

Regional and Inter-Regional Seminar and Workshop on Search and Rescue

Mahe, Seychelles
19 - 22 July 2016



Agenda

- Aireon Introduction
- Space-Based ADS-B Overview
- Aireon System Deployment Status
- Aireon ALERT Overview
- Global Aeronautical Distress and Safety System (GADSS)
- Search and Rescue (SAR)
- Summary

JWC6543
CRJX
310 525



YGD1723
A350
425



SLB3256
A388
400 520



Aireon

An introduction



AIREON LLC PROPRIETARY INFORMATION

Aireon - Overview

- Aireon is an air traffic surveillance company that provides customers with data from a space-based system
- Aireon is currently developing the world's first space-based ADS-B system that will provide 100% global surveillance of all 1099 MHz ADS-B-equipped aircraft – for the first time in history
- Aireon's services will directly address many of the current challenges related to:
 - Remote area and oceanic aircraft surveillance and tracking
 - Terrestrial contingency air traffic monitoring
 - Search and rescue (SAR) operations
 - Global Aeronautical Distress and Safety Systems (GADSS)

Aireon - Owned by ANSPs, For ANSPs

- Shareholders



- \$3 billion development

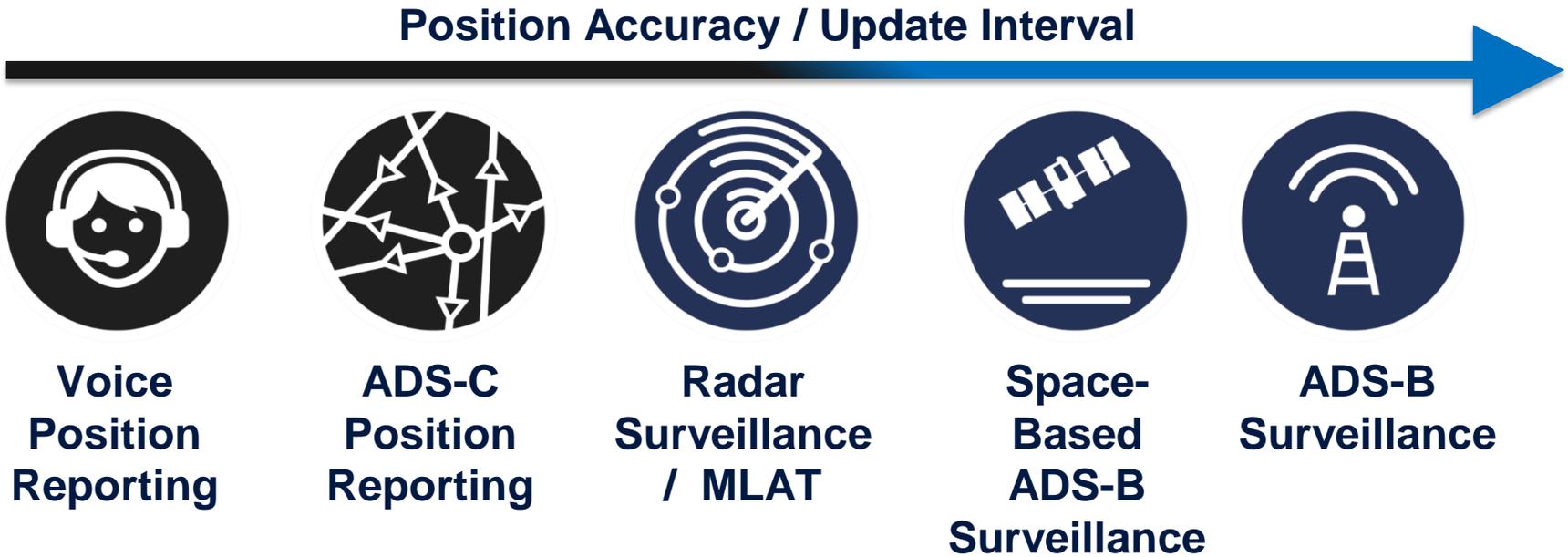


Space-Based ADS-B

Overview



Aircraft Position Detection Options



Automatic Dependent Surveillance – ADS-B (out)

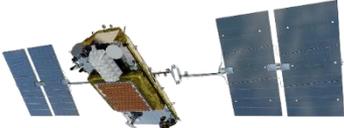
- An innovative and proven (through ground-based stations) surveillance concept
- Radar “calculates” a target position, ADS-B broadcasts a GPS position
- More accurate than radar (higher update interval, GPS position)
- Much lower cost than radar (10% of the costs)
- ADS-B globally accepted as augmentation or replacement for radar
- Upcoming transponder mandate for all aircraft in Europe and US
- ADS-B becoming standard equipment on new aircraft



Currently Over 70% of the World Remains Un-Surveilled



In 2018...100% Global Air Traffic Surveillance



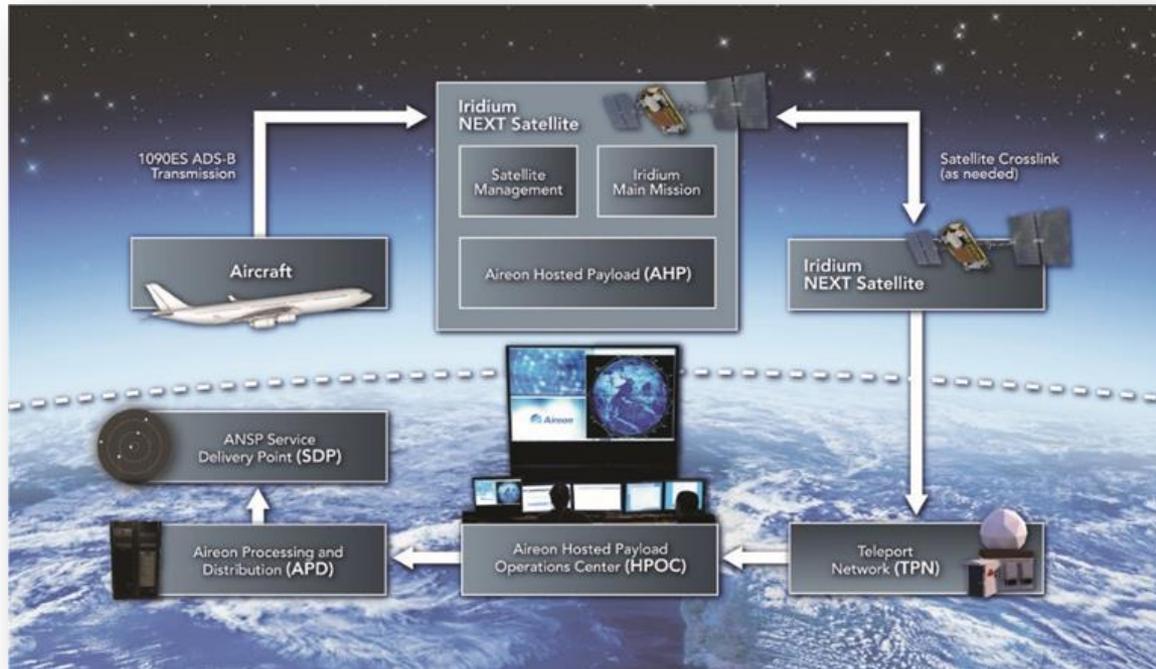
AIREON
GLOBAL
COVERAGE

What is Space-Based ADS-B?

- It's just ADS-B
 - No changes to current, existing and implemented ADS-B technology needed
- Satellite-based ADS-B antennas
 - Antennas (Aireon Hosted Payload – AHP) are integrated with the Iridium NEXT constellation of satellites
 - Data transmitted via Iridium cross-linked satellites to Aireon Processing and Distribution (APD) sub-system
 - APD processes raw ADS-B data and delivers it to ANSPs
- Unique Global Surveillance Capability
 - Any 1090MHz ADS-B equipped aircraft
 - Anywhere in the world
 - Anytime
 - All-weather

Aireon System Technical Overview

- System-of-systems
- Aireon Hosted Payload (AHP) – ADS-B Antenna
- Hosted Payload Ops Center (HPOC) – Antenna Control
- Aireon Processing and Distribution (APD)
- Service Delivery Point (SDP)



Iridium NEXT Constellation Overview

- Satellites in orbit: 66
 - 6 Orbital Planes
 - 11 Satellites per Plane
 - 6 In-Orbit Spare Satellites
 - 9 Ground Spare Satellites
- Orbital Planes: 6
- Availability: ≥ 0.999
- Typical Lifecycle: 14 years (Current constellation approaching 20 years!)
- Operational Altitude: Approximately 485 miles (781 km)
- Full global Air Traffic Surveillance without the need for additional equipment
- **First Launch:** Scheduled for September 12th, 2016





PRESENT AIR TRAFFIC
CONTROL SURVEILLANCE
COVERAGE

The System

Deployment Update



AIREON LLC PROPRIETARY INFORMATION

System Deployment - Making Good Progress

- Complex system built by industry leaders in space, communications and aviation
- 81 of 81 hosted payloads completed ahead of schedule
- Currently conducting readiness testing and preparation for:
 - First launch (Scheduled for September 12th, 2016)
 - On-Orbit Testing (OTT)
- No major roadblocks - on track for system completion and operational readiness in 2017
- Go-live scheduled for Q2 2018



First Launch – September 2016

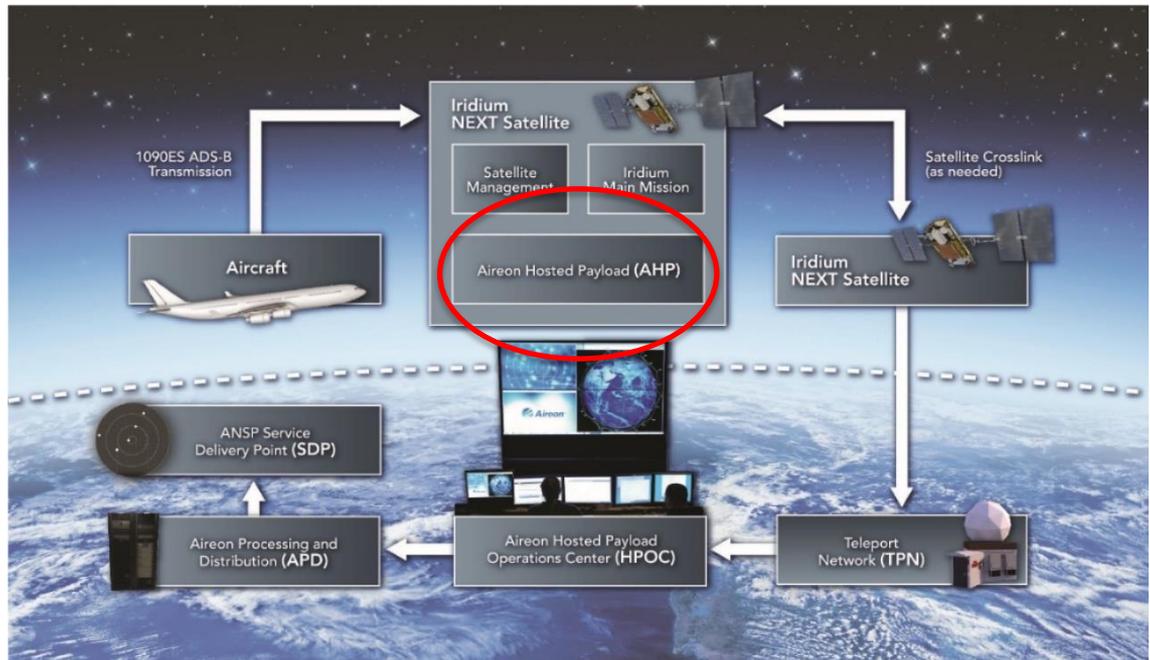
- **First launch** will be **10 satellites** on a Falcon 9 rocket launched out of California – Scheduled for **September 12th, 2016** 
- Second launch will be 3 months later, then every two months afterwards



Launch schedule supports constellation completion by end of 2017

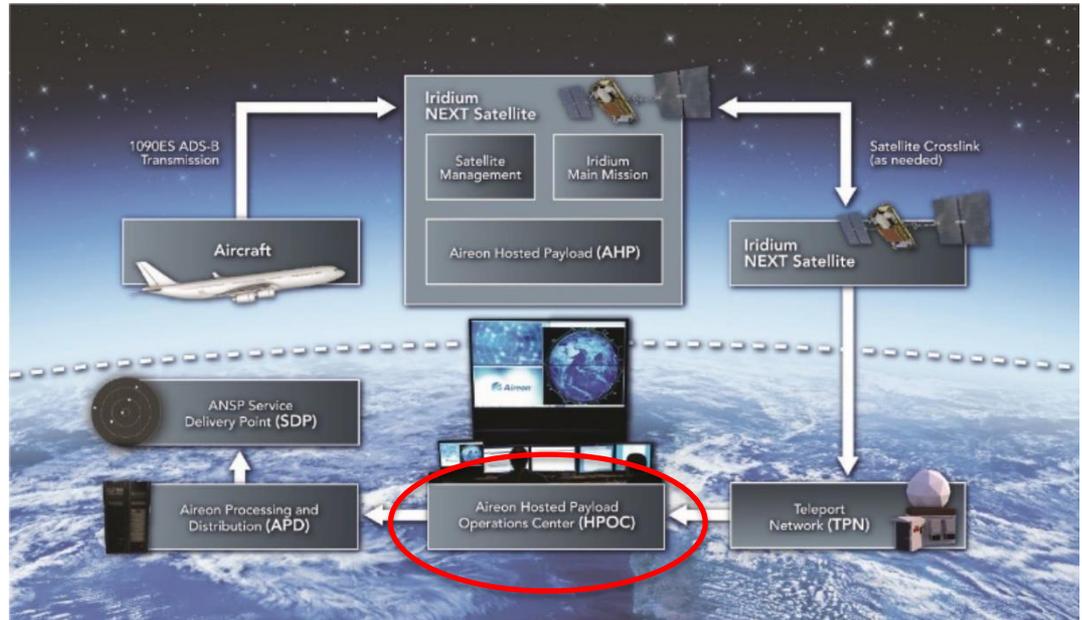
Aireon Hosted Payload (AHP) – ADS-B Antenna

- All 81 AHPs built
- 78 have completed testing
- 18 have been installed & integrated on satellite comms panel



Hosted Payload Operations Center (HPOC)

- ADS-B antenna control system
- HPOC in operational readiness testing
- Initial operations procedures written
- Tightly integrated with Iridium satellite operations
 - Physically located at SNOC
- Launch readiness rehearsals underway



Satellite Network Ops Center



HPOC



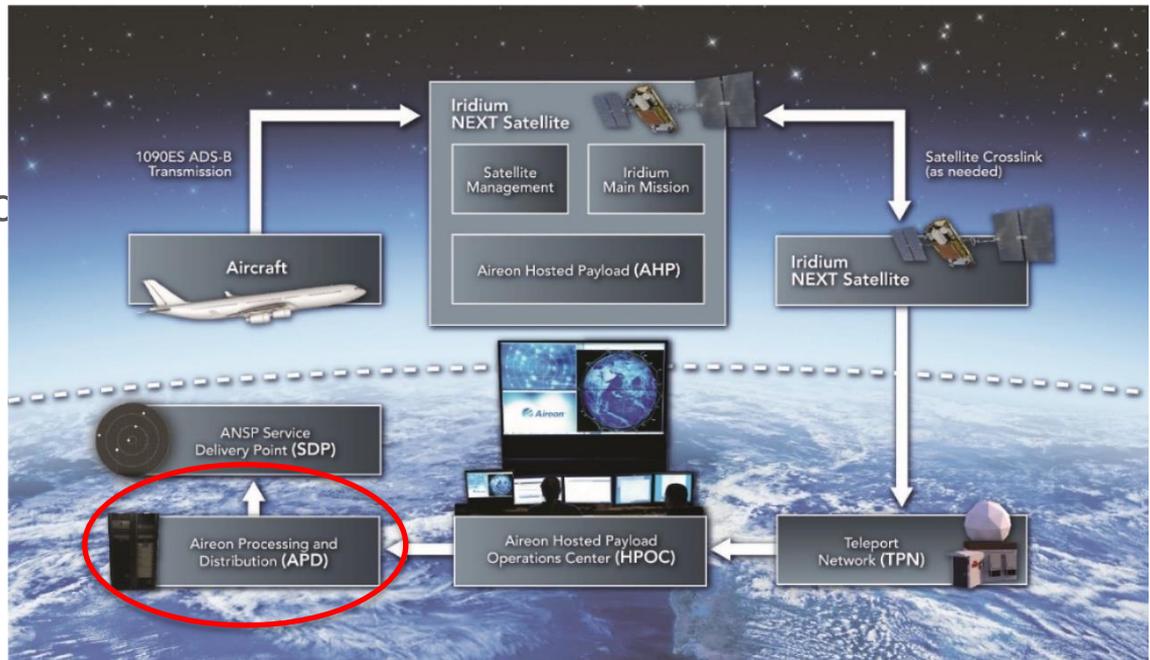
Launch & Early Ops Facility



Aireon Processing and Distribution (APD)

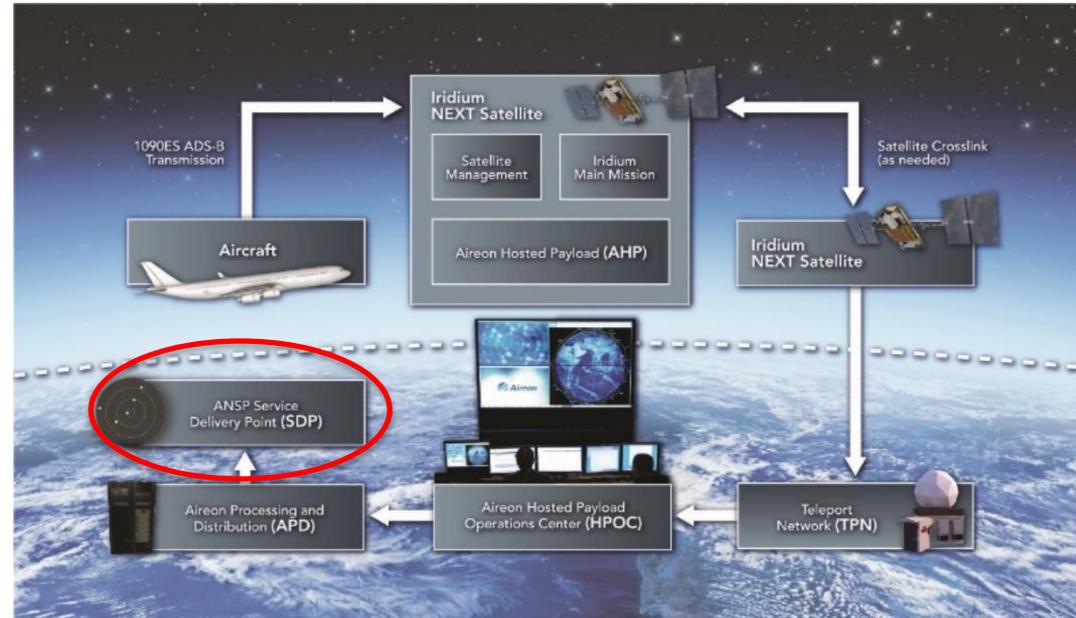


- ADS-B message processing system
- Parses messages and sends to customers based on FIR/Service Volume
- Build 6 in regression testing
- On-Orbit-Testing (OOT) scripts in final draft
- On-Orbit-Testing (OOT) readiness testing to begin



Aireon Service Delivery Point (SDP)

- Demarcation between the Aireon system and the ANSP's system(s)
- SDP typically installed outside of ANSP's ATC system firewall
- Aireon manages data delivery (including security) to the demarcation point
- Aireon manages equipment at the demarcation point
- SDP development complete – configuration options in-development



Example: Racksource RACK-151-18U



Implementation and Operations

- Initial test connection to NATS and NAV CANADA complete
- Early testing with ATM automation systems on-going
- Test and validation of on-orbit data upcoming – December 2016
- Connections to FAA, IAA, Naviair, ENAV, Singapore, ATNS and Curacao – Scheduled throughout 2016/2017
- Interim operations support in place – September 2016

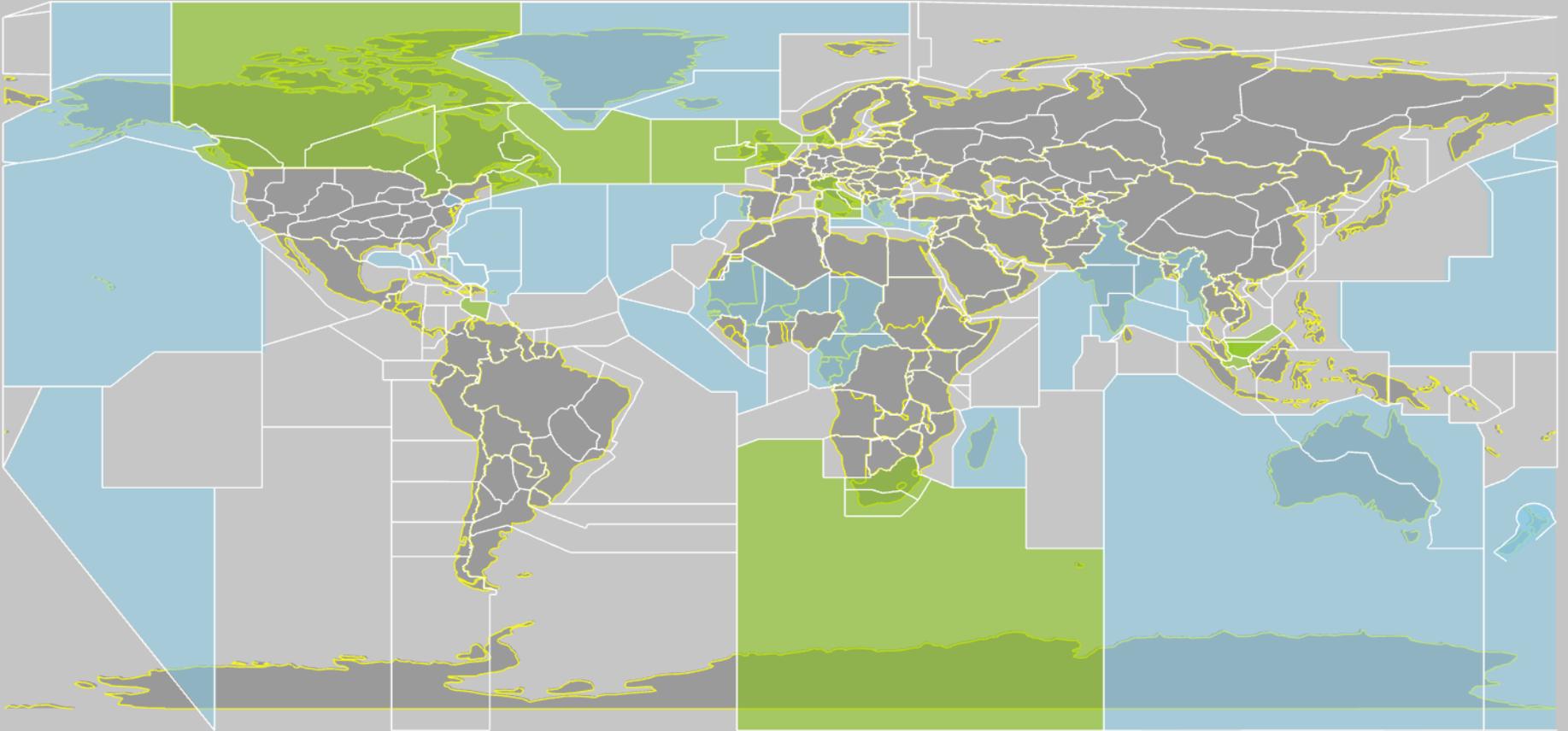


Full Integration and End-to-End Test



ADS-B signal received through roof of test facility building and processed through entire Aireon system

Aireon Status: Building Support Among Major ANSPs



Data Service Agreements (DSA) / Memorandum of Agreement (MOA)

ANSPs have the contractual right to pass all ADS-B positions to their search and rescue organizations.



AIREON LLC PROPRIETARY INFORMATION

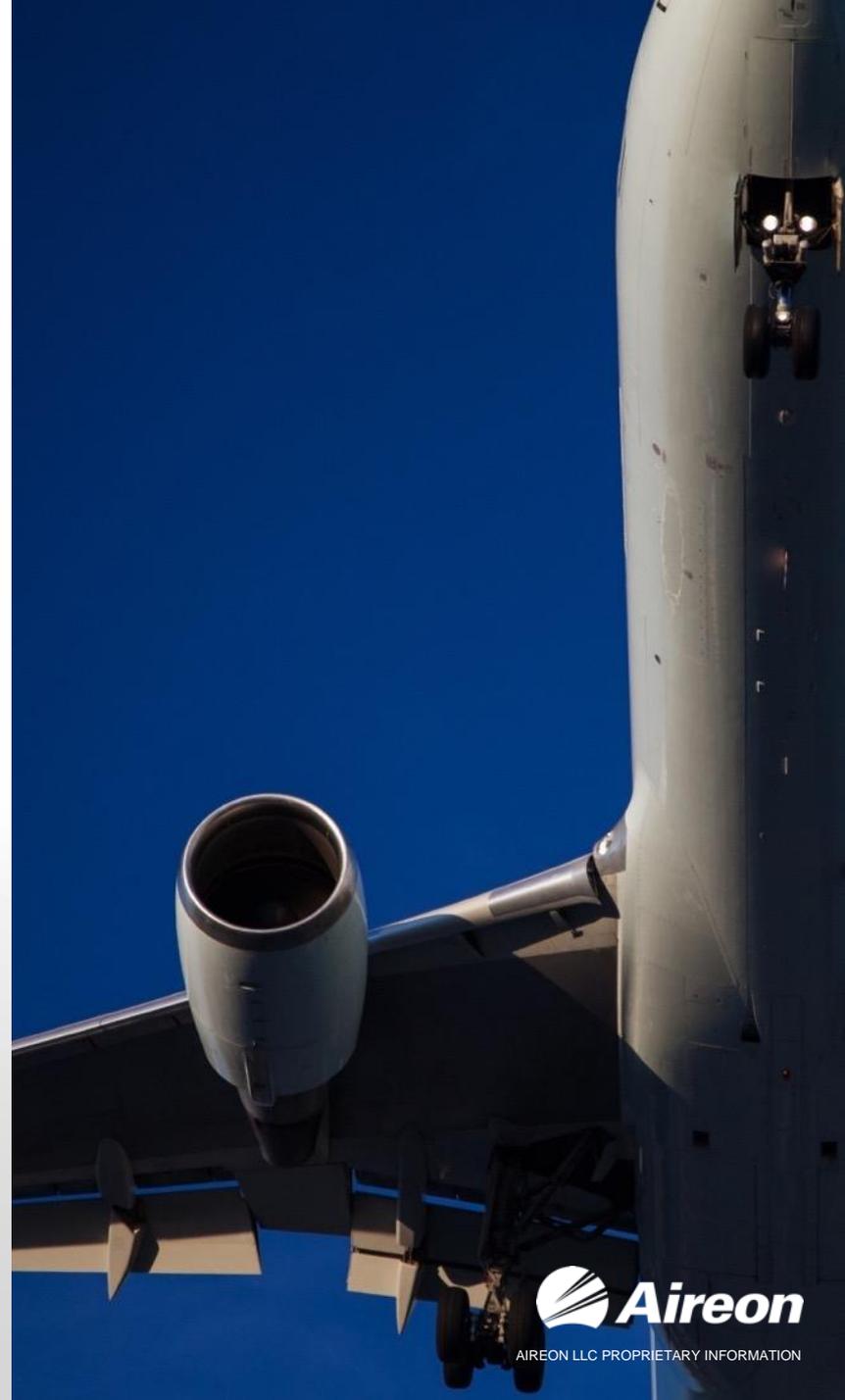
ICAO and Space-Based ADS-B

- Strong support for space based ADS-B during 12th Air Navigation Conference
- Space based ADS-B to be included in upcoming versions of GANP and ASBU
- ITU World Radiocommunication Conference (November 2015) 1090Mhz protection, allowing the operational usage of Satellite ADS-B for ATS surveillance



Aireon ALERT

Overview & Benefit



AIREON LLC PROPRIETARY INFORMATION

Aireon ALERT & Aircraft Flight Tracking



- Aireon Aircraft Locating and Emergency Response Tracking (ALERT)
 - Aireon ALERT will have global ADS-B visibility
 - Based on Aireon's core service - enables real-time flight tracking without new avionics
 - Position updates available every 8 seconds or less
- Details
 - A free emergency flight location service to be made available as a public service to qualified organizations
 - **The Aireon ALERT service will provide the last known position and track in the event of a loss of communications, distress or alert event**
 - A 24/7 call center will be available through IAA's COM facility
 - All airlines, states and rescue coordination centers can pre-register



Aireon ALERT will satisfy the ICAO 15 minute global flight tracking recommendation – providing updates every 8 seconds - **without additional avionics costs.**

Aireon ALERT: Service Overview

- Registration
 - User organization registers on Aireon ALERT website
 - User organization undergoes verification process and is issued a unique identification code
- Service Request
 - User calls with an Aireon ALERT request and is validated as an authorized user via their assigned identification code
 - Aireon ALERT Coordinator (IAA) logs the request in the Aireon ALERT request tracker
 - User provides the aircraft-of-interest's identification information
 - Coordinator queries Aireon's flight data system and obtains location and flight track data
 - Last known location will be supplied to the user by phone before the call is terminated
 - A pre-defined, standard data package that includes the last known position of the aircraft and a period of historical data shall be sent to the user via email
 - Additional requests for information related to same event or follow-up information shall be processed, as needed

NOTE: Aireon ALERT scheduled to “Go Live” by the end of 2017

Global Aeronautical Distress and Safety Systems (GADSS)

How Aireon can help



AIREON LLC PROPRIETARY INFORMATION

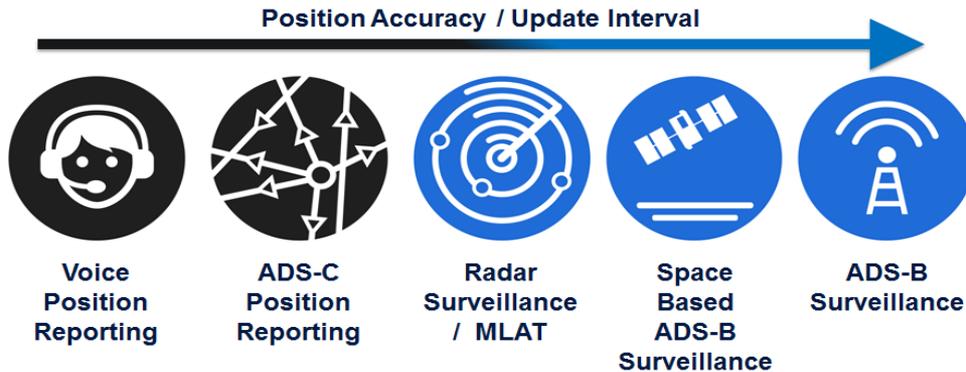
GADSS – Concept of Operations Improvement Opportunity

- **Space-Based ADS-B:** Expansion of space-based infrastructure to achieve global coverage during all phases of flight:
 - Satellite-integrated (space-based) systems will provide complete global coverage
 - Space-based ADS-B will provide oceanic and remote area tracking for the first time
 - ADS-B ground infrastructure could be augmented with space-based ADS-B to provide complete global en route tracking capability
 - Space-based ADS-B is scheduled to be available in Q2 2018
 - This will be a significant benefit globally and in particular for remote regions, oceanic areas and polar route operations:
 - ◆ Today, above 80N and below 80S the polar routes are effectively outside communications and surveillance coverage

GADSS and Space-Based ADS-B

- ADS-B and transmitting 4D position and identity:
 - Many aircraft over remote or oceanic airspace are not equipped with long range communication systems for regular transmission of 4D position
 - Most transport category aircraft are equipped with Mode S transponders which are, in accordance with Annex 10, ADS-B out capable
 - If that ADS-B out signal can be received and processed via satellite, no additional equipage would be required
 - Equipage of ADS-B is rapidly increasing as mandates take effect and new aircraft (standard equipage) are delivered

Space-Based ADS-B Will Improve Last Known Position Location



The calculations below show the impact of different surveillance update intervals on potential search areas for common aircraft

		Common Jets in INDIAN OCEAN			
		A320	A330	A340/B77W	A388
	cruise speed (knots)	427	475	482	488
Potential search area	PIREP (30min)	491,165	607,798	625,844	641,522
	ADS-C (15min)	122,791	151,949	156,461	160,380
	SB ADS-B (8sec)	9.7	12.0	12.4	12.7

Aireon and How It's Applicable to GADSS/SAR: A Summary

- Space-based ADS-B will provide complete global surveillance
- System fully operational by the end of 2018
- SAR organizations will have immediate access to aircraft positions if their state or ANSP has a contract with Aireon for surveillance service
- If not a customer, basic location and track information will be made available through the Aireon ALERT service (pre-registration and manual request required)
- We will keep ANSPs updated as Aireon ALERT becomes operational and open for registration

Questions & Discussions

