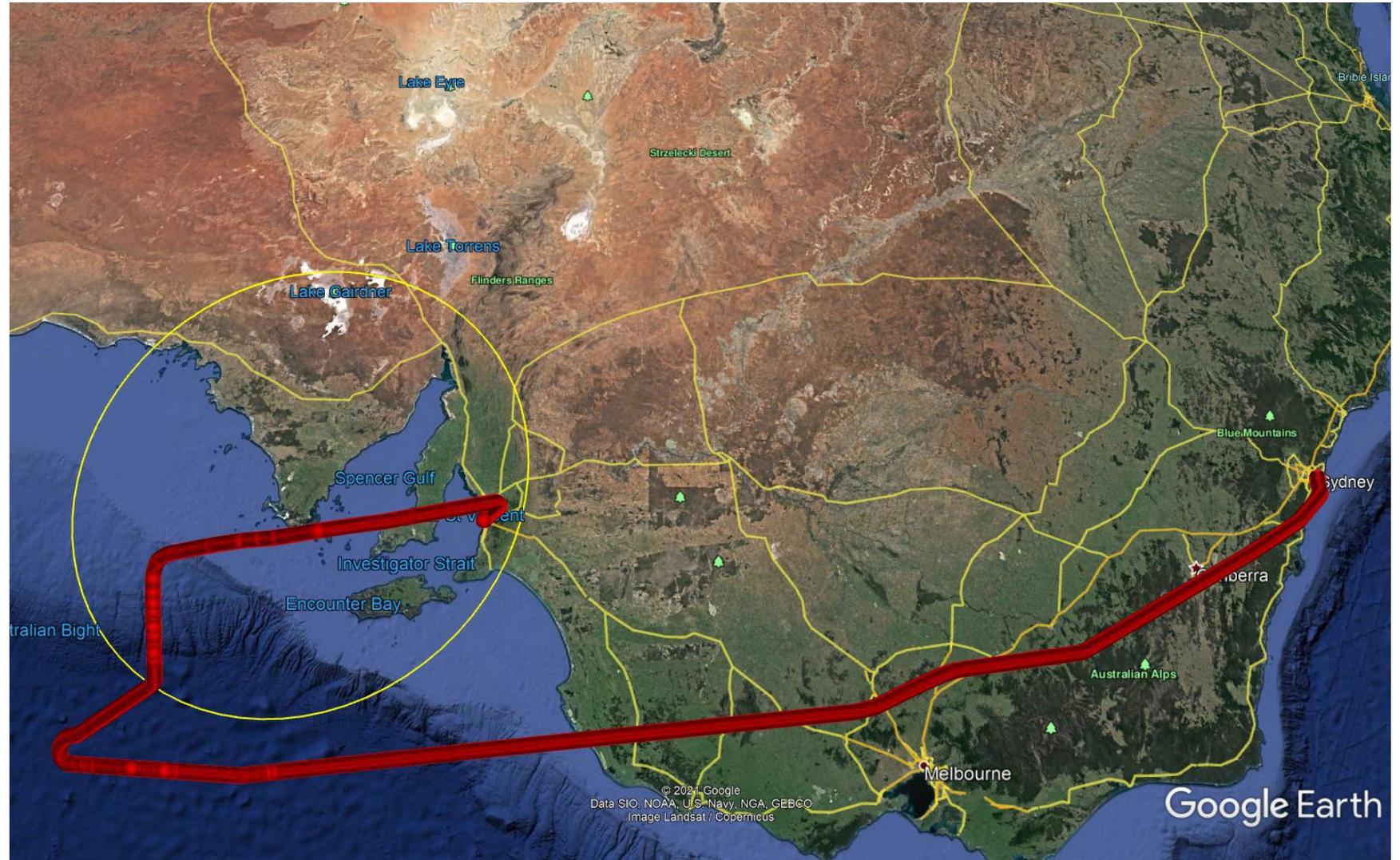
**VHEBK**  
**QFA583**  
**4/2/2021**



AIREON LLC PROPRIETARY INFORMATION

# Entire Flight QFA VH-EBK as seen by Aireon

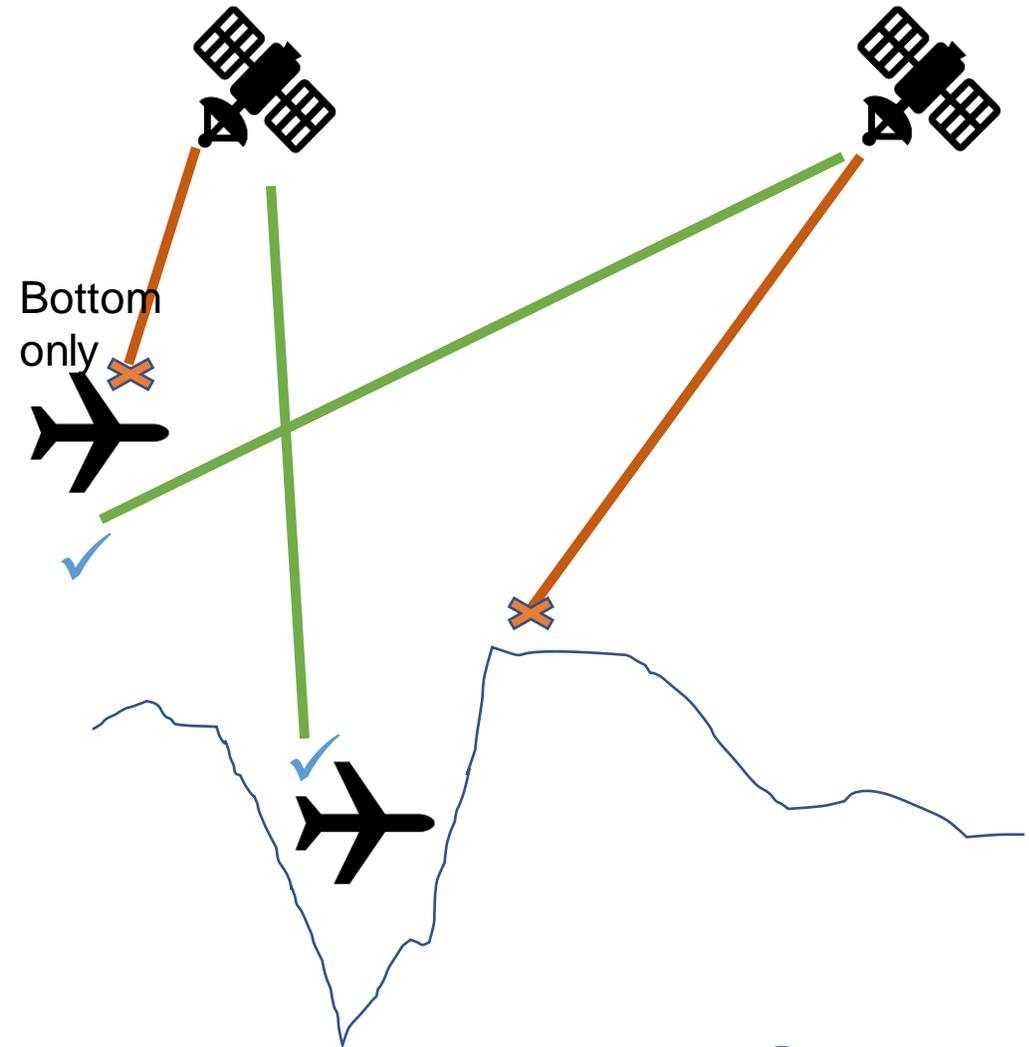
Estimated North Block ADS-B Ground station coverage at 10,000 feet in yellow



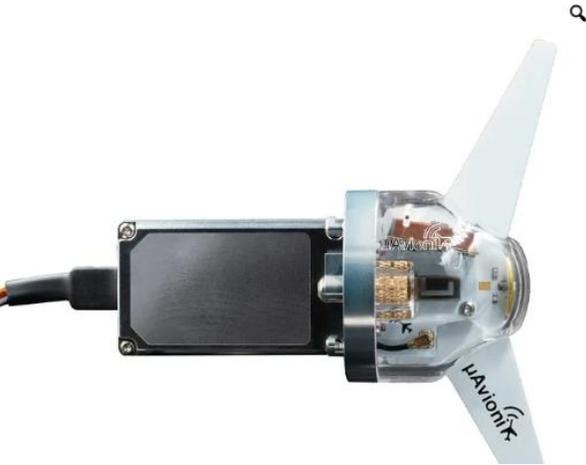


# Aireon Performance Depends On

- 125 watt ADS-B transmission from top antenna
- Aircraft with TCAS have top antennas & diversity transmitters
- Aireon can see bottom only antennas – but with lower performance



# Some GA products available & compatible: with top antennas



## tailBeaconX TSO

The next era of global ADS-B. Compatible with space and ground-based ADS-B surveillance systems, tailBeaconX is a Mode S Extended Squitter ADS-B transponder and WAAS GPS integrated into an LED rear position light. With global compliance, tailBeaconX is the key to limitless destinations.

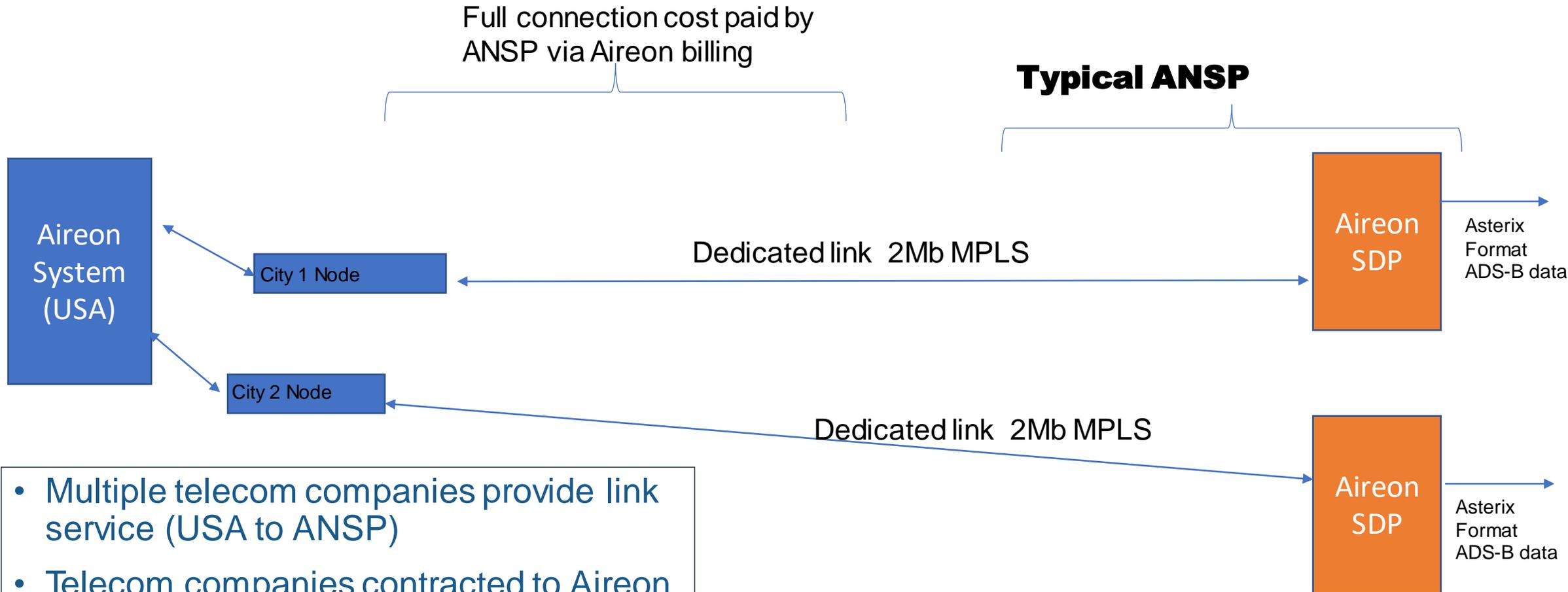
[Learn More about tailBeaconX](#)



AVIATION

### Garmin Introduces GTX 335D and GTX 345D ADS-B Diversity Transponders

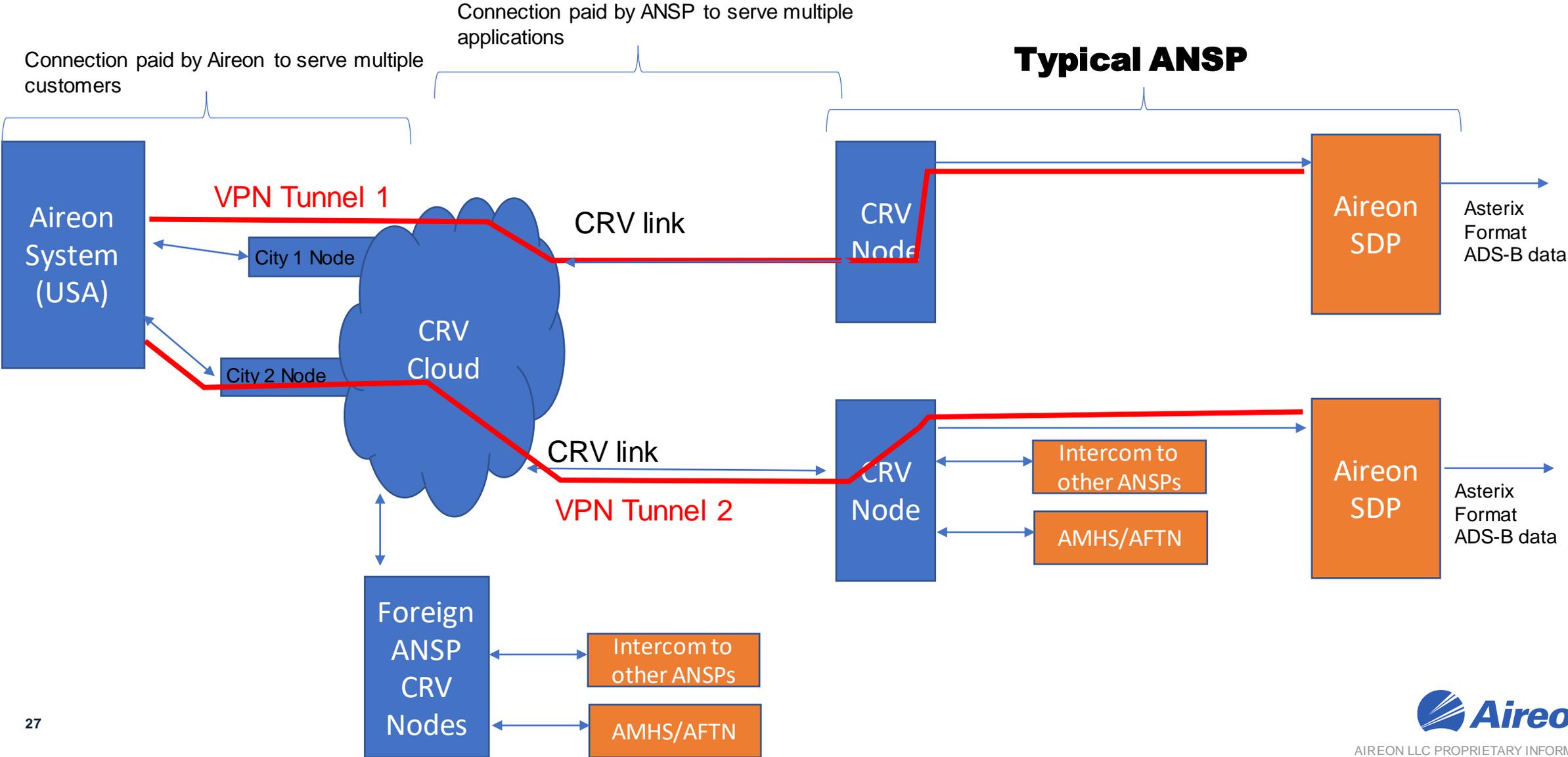
# Communication Costs



- Multiple telecom companies provide link service (USA to ANSP)
- Telecom companies contracted to Aireon
  - Their performance is part of the Aireon service

# CRV Solutions to Reduce Recurring Cost

CRV : ICAO APAC Common Regional Virtual Private Network



# Aireon is Flexible

- Customer choice regarding communications
- Duplicated or not
- CRV or Not
- Mixed (One CRV and one direct) is OK too

# Doc 4444 allows Aireon data to support 5NM separation

- With VHF voice communication
- ICAO requirements remain the same. ADS-B is ADS-B.
- As used by Canada

**Doc 4444-ATM  
Amendment No. 9  
5/11/20**

**PARA  
8.7.3**

**8.7.3 Separation minima based on ATS surveillance systems**

8.7.3.1 Unless otherwise prescribed in accordance with 8.7.3.2, 8.7.3.3 or 8.7.3.4, or Chapter 6 (with respect to independent and dependent parallel approaches), the horizontal separation minimum based on radar and/or ADS-B and/or MLAT systems shall be 9.3 km (5.0 NM).

8.7.3.2 The separation minimum in 8.7.3.1 may, if so prescribed by the appropriate ATS authority, be reduced, but not below:

- a) 5.6 km (3.0 NM) when radar and/or ADS-B and/or MLAT systems' capabilities at a given location so permit; and
- b) 4.6 km (2.5 NM) between succeeding aircraft which are established on the same final approach track within 18.5 km (10 NM) of the runway threshold. A reduced separation minimum of 4.6 km (2.5 NM) may be applied, provided:

# Doc 4444 allows Aireon data to support reduced oceanic standards

- 19Nm lateral / 17 or 15Nm longitudinal
- RCP 240 communication : CPDLC
- Alternate coms also required
  - e.g. HF, sat voice
- Appropriate surveillance
  - Acceptable to regulator
- ATC automated lateral deviation alert
  - Detection threshold 3NM

## **Doc 4444-ATM Amendment No. 9 5/11/20**

**PARA 8.7.4**

### **8.7.4 Separation minima using ATS surveillance systems where VHF voice communications are not available**

8.7.4.2 Unless otherwise prescribed in accordance with 8.7.4.3 and 8.7.4.4, the separation minima shall be:

- 35.2 km (19.0 NM) lateral spacing between parallel or non-intersecting tracks;
- 35.2 km (19.0 NM) lateral separation of aircraft operating on intersecting tracks applied in accordance with 5.4.2.1.5 a) and b);
- 31.5 km (17.0 NM) longitudinal separation of aircraft operating on same tracks or crossing tracks applied in accordance with 5.4.2.9.5 provided that the relative angle between the tracks is less than 90 degrees; and
- opposite direction aircraft on reciprocal tracks may be cleared to climb or descend to or through the levels occupied by another aircraft, provided that surveillance position reports have been received from both aircraft demonstrating the aircraft have passed each other by 9.3 km (5.0 NM).

8.7.4.3 The separation minimum in 8.7.4.2 a) may, if so prescribed by the appropriate ATS authority, be reduced, but not below 27.8 km (15.0 NM), provided either:

# ADS-B is not ONLY used for ATC separation

In procedural airspace ADS-B surveillance can

- **Reduce workload**
  - Reducing or removing voice position reports and processing
  - Remove need for stepped climbs
  - Remove need for “reaching level” reports
  - Reduce voice communication to remove uncertainty
  - Definite passing support
- **Increase safety**
  - Safety nets
  - SAR
  - Situational awareness
    - Aircraft level
    - Approaching FIR / boundary safety
    - At remote towers or remote airports without towers

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# Space-Based ADS-B Applications in Asia Pacific

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# Speaker



**Herman Rai**

**Chief Engineer**

**NiuSky Pacific Limited**

# NiuSky Pacific Limited

Papua New Guinea





**SPACE-BASED ADS-B via CRV**

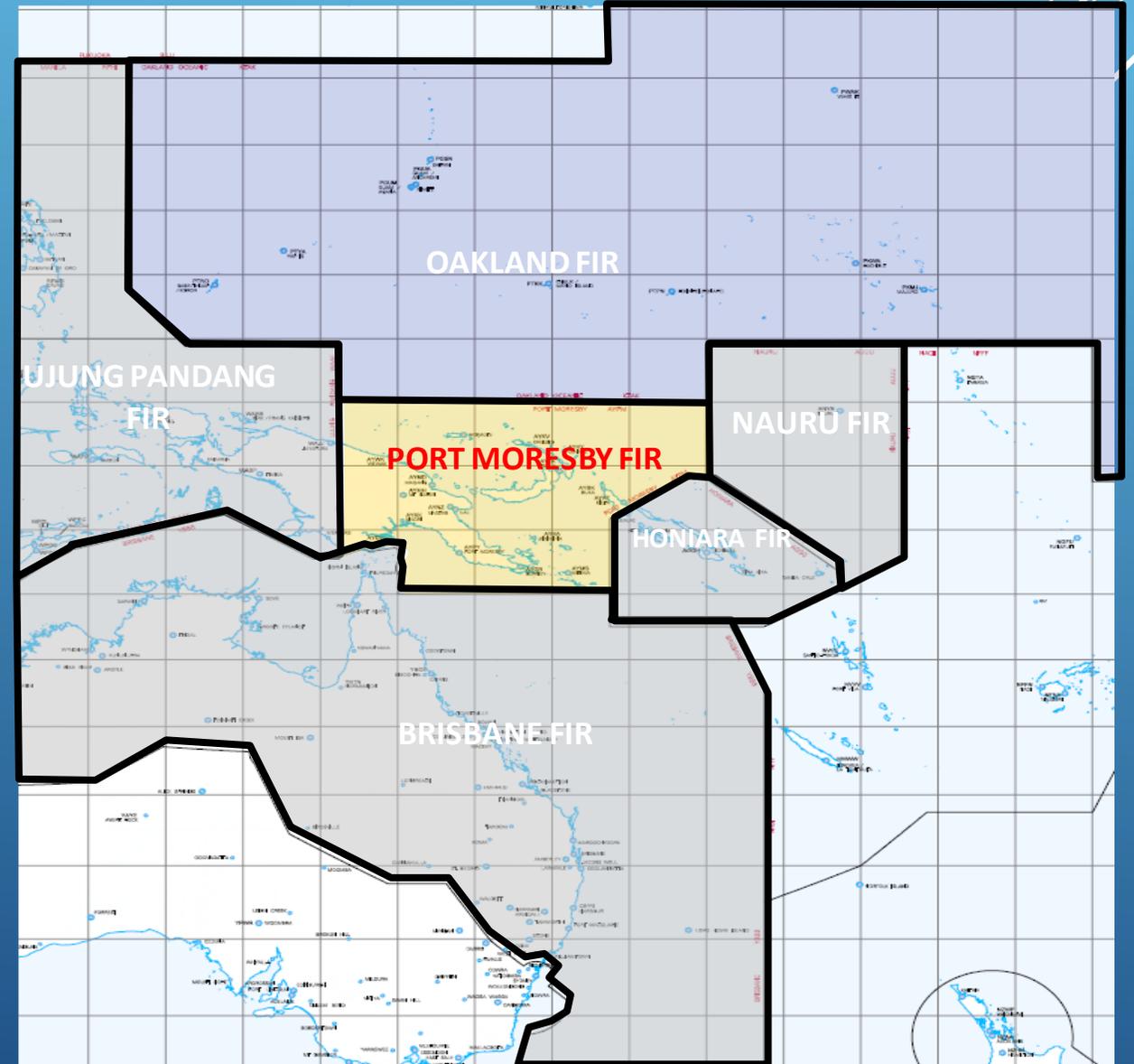
**NiuSky Pacific Limited**

**PAPUA NEW GUINEA**

# Introduction

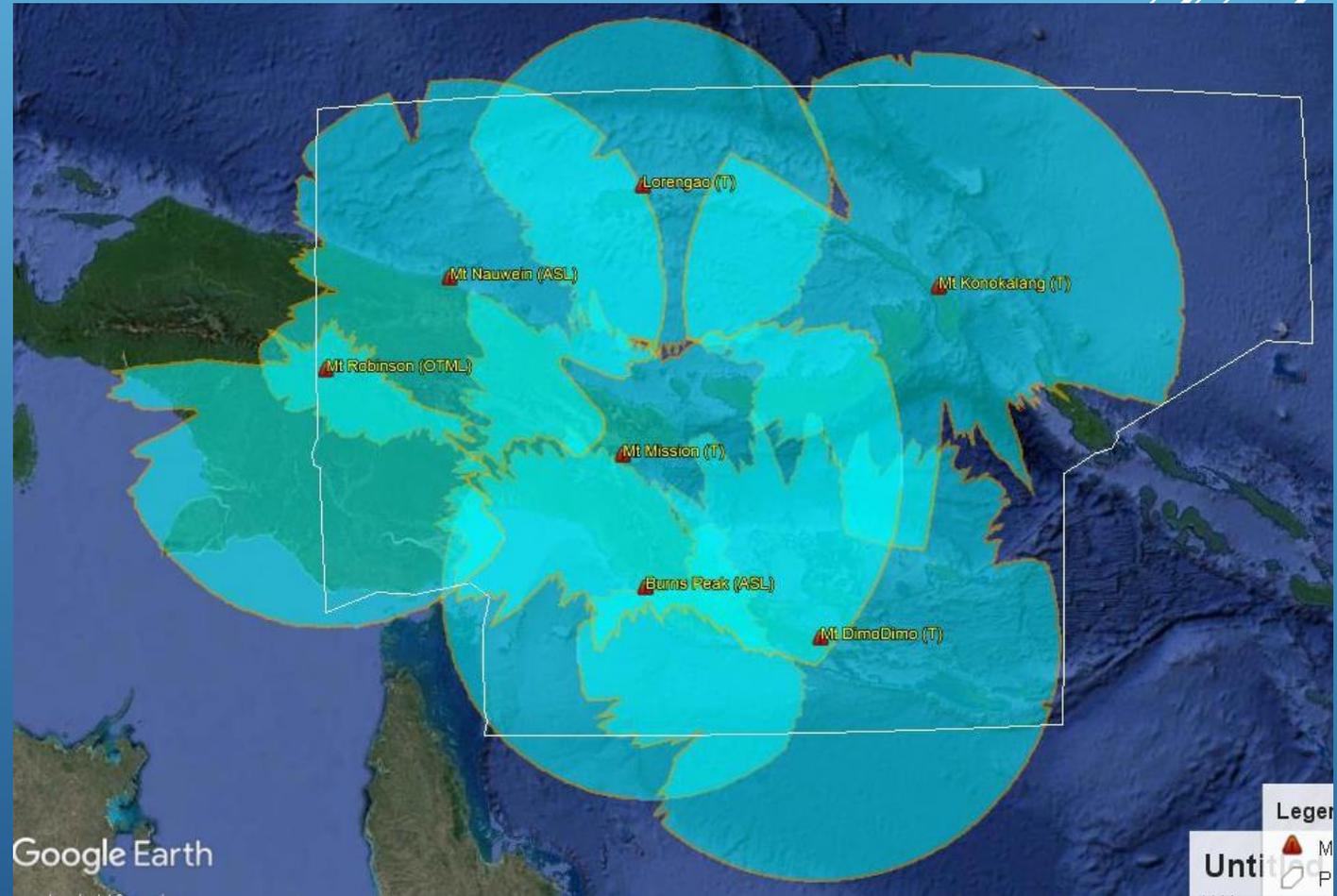
NiuSky Pacific Limited (NSPL), formerly known as Papua New Guinea Airservices Limited manages the Port Moresby FIR from the main Air Traffic Services Centre in Port Moresby and five Control Towers throughout the country.

We share FIR boundaries with Oakland, Unjung Pandang, Brisbane, Solomon Island and Nauru.



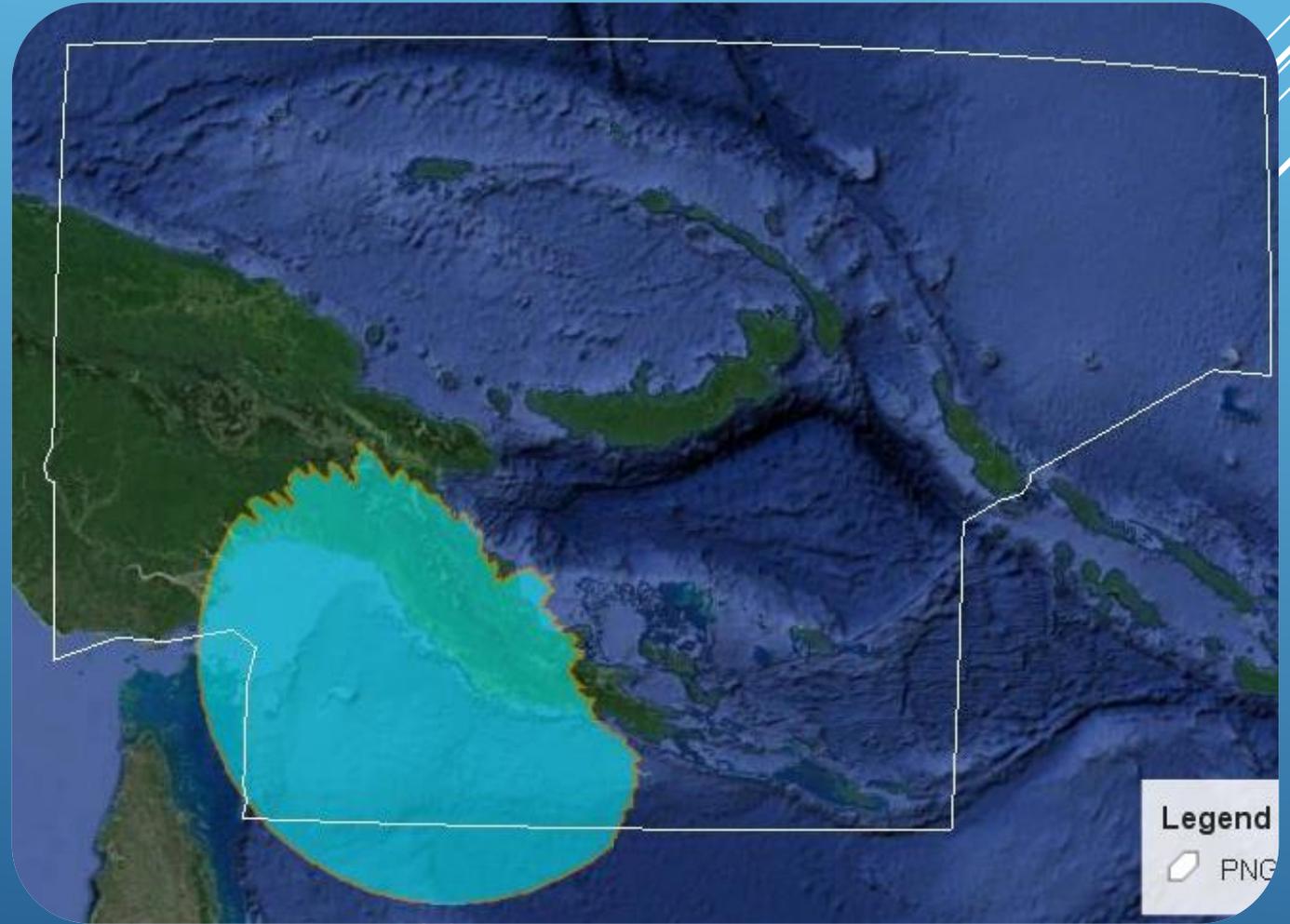
# Introduction

- ❑ The company designed and rolled out a modernization program to improve its aging CNS/ATM systems and facilities to more an advanced highly integrated CNS/ATM system.
- ❑ Surveillance Coverage Improvement
- ❑ FIR wide ADS-B coverage.
- ❑ Initial plan was to install 7 ADS-B ground stations”

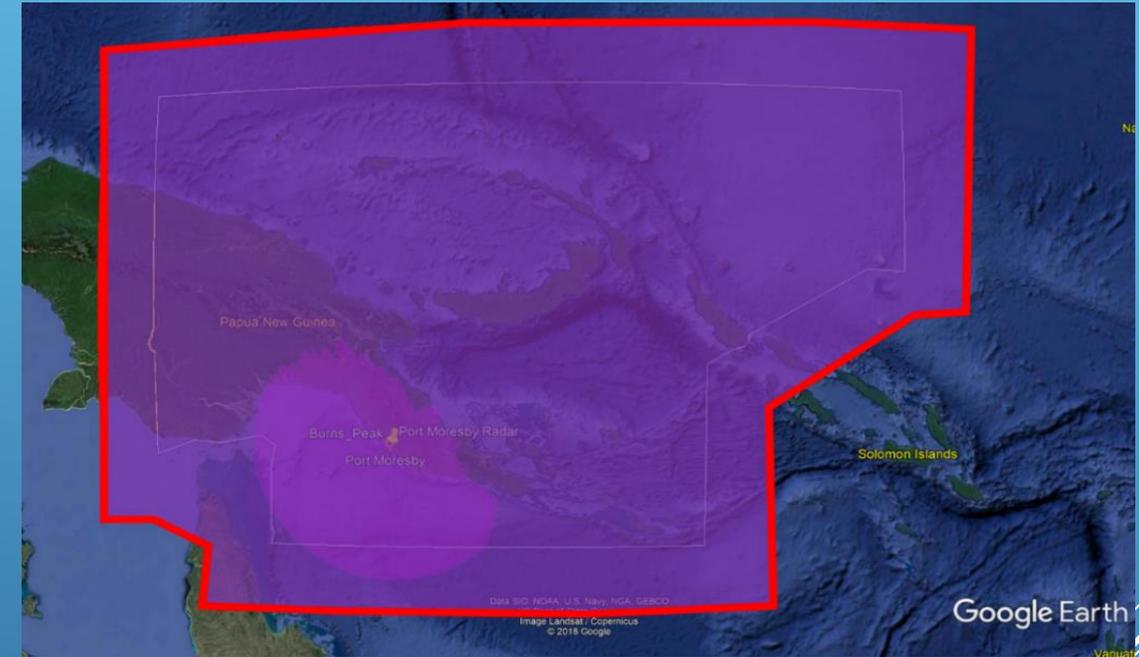


# Surveillance in PNG

- ❑ One Secondary Surveillance Radar (SSR)
- ❑ One ADS-B ground stations in Port Moresby
- ❑ Limited surveillance coverage
- ❑ ADS-C service



- ❑ In 2020, NSPL signed a contract with Aireon for delivery of SB ADS-B data to PNG initially using two dedicated MPLS lines.
- ❑ Space Based ADS-B provides ADS-B coverage over the complete PNG FIR, and also in the 50 NM outside the FIR boundary to support traffic coordination as shown in the figure (right).
- ❑ The SB ADS-B data was successfully integrated into our TopSky ATM System together with existing Radar and ADS-B ground stations data.

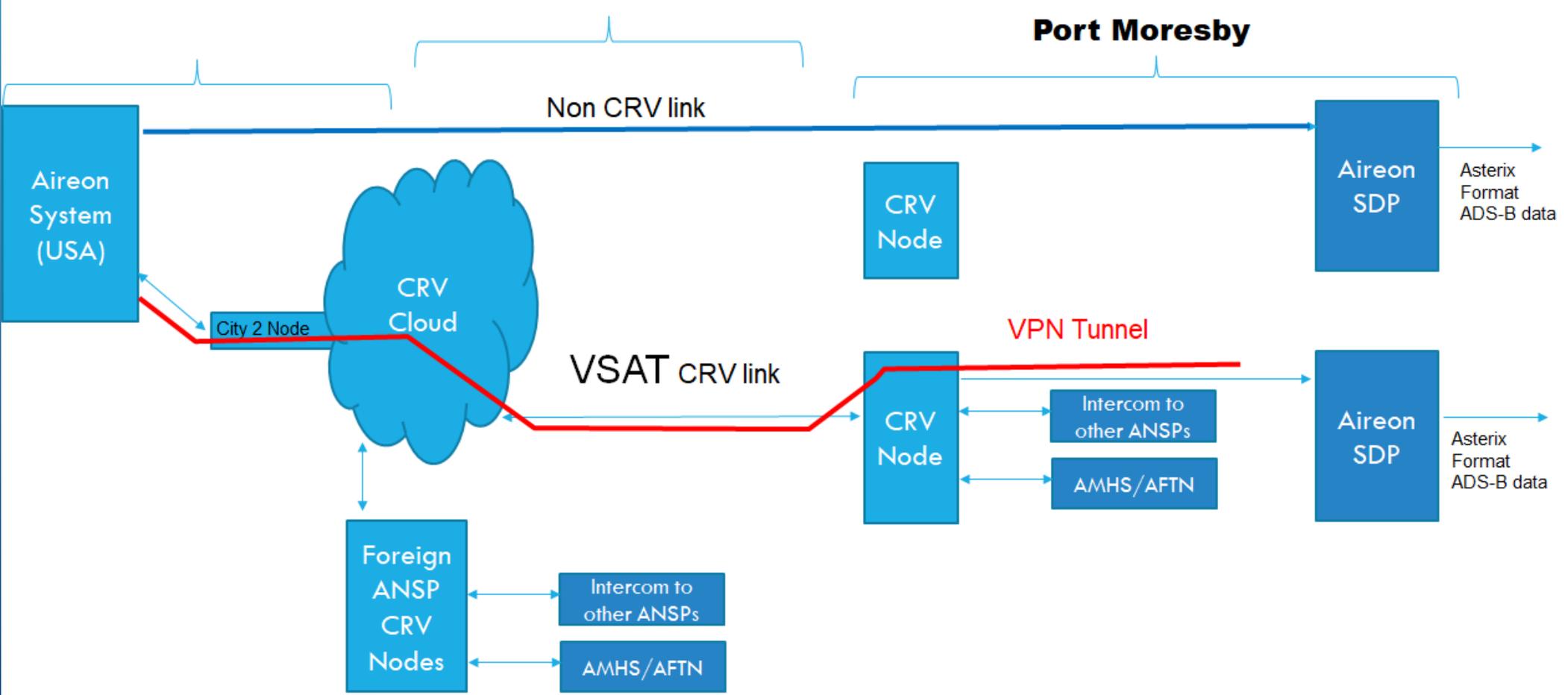


# Transition to CRV

- ❑ PNG signed a contract with PCCW in July 2020 for dual package C connection to the CRV where both lines active.
- ❑ Aireon also signed up with PCCW for connection to the CRV some months later in 2020 after being issued the approval by ICAO's CRV Operations Group (OG).
- ❑ Aireon in collaboration with PNG developed a multistage transition plan to safely migrate SB ADS-B data delivery to the CRV from the two MPLS lines used initially. The transition involved three stages:
  - ❑ Stage 1: Establishing of VPN tunnel between Aireon and PNG over the CRV cloud.

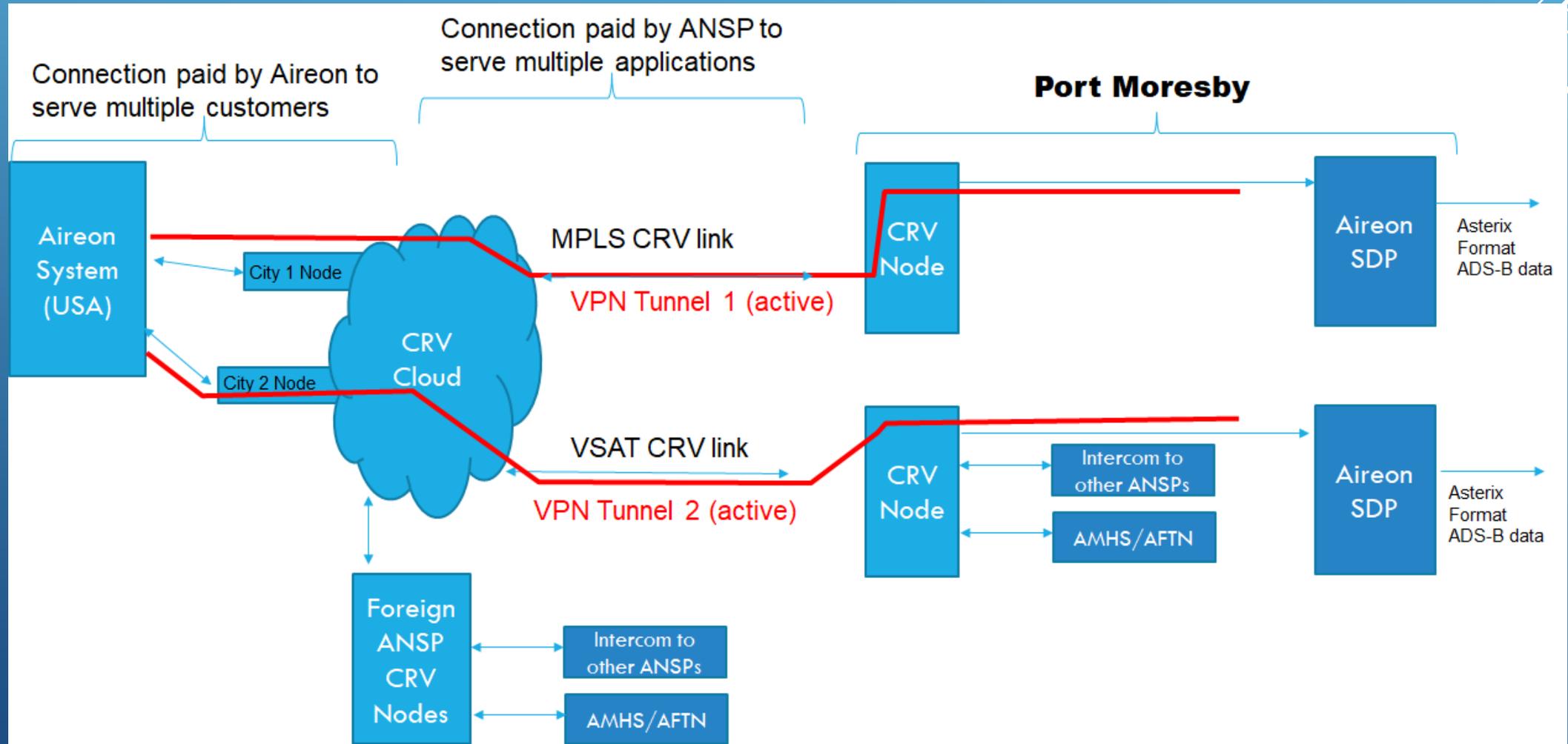
□ Stage 2: Migration of SB ADS-B data from one MPLS line to CRV using one CRV Line (VSAT line).

Operational

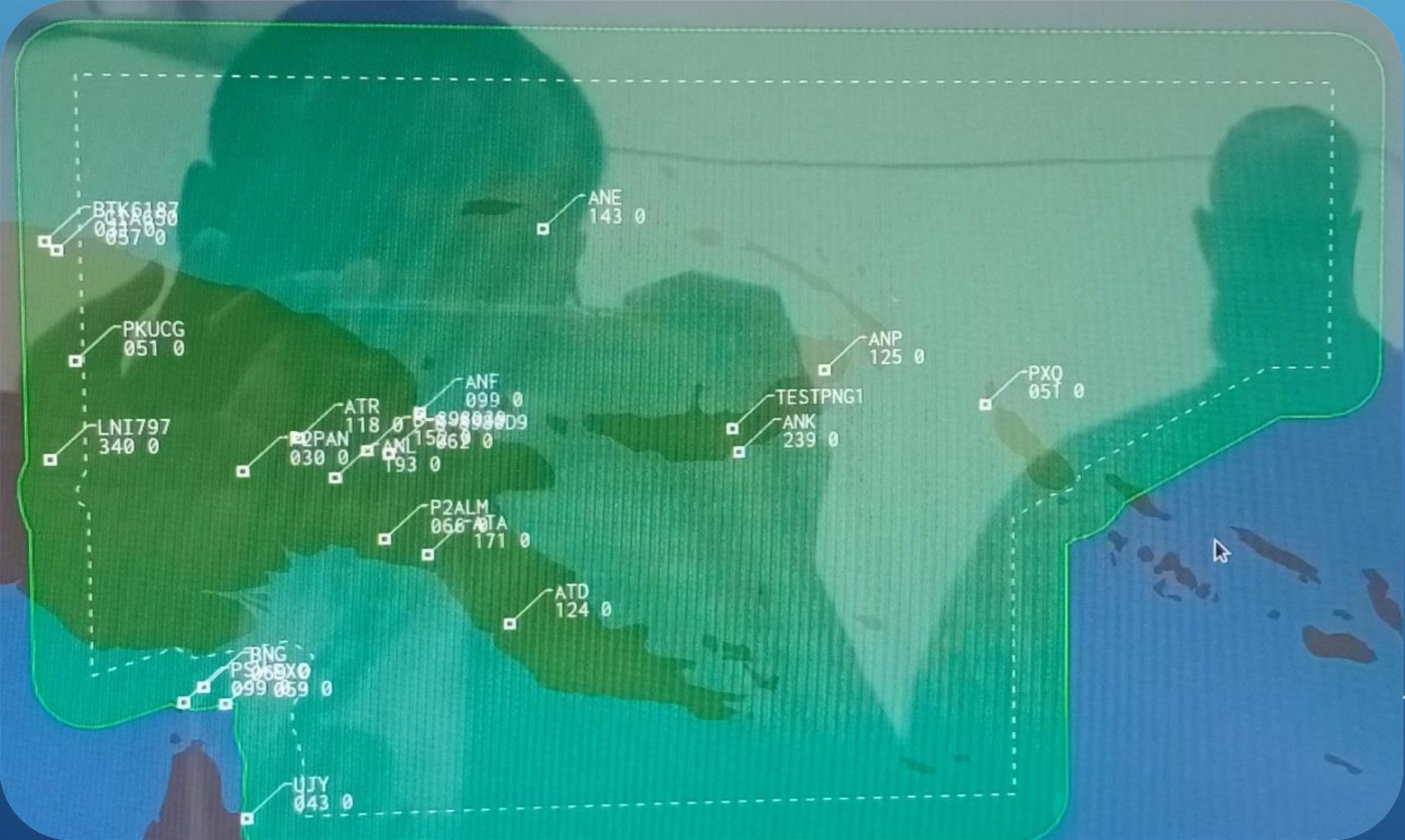


# □ Stage 3: Migration of SB ADS-B data from second MPLS line to CRV using second CRV line (MPLS line)

2<sup>nd</sup> CRV path being tested now



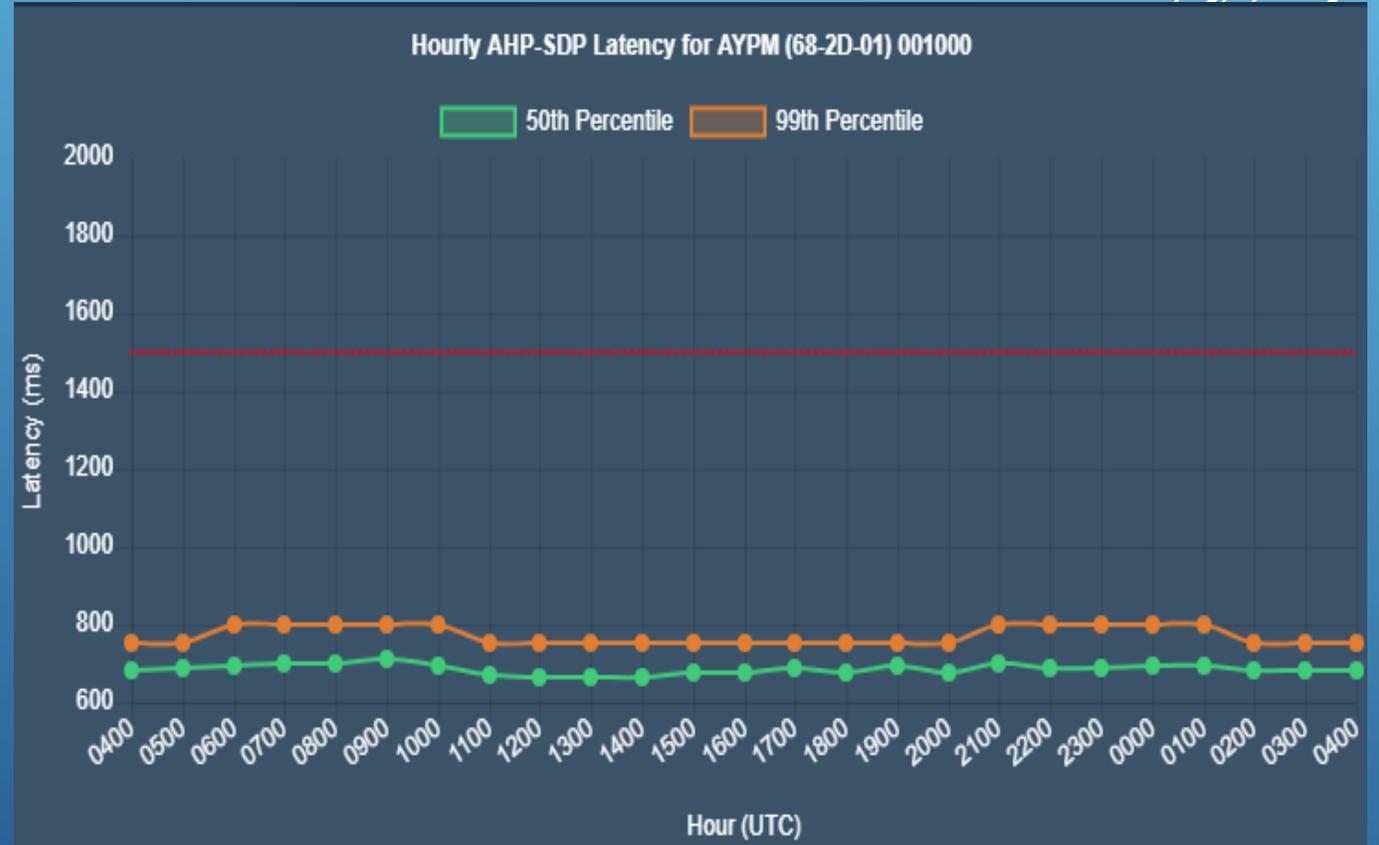
❑ Confirmation that Asterix CAT 21 data format can be received on the CRV.



# Performance

To assess the performance, few critical areas we looked at.

- ❑ Coverage - Full FIR wide coverage and extends 50NM from the boundary
- ❑ Update Interval – stable and within tolerance.
- ❑ Low level detection
- ❑ Latency
  - 600 – 800ms on CRV line one (VSAT link)
  - 400 – 500ms on MPLS line (non CRV)



# Deployment in the ATM System

- ❑ Software upgrade on our TopSky ATM System from Thales – V20
- ❑ System configuration Change on the Simulator or Test System
- ❑ Monitoring performance on the TopSky Display by controllers – No issues
- ❑ Deployment on Operational TopSky ATM System – No issues
- ❑ Currently using it for Situational Awareness (SA) only.
- ❑ Next step is to use it for traffic separation

# BENEFITS

- ❑ Access to high reliable surveillance (Asterix CAT21) data
- ❑ Confidence in application of surveillance-based separation
- ❑ Enables more efficient flight through less restrictive separation standards, flexible routing etc.
- ❑ Cost reduction – no separate MPLS lines required
- ❑ Less maintenance work for NSPL – cost reduction

**SPACE-BASED ADS-B via CRV  
for  
PAPUA NEW GUINEA**

**THANK YOU**



**Any questions....**

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# Speaker



## Vincent Wong

Acting Chief Electronics Engineer of  
the Air Traffic Engineering Services  
Division

Hong Kong CAD

# Hong Kong Civil Aviation Department





# **Space-Based ADS-B Applications in Asia-Pacific: A More Dynamic, Collaborative and Harmonized Future**

**25 May 2021**

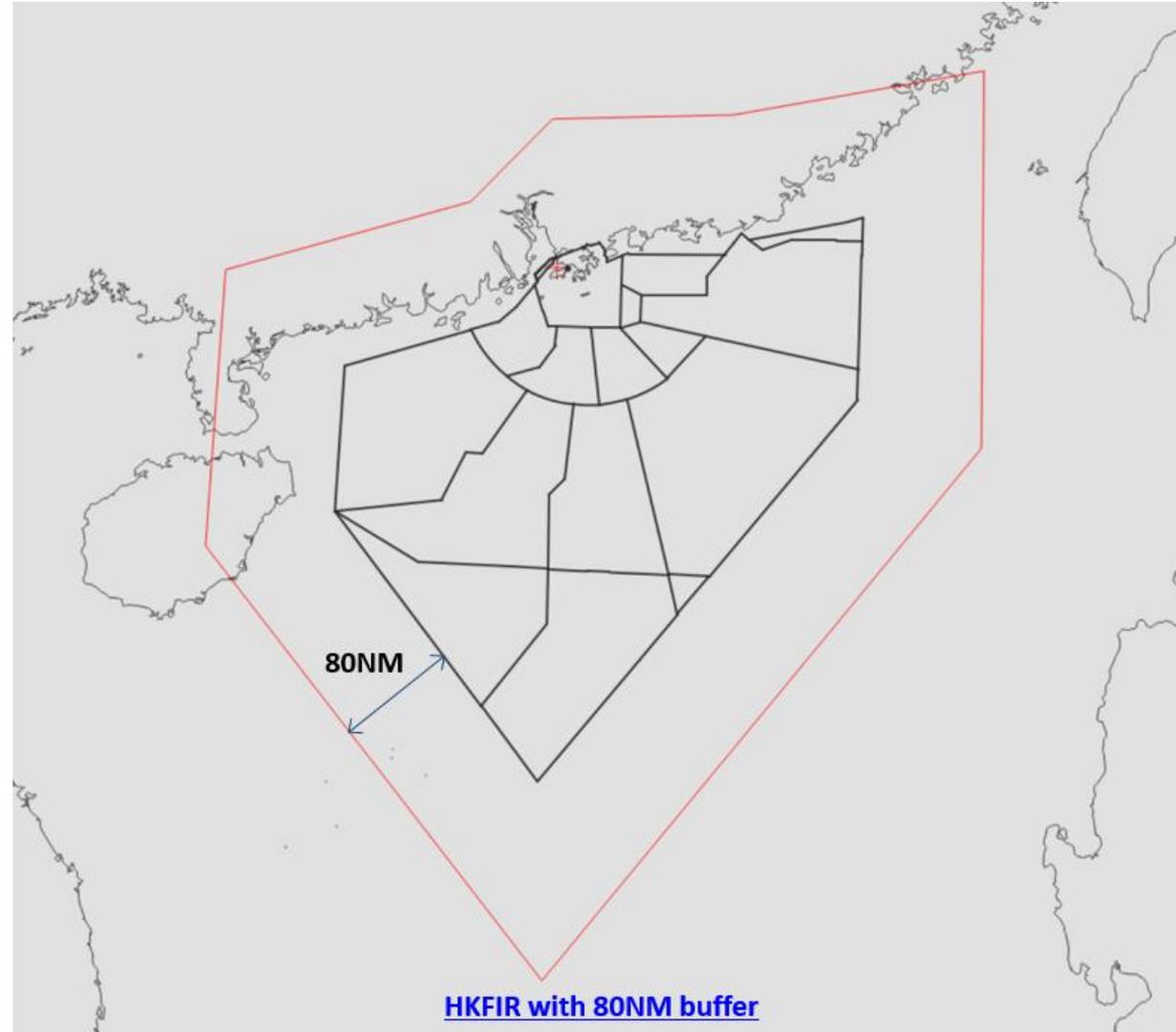
Hong Kong Civil Aviation Department

# Implementation of SB ADS-B in Hong Kong

3 data streams procured:

Date stream 1

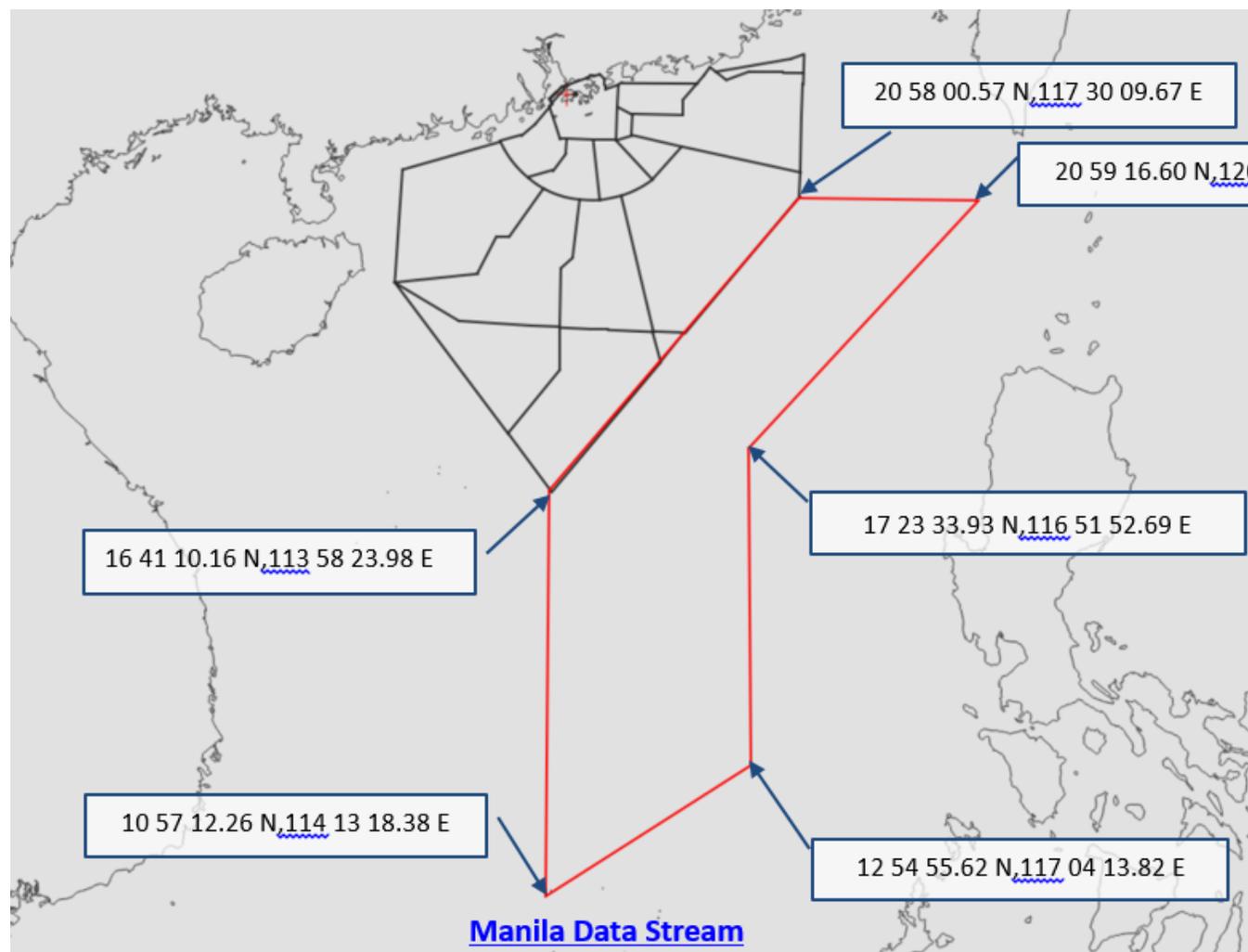
HKFIR with 80NM buffer



# Implementation of SB ADS-B in Hong Kong



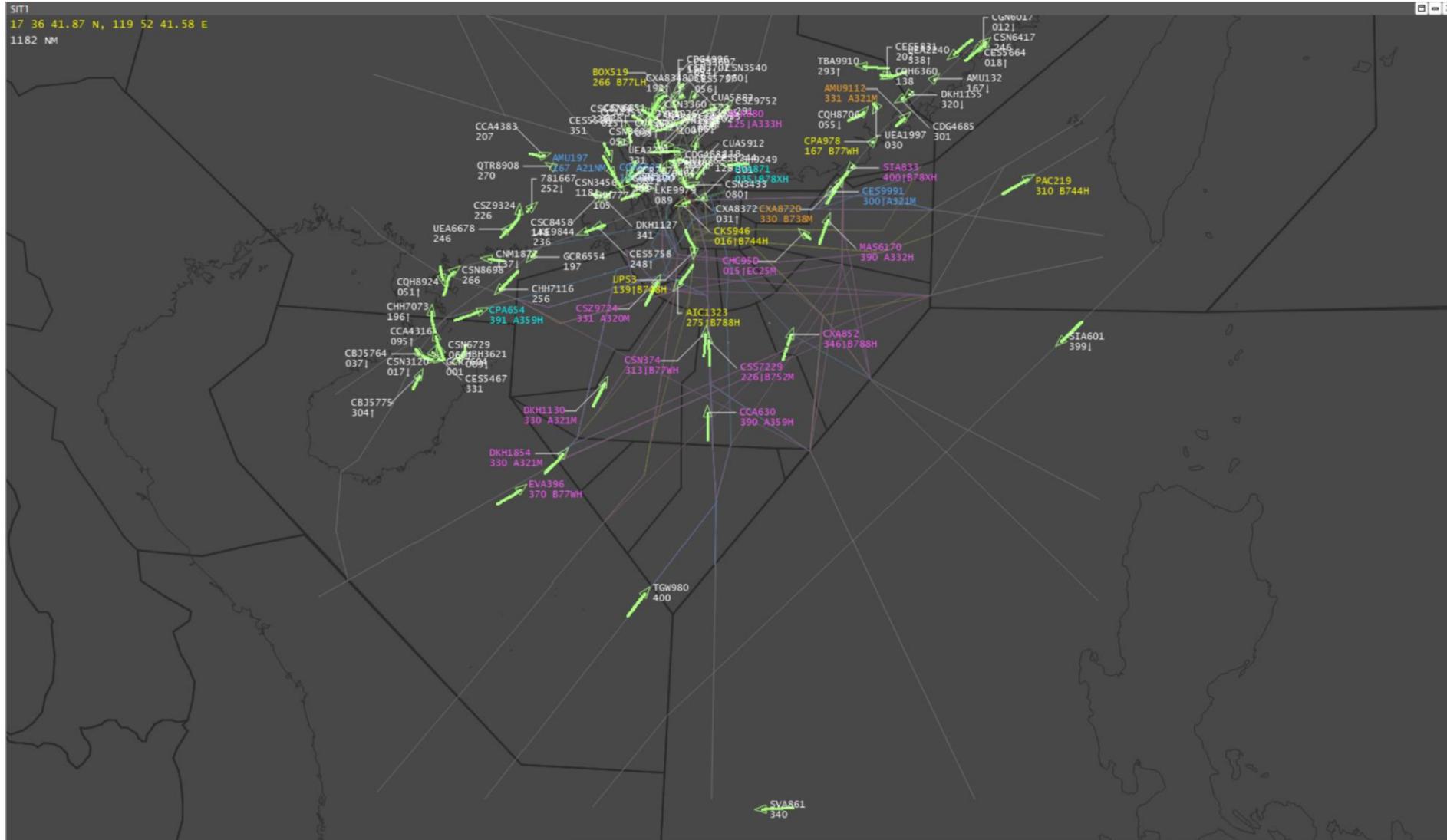
**Date stream 2**  
**Manila data stream**



# Implementation of SB ADS-B in Hong Kong



Date streams 1 & 2 – HK FIR and Manial

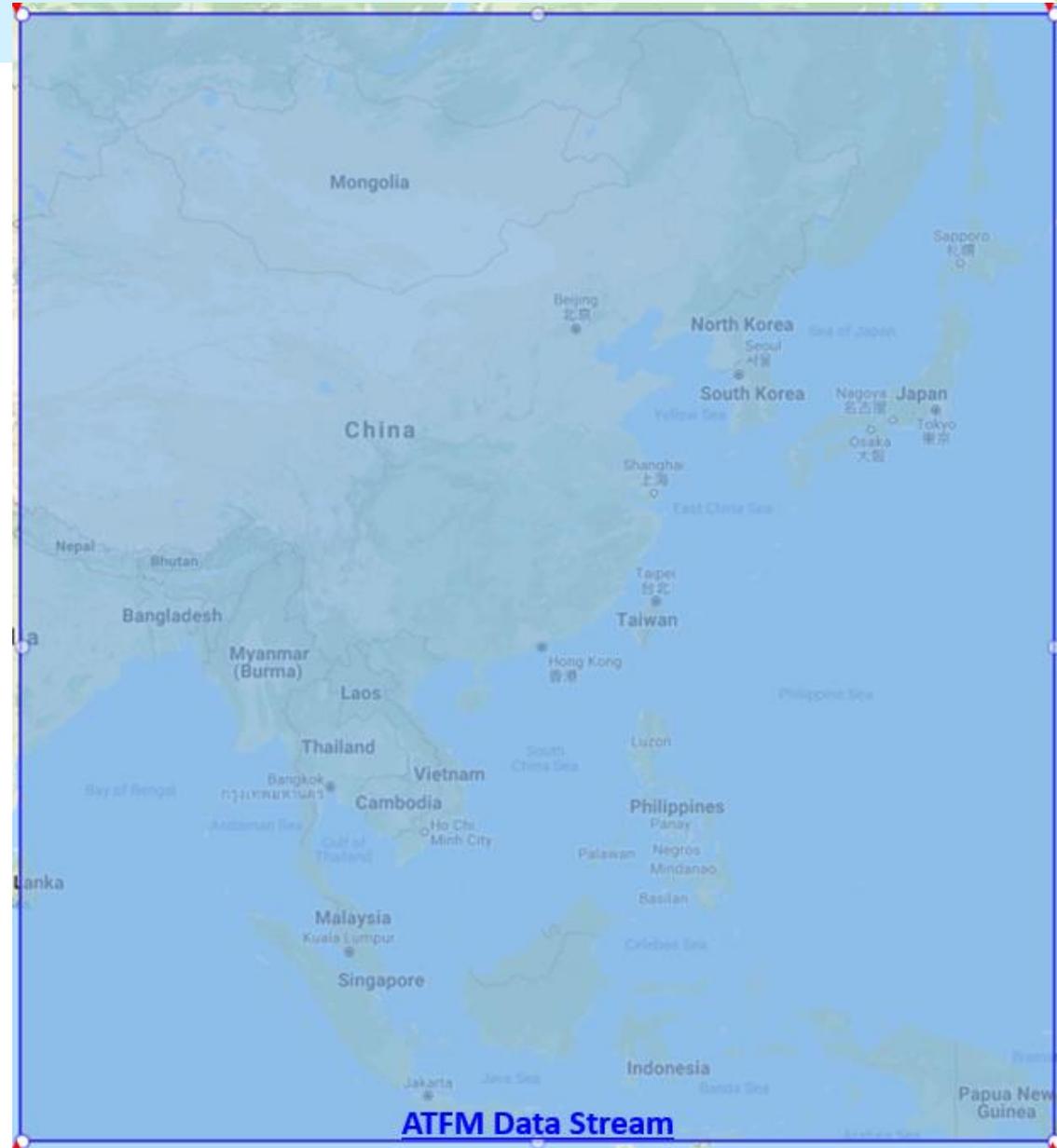


# Implementation of SB ADS-B in Hong Kong



## Date stream 3

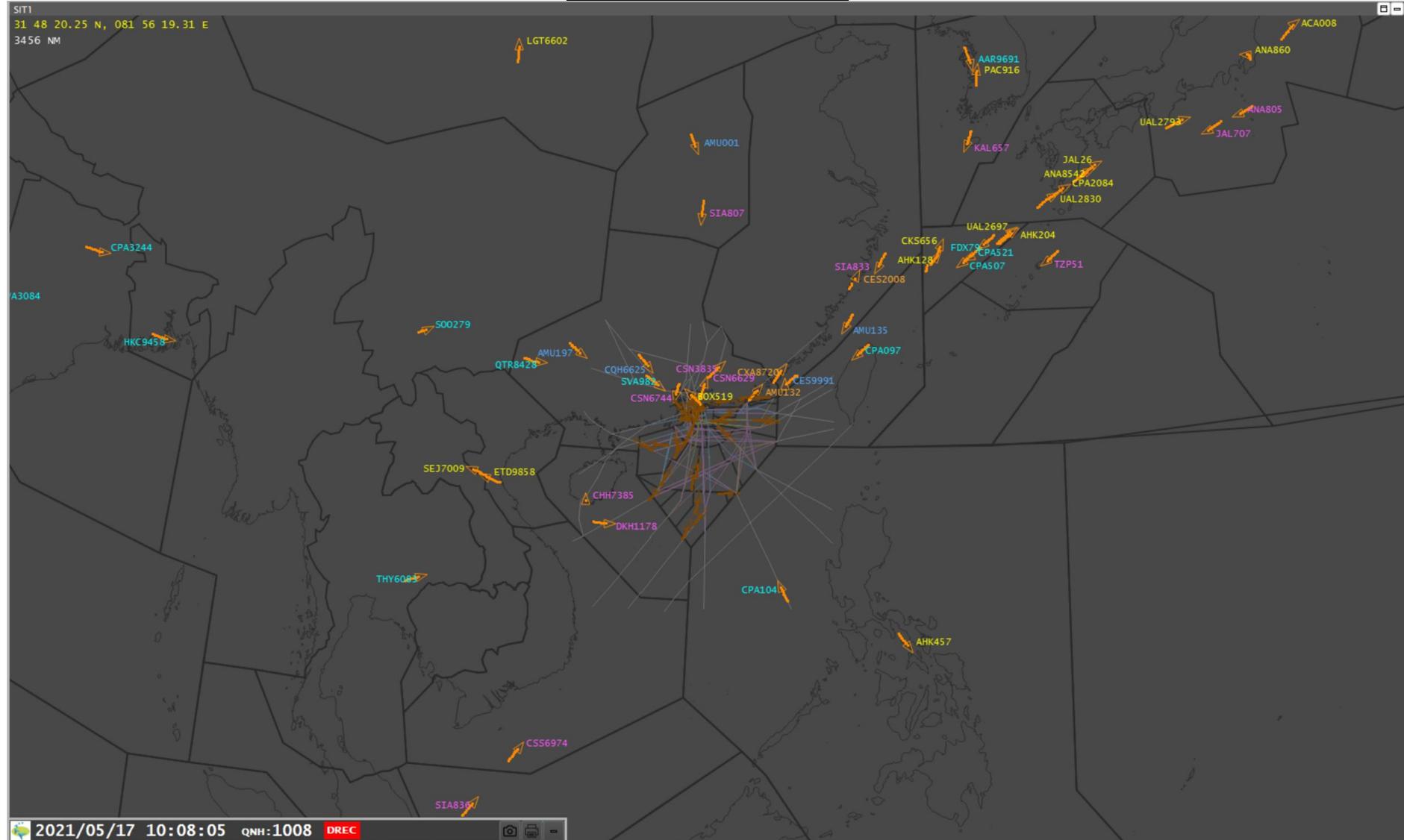
ATFM data stream coverage  
(Approx. 6 hours of flying time  
from HKFIR boundary)



# Implementation of SB ADS-B in Hong Kong



Date stream 3 – ATFM



# Implementation of SB ADS-B in Hong Kong



- HK FIR is fully covered by its own Terrestrial ADS-B with antennae mostly at radar and DVOR sites and an external ADS-B source for the southern tip of HKFIR.
  
- Why Space-Based ADS-B?
  - ❖ Redundancy – an additional ADS-B source in case of issues with terrestrial ADS-B system
  - ❖ Coverage – 80NM buffer, particularly boundary of HK-Manila FIR, which is beyond usual 250NM coverage of traditional radar and terrestrial ADS-B system.
    - Potential benefit: reduced enroute separation with CPDLC + SB ADS-B
    - Oceanic coverage beyond capability of traditional surveillance systems
  - ❖ ATFM coverage –for air traffic flow awareness as CAD has a trial ATFM system testing/development with neighboring ANSPs and plans to tender for a full-fledged ATFM system in late 2022.

# Implementation of SB ADS-B in Hong Kong



- SB ADS-B system was accepted in Q1, 2021
- SB ADS-B performance under evaluation
- Integration and fine-tuning of SB ADS-B data into HKCAD's Terrestrial ADS-B is on-going, such as:

## HKFIR Coverage

- ❖ Reconciling differences in data latency and update rates (Terrestrial Vs Space-based: 1 second Vs 8 seconds); ATMS situational display target rate at 3 seconds
- ❖ Occasional missed SB ADS-B target update, possibly a result of moving Iridium satellite coverage footprints, satellite positioning and aircraft transmission flooding in high-traffic areas

## ATFM Coverage

- ❖ Large coverage area → large amount of data → collaboration between HKCAD and Aireon to filter targets by departure/arrival aerodrome/call sign/flight routes

# Implementation of SB ADS-B in Hong Kong



- As HKCAD sees it (for discussion):
  - A. Customer service targeting user's specific needs is important
  - B. ATFM data contains only primitive subset of ADS-B data with little flight info. (call sign and 24-bit Mode S address), not immediately useful without customization → HKCAD-Aireon collaboration becomes necessary
  - C. Flexibility in data service pricing considering:
    - Customer is paying for service while collaborating with Aireon to improve the data package
    - Data charging formula – by air volume/by target report counts/by flight time? An ANSP might need large coverage footprint, within which usual traffic volume is low

- As HKCAD sees it (for discussion)...*continued*:
  - D. Renewing data service could be a challenge:
    - Considerable efforts and time in contract renewal – with risk of missed renewal by expiry of current service. Terms and conditions become matters of contention.
    - Lack of transparent and across-the-board pricing makes it a difficult case to argue for data renewal without strong justifications.
    - For 1<sup>st</sup> time customer, data delivery requires substantial capital investment in a data delivery system
- Considering the above, what if:
  - SB ADS-B is a data service with standard pricing, service level agreement and available on the CRV as a standard data service?

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# Speaker



**Chris Devlin**

**Director, Product Management**

**Aireon**

# Aireon Commerical Data Services



# Commercial Services Product Portfolio



# Quick Reference



Data Designed for ATFM			●
Real-Time Position Data Stream	●		●
Includes Additional Contextual Data	●	●	
Historical Data Available		●	
Data Filtering	Global, Aircraft Tail Numbers, OR Area of Interest	Aircraft Tail Numbers OR Area of Interest	Proximity to Area of Responsibility (AoR) or Flight Information Region (FIR)
Standard Data Feeds	Aircraft Tracking, Airport/ Airspace Analysis		
Tailored Data Feed	●		●
Customizable Reports		●	
Coverage Area	Global	Global	Global
Update Rate	Customizable, 4s, 8s, 1 min, 5 min	Daily, Weekly, Monthly	Customizable, up to once per minute
Low Latency Data Source	●		●
AMQP Support	●		●
Compatible with ATFM, SWIM Node, and A-CDM Systems			●
Data Provenance	Aireon's high-fidelity, low-latency surveillance-grade data	Aireon's high-fidelity, low-latency surveillance-grade data	Aireon's high-fidelity, low-latency surveillance-grade data



```
1 'use strict'
2
3 const AMQP = require('amqp10');
4 const logger = require('./helpers/logger');
5 const cmd = require('./helpers/command');
6
7 var messagesReceived = 0;
8 const limit = cmd.messages ? cmd.messages : Number.MAX_VALUE;
9
10 if(!cmd.messages)
11     logger.warn('No limit is specified for number of messages to receive.');
```



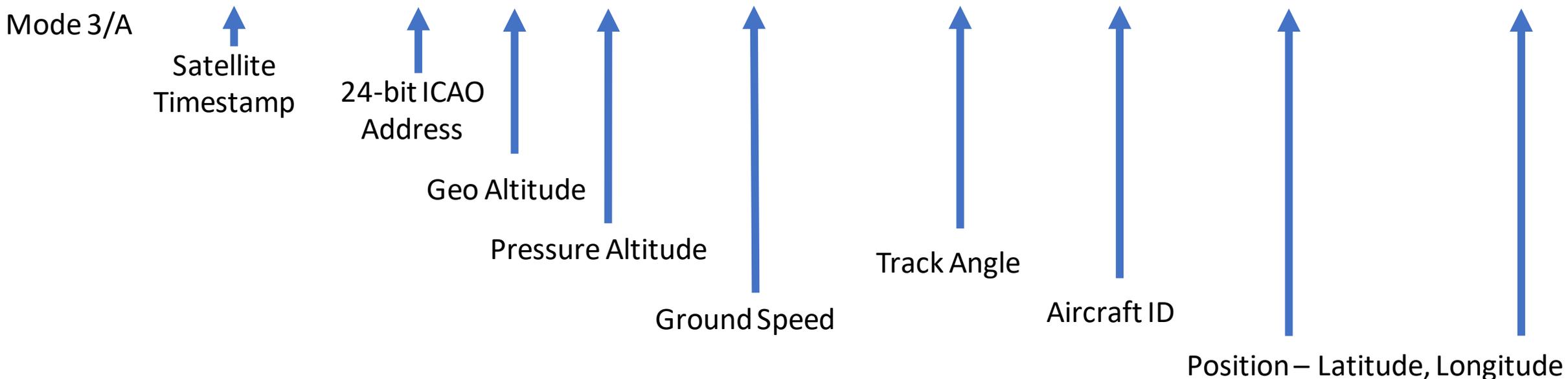
```
12
13 // client setup
14 const client = new AMQP.Client(AMQP.Policy.merge({
15     defaultSubjects : false
16 }));
17 client.on(AMQP.Client.Events.connected, () => logger.info('Connected. '));
18 client.on(AMQP.Client.Events.disconnected, () => logger.error('Connection closed $@'));
19 client.on(AMQP.Client.Events.connectionClosed, () => logger.error('$@', closeConnection()););
20
21 //formats the connection url with the args passed in.
22 const getConnectUrl = (cmd) => {
23     const [protocol, host, port] = cmd.url.split(':');
24     return `${protocol}://${cmd.host}:${cmd.port}${cmd.path}${cmd.username ? `:${cmd.username}@` : ''}`;
25 }
26
27 const consume = async (connectionUrl) => {
28     try {
29         logger.info('Connecting to ${connectionUrl}');
30
31         await client.connect(connectionUrl);
```

```
PS C:\Users\AndrewHoag\Documents\SLOC\cds-streaming-services-starters\node> |
```

# AireonSTREAM™ Standard Data Fields

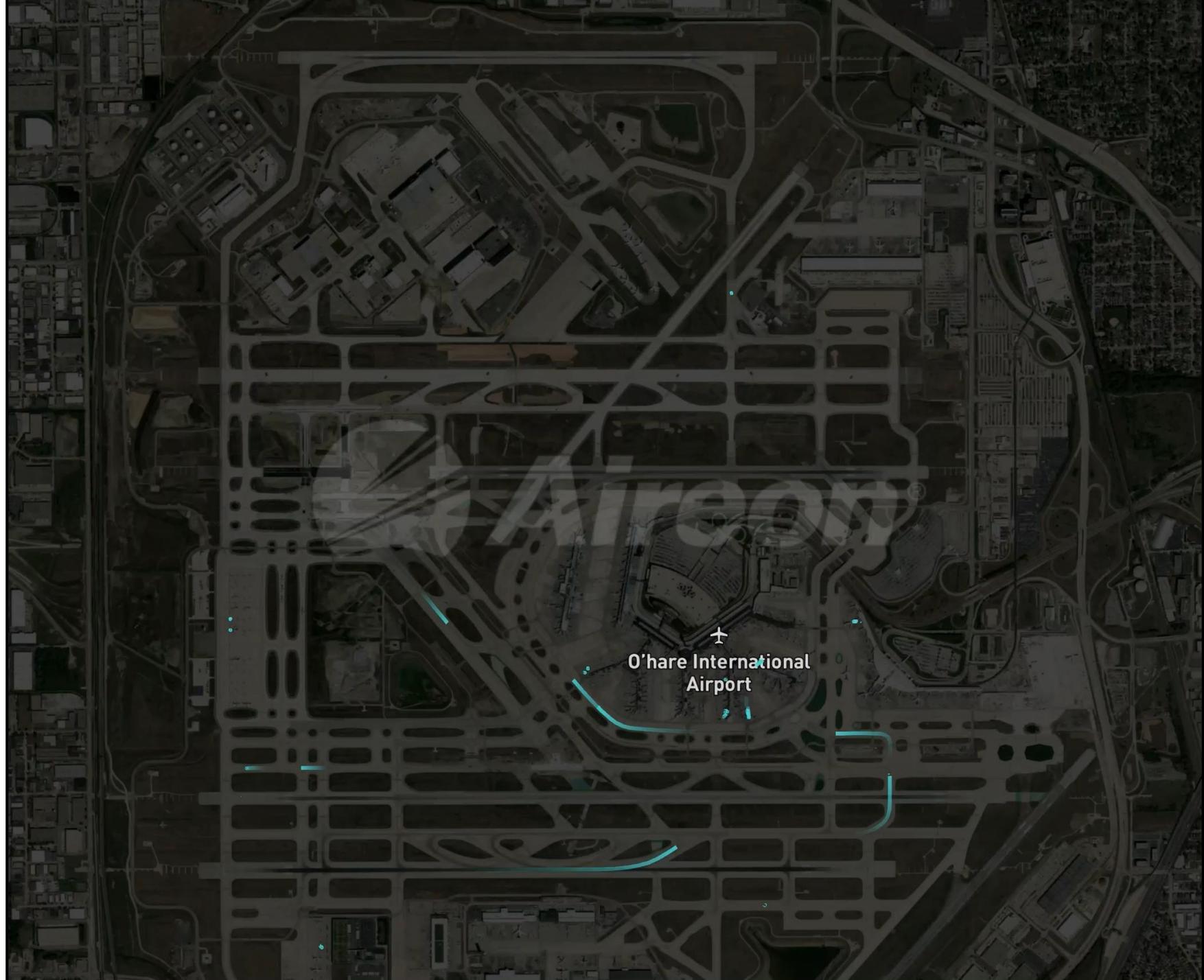
The CSV format from AireonSTREAM provides access to ADS-B data without special coding

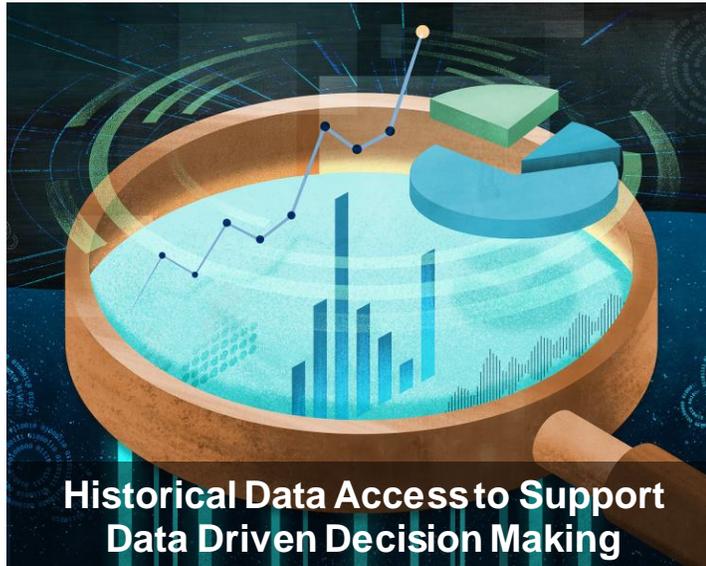
```
021,3470,2021-02-09 20:48:20.836,7805AA,30625.00,330.00,0.14306640625000,120.0476074218750,CSN435,53.404861371964174,-109.47577781975261
021,7142,2021-02-09 20:48:20.805,A670A3,35375.00,380.00,0.12866210937500,319.6362304687500,DAL295,52.367340009659486,-95.49308778718107
021,3463,2021-02-09 20:48:20.914,A2D92A,33950.00,350.00,0.14422607421875,136.7138671875000,ASA90,52.548631522804456,-128.7414813414215
```





# Chicago O'Hare (ORD) Airport Data





**Historical Data Access to Support  
Data Driven Decision Making**



**Flight Cycles and Hours**



**Access to Global KPIs for Safety,  
Efficiency and Environmental Analysis**



# Historical Query

Andrew Hoan

- Historical Query
- Locate Aircraft
- Your Queue
- Help
- Contact Support
- Logout

## Date and Time

Select a date and time range for your query

Start Date/Time (UTC)

End Date/Time (UTC)

YYYY-MM-DD HH:mm

YYYY-MM-DD HH:mm

## Geospatial

Select a pre-defined region or enter one or more bounding boxes

Flight Information Region   Custom Bounding Box

Select an FIR bounding box

Dropdown menu for FIR bounding box

## Altitude Filter

Floor

Ceiling

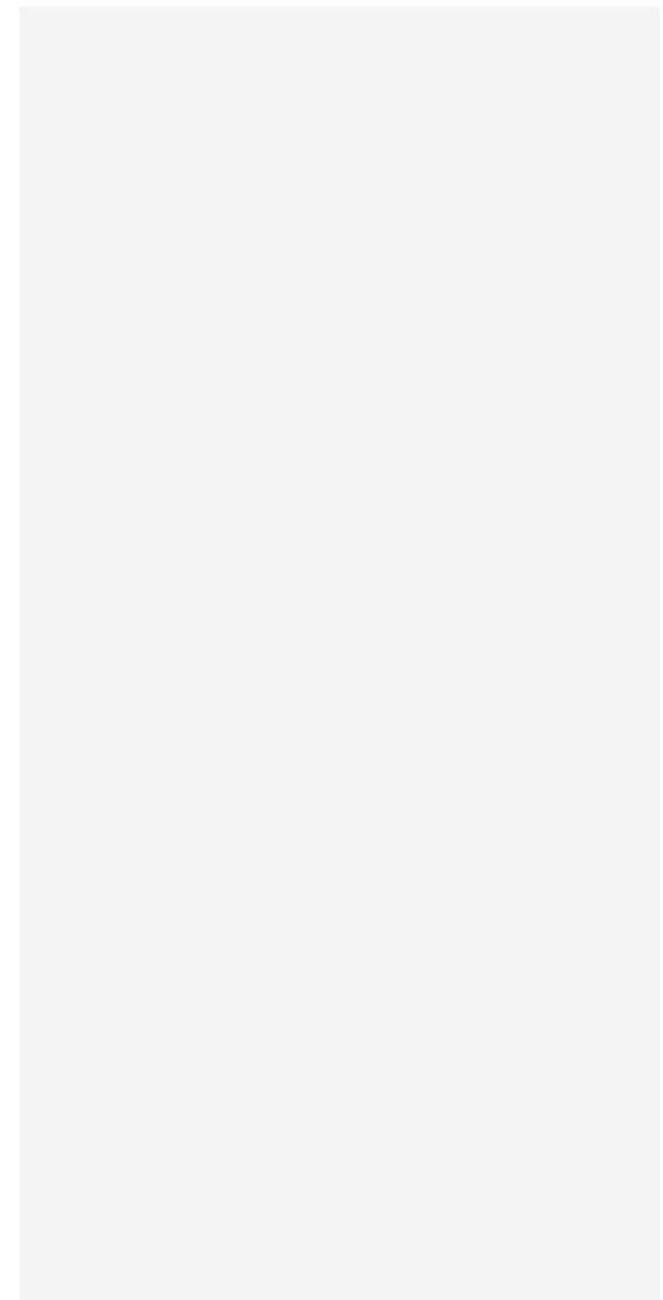
-1000 minimum

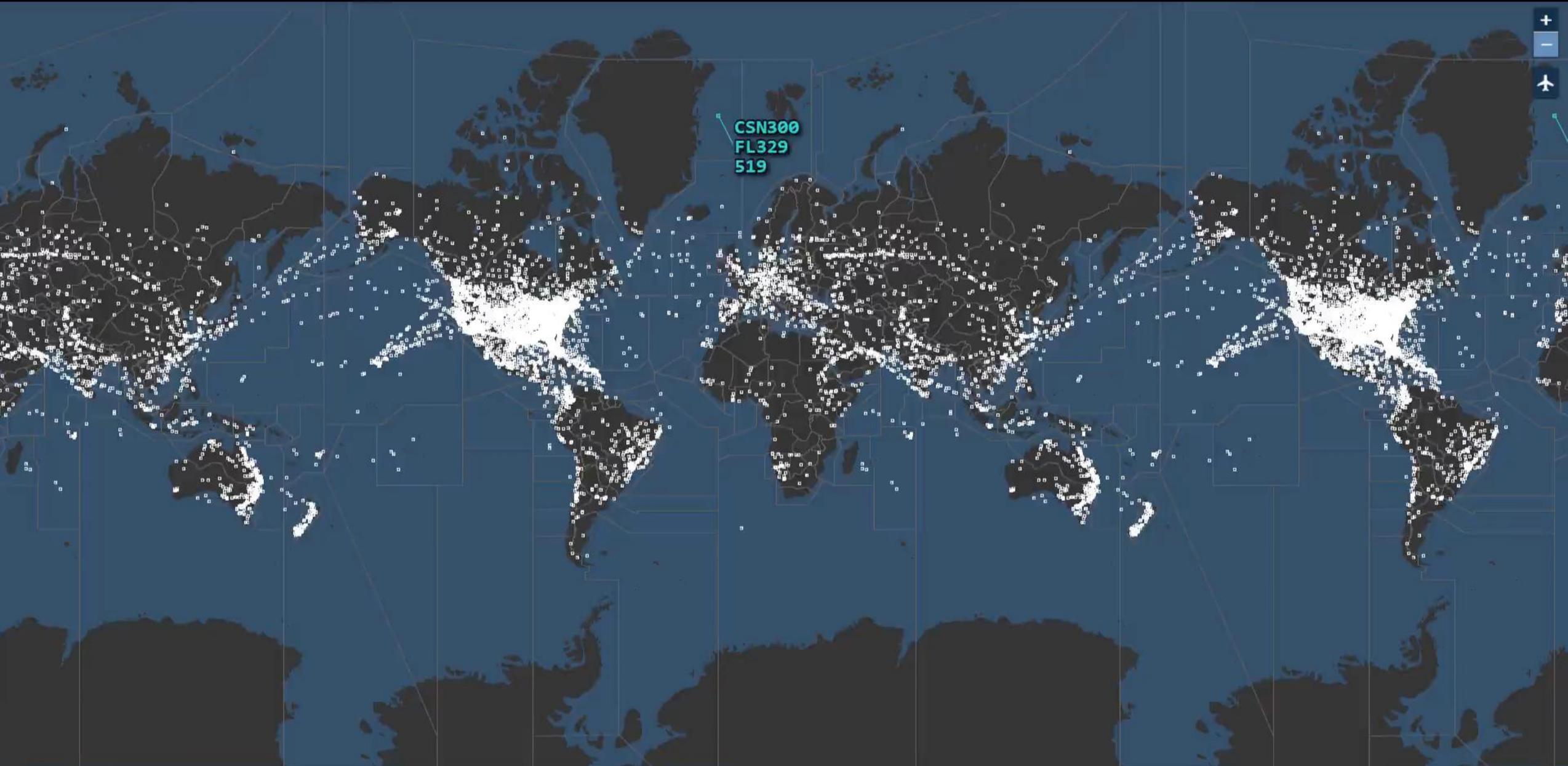
126700 maximum

Flight Levels expressed in feet.

Include Ground Data in Results?

## Aircraft Specification





CSN300  
FL329  
519



DAL1585  
FL8  
152

DAL376  
FL0

DAL1098  
FL0

DAL829  
FL0

EDV5290  
FL0

DAL1459  
FL0

DAL310  
FL0

RPA5716  
FL0

RPA5806  
FL0

a948c4  
FL0

DAL2274  
FL9  
151

EDV5254  
FL0

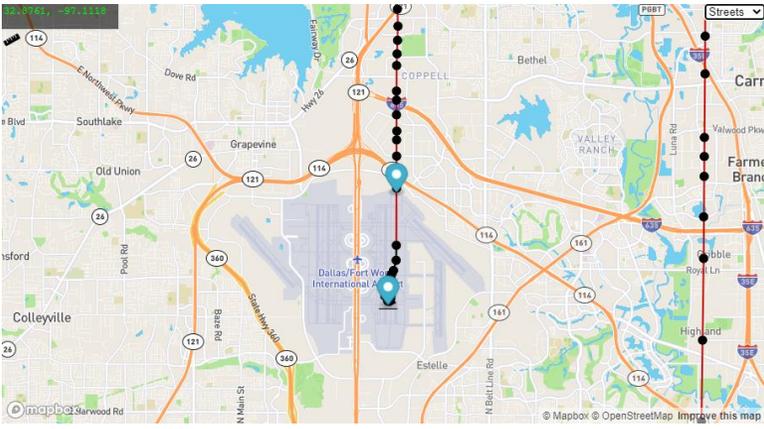
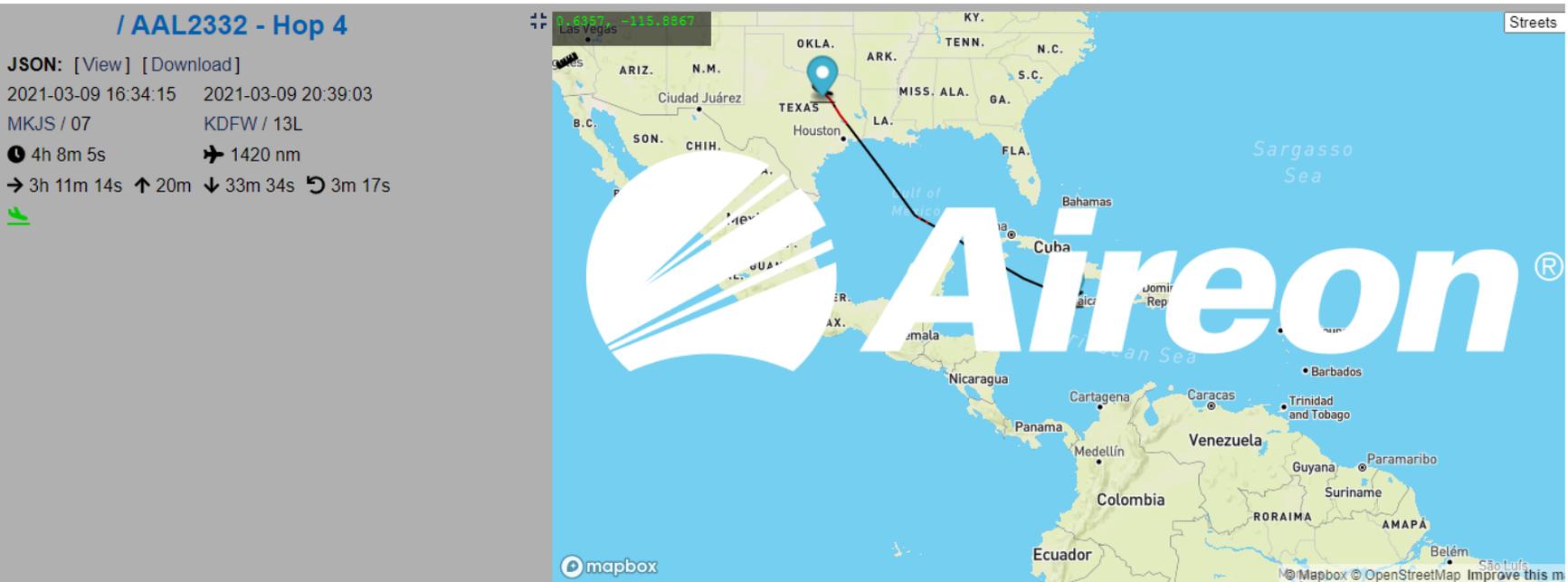
DAL2205  
FL5  
96

DAL2073  
FL0

DAL1613  
FL14  
178

 **Aireon**®

# AireonINSIGHTS™ LogBook



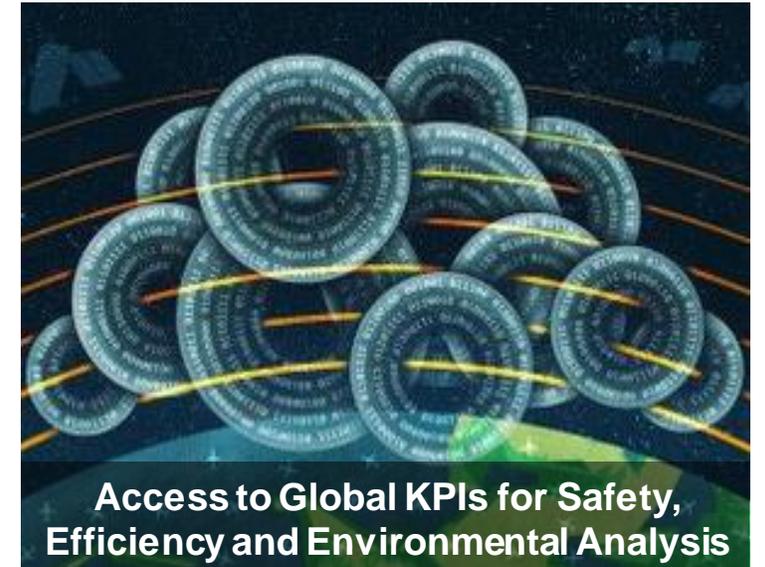
Events													
Date/Time	Type	AID	Latitude	Longitude	Altitude (B/G)	Speed (G/T)	Vertical	Heading	Ground Bit	Min Altitude	Airport	Distance	Altitude
2021-03-09 16:34:15	Transponder On	AAL2332	18.4990	-77.9180					Yes				
2021-03-09 16:53:58	Airborne	AAL2332	18.5040	-77.9126	-175 / -50 ft	129 kt		65°					
2021-03-09 20:34:29	Landing	AAL2332	32.9208	-97.0259	500 / 625 ft	118 kt		179°					
2021-03-09 20:39:03	Transponder Off	AAL2332	32.8860	-97.0291					Yes				



**Historical Data Access to Support  
Data Driven Decision Making**



**Flight Cycles and Hours**



**Access to Global KPIs for Safety,  
Efficiency and Environmental Analysis**

# AireonFLOW™ Data Coverage and Connection

## Data Coverage

- AireonFLOW data includes all ADS-B equipped aircraft available to the Aireon receivers (i.e., 1090 MHz Extended Squitter (1090ES), 125W diverse/ top-mounted antenna)
- AireonFLOW data is available from the ground to ceiling of FL600, globally
- Customers receive all position reports of subscribed aircraft with a standard update rate of 60 seconds and a minimum probability of update of 96%
- Latency from satellite to customer delivery is up to < 5 seconds, 99%

## Tailored Subscription

- Feed configurable based on aircraft of interest, area of interest, or by departure/arrival aerodrome

REGIONAL FOCUS

# Space-Based ADS-B Applications in Asia Pacific

A More Dynamic, Collaborative  
and Harmonised Future



25 MAY 2021 @ 08:00 TO 10:00 CEST



WEBINAR



# Speaker



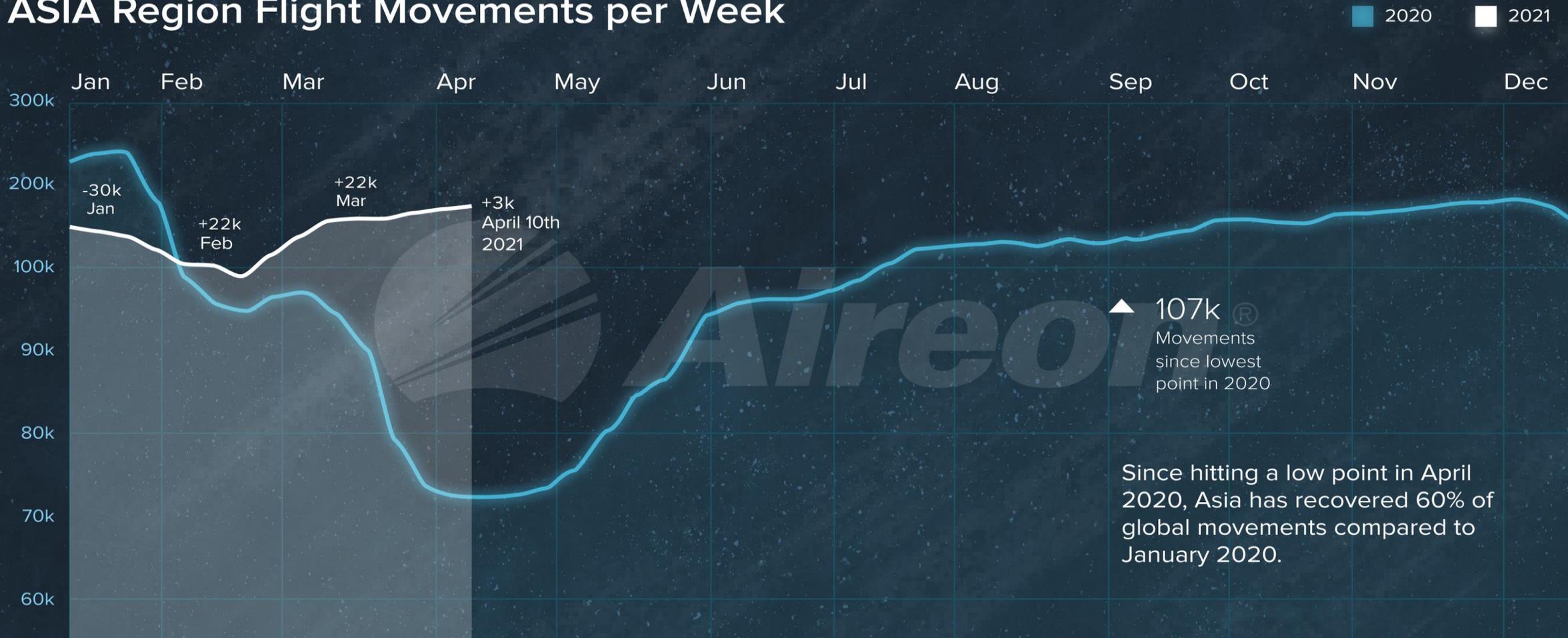
**Adam Burford**

**Business Development, Asia Pacific**

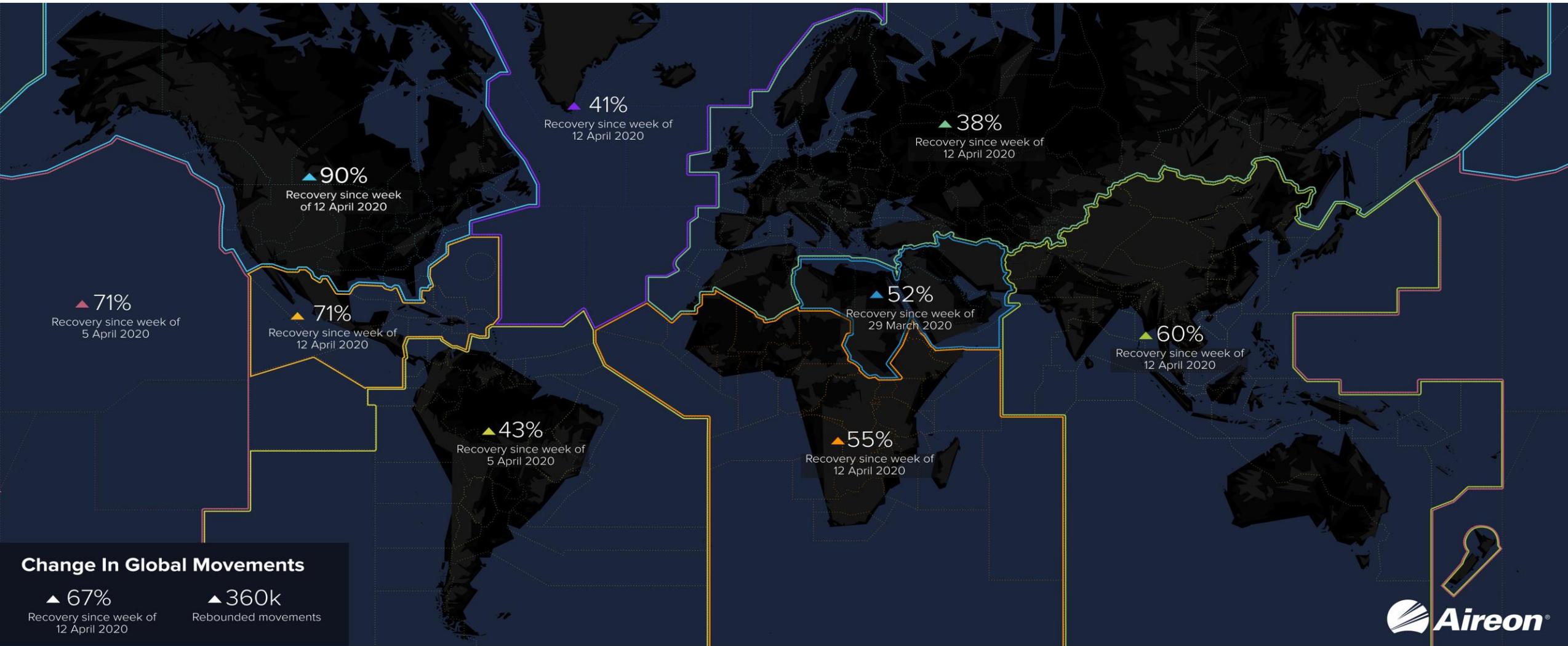
**Aireon**

# COVID-19 Impacts – Asia Pacific

## ASIA Region Flight Movements per Week



# COVID-19 Impacts – Asia Pacific



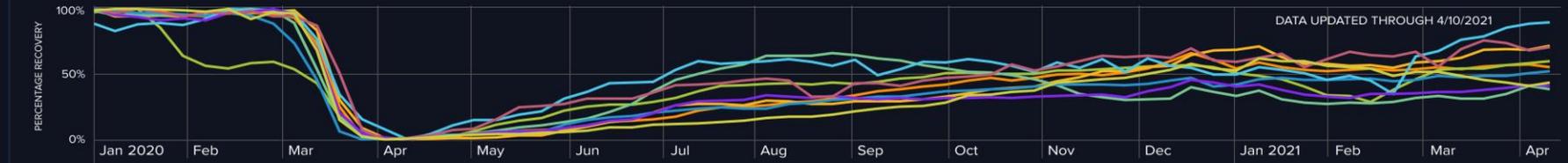
## Change In Global Movements

▲ 67% Recovery since week of 12 April 2020

▲ 360k Rebounded movements

In 2020, the COVID-19 pandemic sent global air traffic plummeting to its lowest point the week of 12 April 2020, with a total loss of over 535K movements. Since that lowest point, regions have seen substantial traffic rebounds at their own pace, in total regaining 360k movements worldwide.

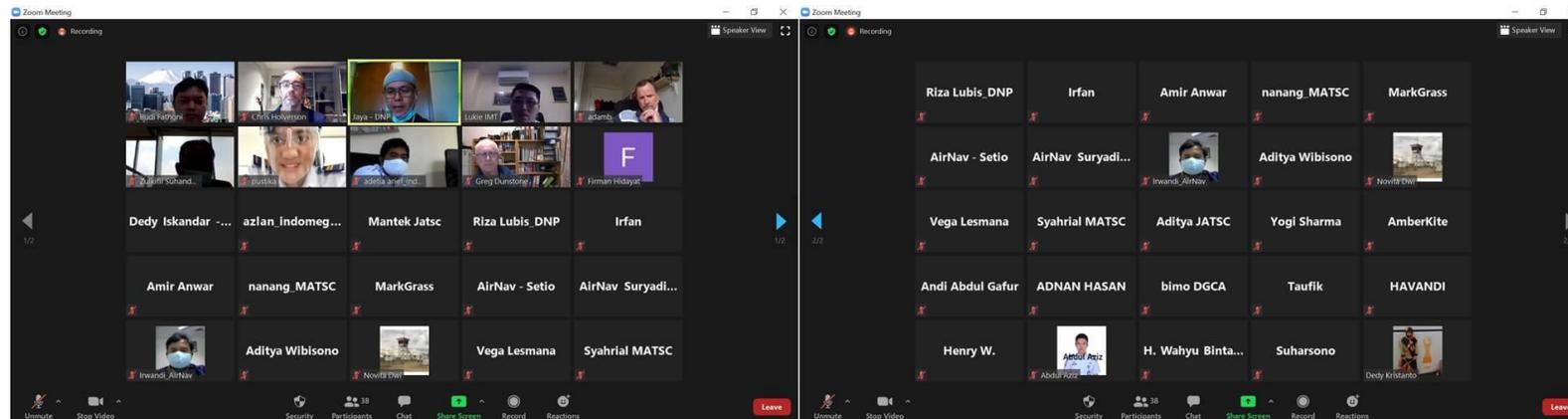
- AFI ▲ 6K
- ASIA ▲ 107K
- CAR ▲ 25K
- EUR ▲ 59K
- MID ▲ 15K
- NAM ▲ 155K
- NAT ▲ 5K
- PAC ▲ 9K
- SAM ▲ 17K



DATA UPDATED THROUGH 4/10/2021

# Aireon Deployment in a COVID World

- Shipment
- ANSP or agent installation
- Remote checkout with help of ANSP via Zoom/Teams etc
- Site acceptance testing via Zoom/Teams etc
- Coordination with ATC automation system vendors for integration
- Many meetings / Teamwork / Motivation



# Why Space-Based ADS-B?

- **Surveillance as a Service**

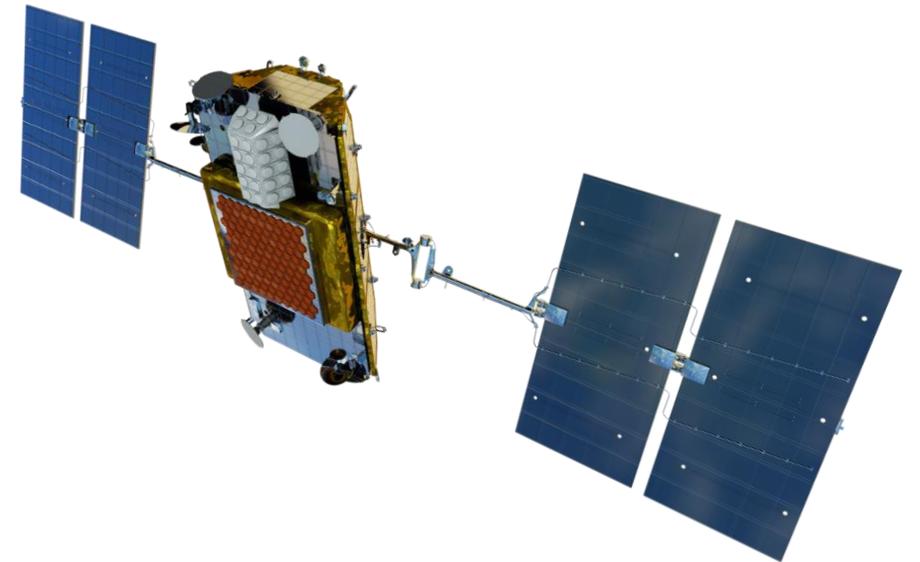
- Financial efficiency
- Known operating cost (fixed per year or variable based on traffic volume)
  - no financial surprises
- Very low capital cost. Reduce need for terrestrial duplication (where terrestrial is required)
- No maintenance costs, minimal staff costs
- Low cost for surveillance coverage
- Data communication cost lower if CRV used

- **Airline Customer Value**

- Reduced position reports & pilot workload
- Seamless service everywhere – completes the coverage
- Safety

- **Safety Improvement**

- Surveillance to ground level everywhere – completes the coverage
- Search & Rescue improvement / Situational awareness
- Situational awareness at FIR boundary into adjacent FIR
- Independent of terrestrial events (earthquake, fire, weather, flood etc.)



# Customized Commercial Proposals

- Fixed per month
  - If traffic climbs you don't pay more
  - Good for fixed budgets
- Or Fixed per Flight hour
  - If traffic drops – you pay less
- Price depends on use case
  - Tier 1 : ATC separation
  - Tier 2 : Support procedural ATC
  - Tier 3 : Flight service
  - Supplement existing surveillance
  - Coverage beneath radar coverage
  - Surveillance where there is none
  - FIR boundary safety
  - Remote towers



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# Questions and Answers

# Contact



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# Thank you

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