IAA
Space-Based ADS-B Projects

Surveillance Info Day
Brussels, 7 Dec 2017
Charlie O'Loughlin

IAA Space-Based ADS-B

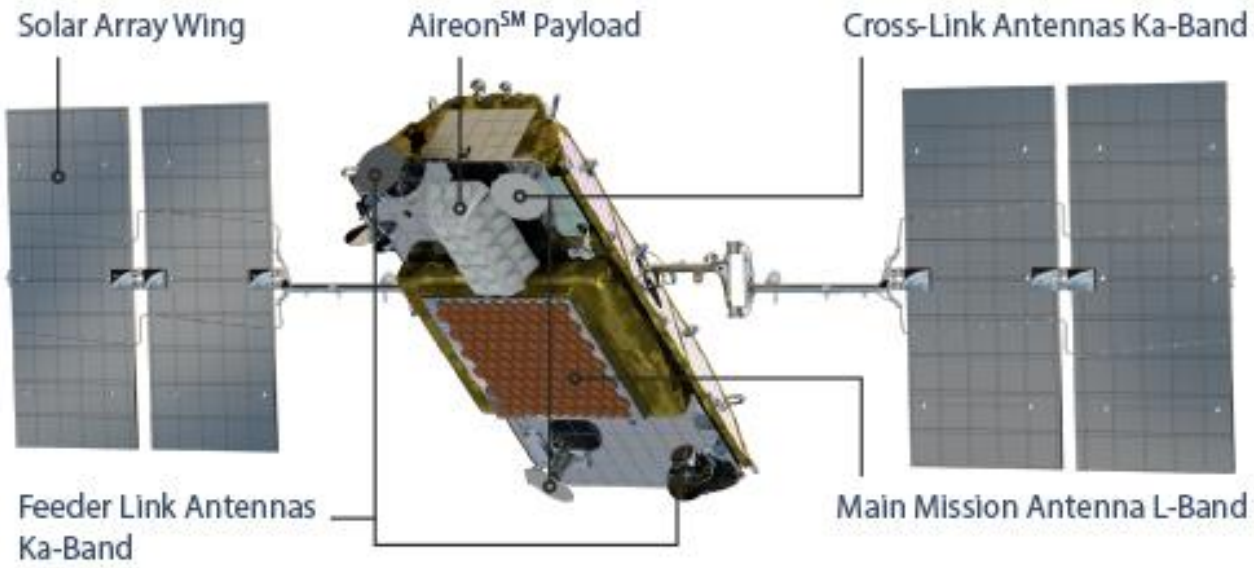
IAA has two projects related to space-based ADS-B:

1. **Evaluate space-based ADS-B for operational use in 5NM and 3NM airspace.**
2. **Aireon ALERT, a free global service, to provide the last received ADS-B position of aircraft in emergency situations regardless of global location to aviation stakeholders.**

IAA is part of the Aireon joint venture between Iridium, NAV CANADA, Enav and Naviair, to provide a global solution for tracking and monitoring aircraft anywhere in the world by using space-based ADS-B receivers.

IAA

Iridium NEXT Satellite



Iridium NEXT Satellite Specifications

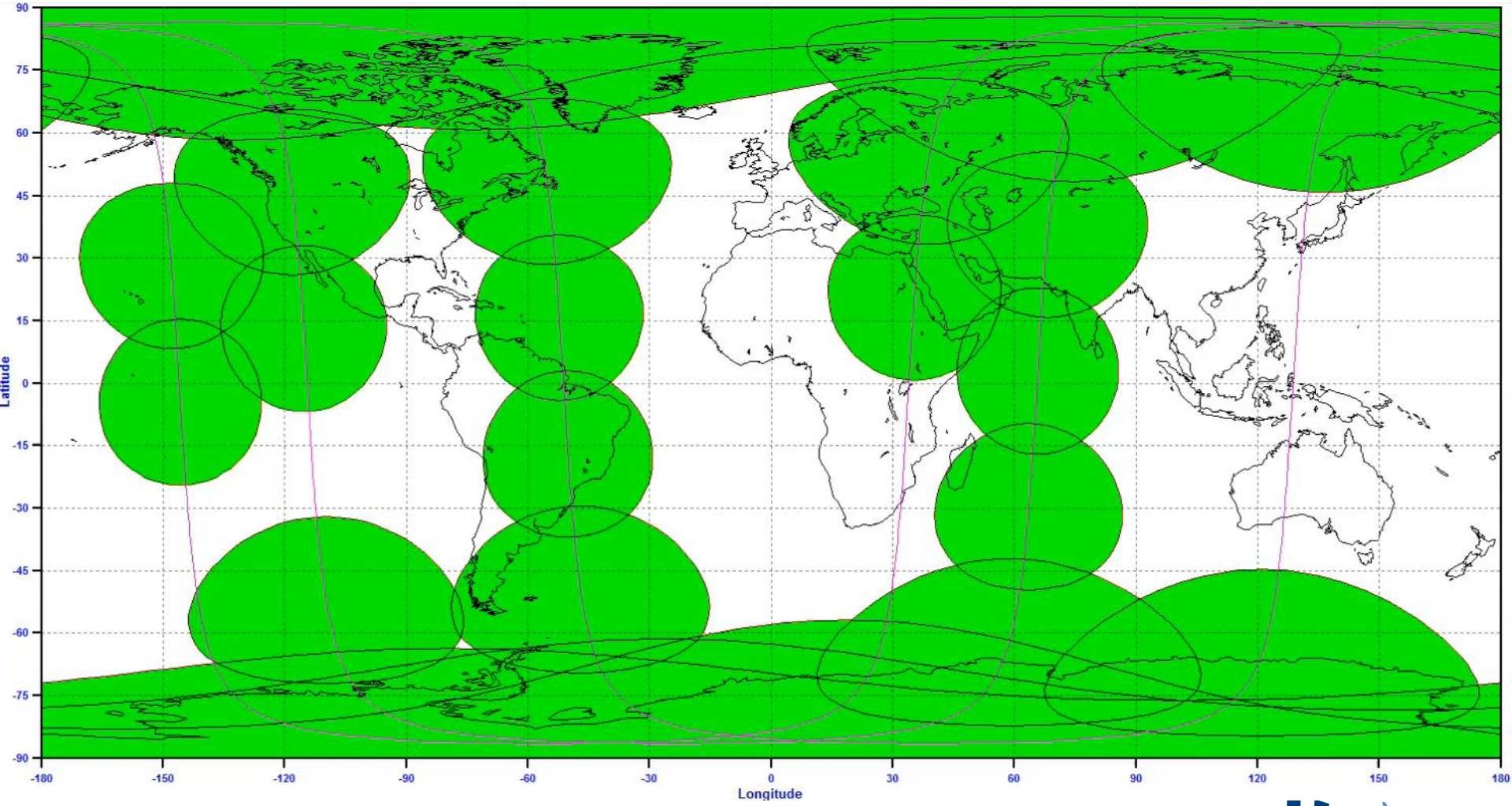
Deployed Wingspan	9.4m
Weight	860 kg (approx.)
Stowed Dimensions	3.1m x 2.4m x 1.5m

Orbit Characteristics

- 6 orbital planes of 11 satellites
- Near-polar orbit at 780 km altitude
- Orbit period ~100 minutes
- Ground speed ~24,000 km/h
- Satellite footprint diameter >2000NM
- Aircraft in satellite view < 9m

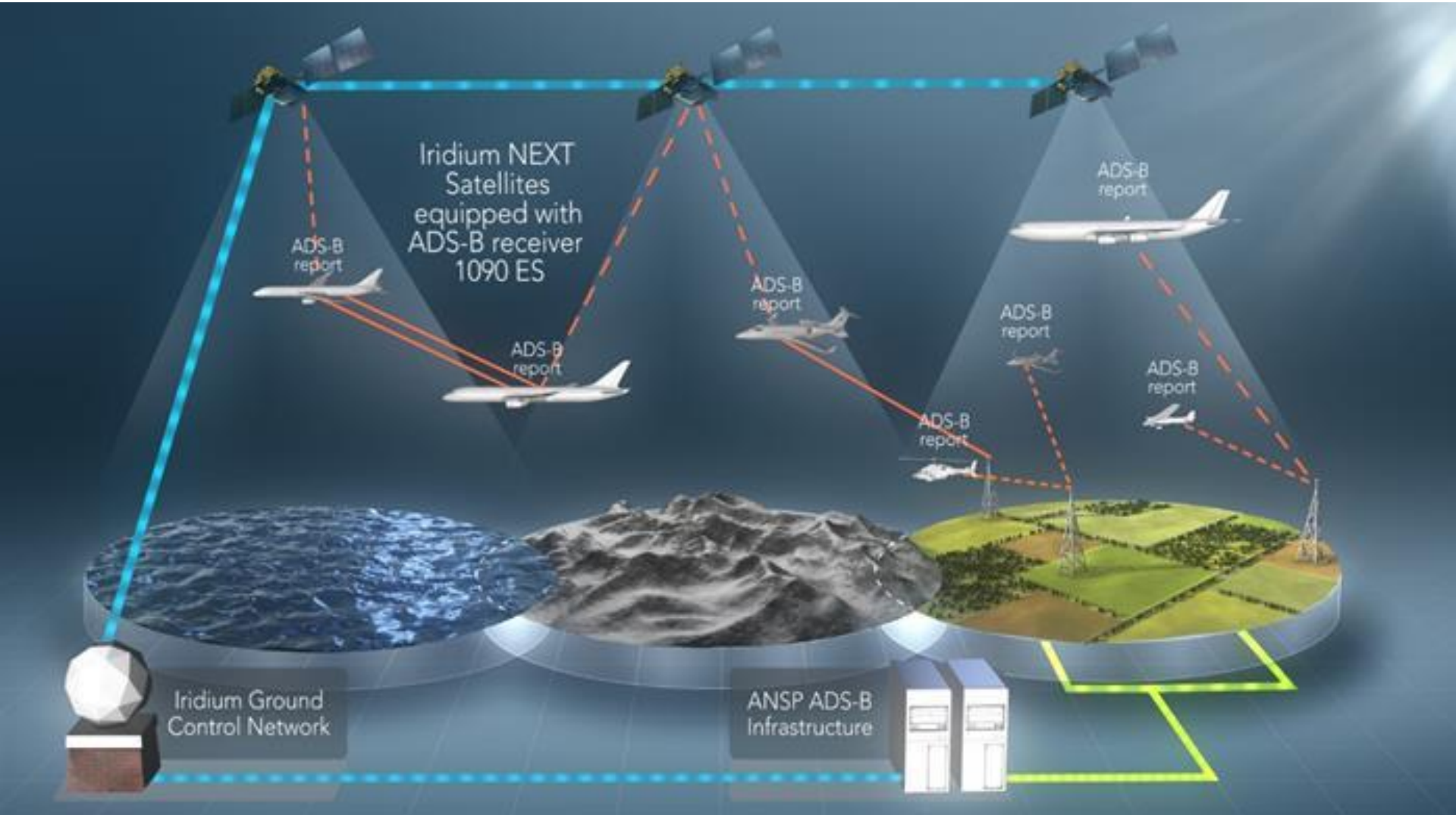
SpaceX Iridium NEXT Launch-3

Current Aireon Coverage



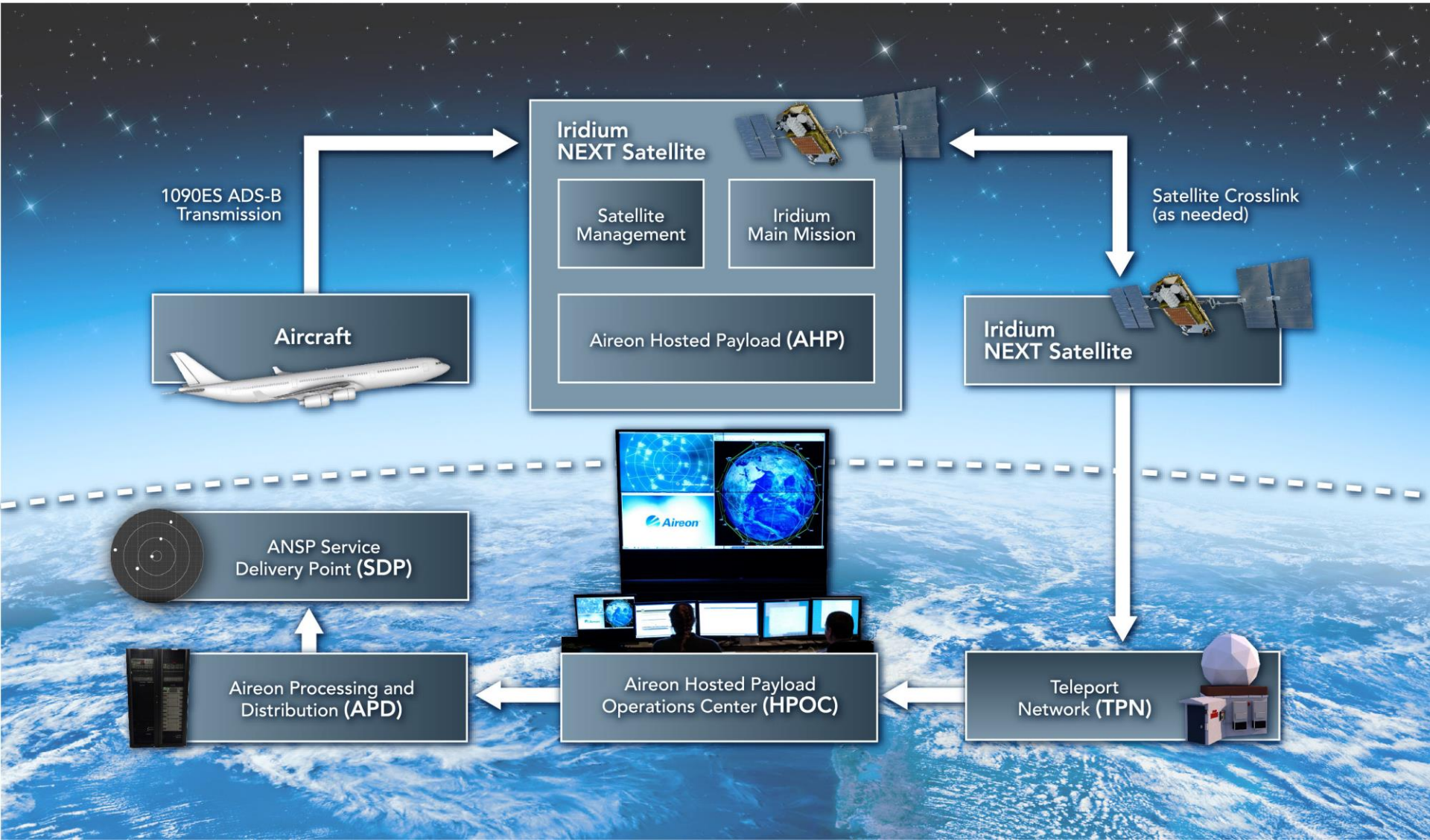
23 Operational Payloads (total of 30 in orbit after 3rd Launch)

Aireon Concept

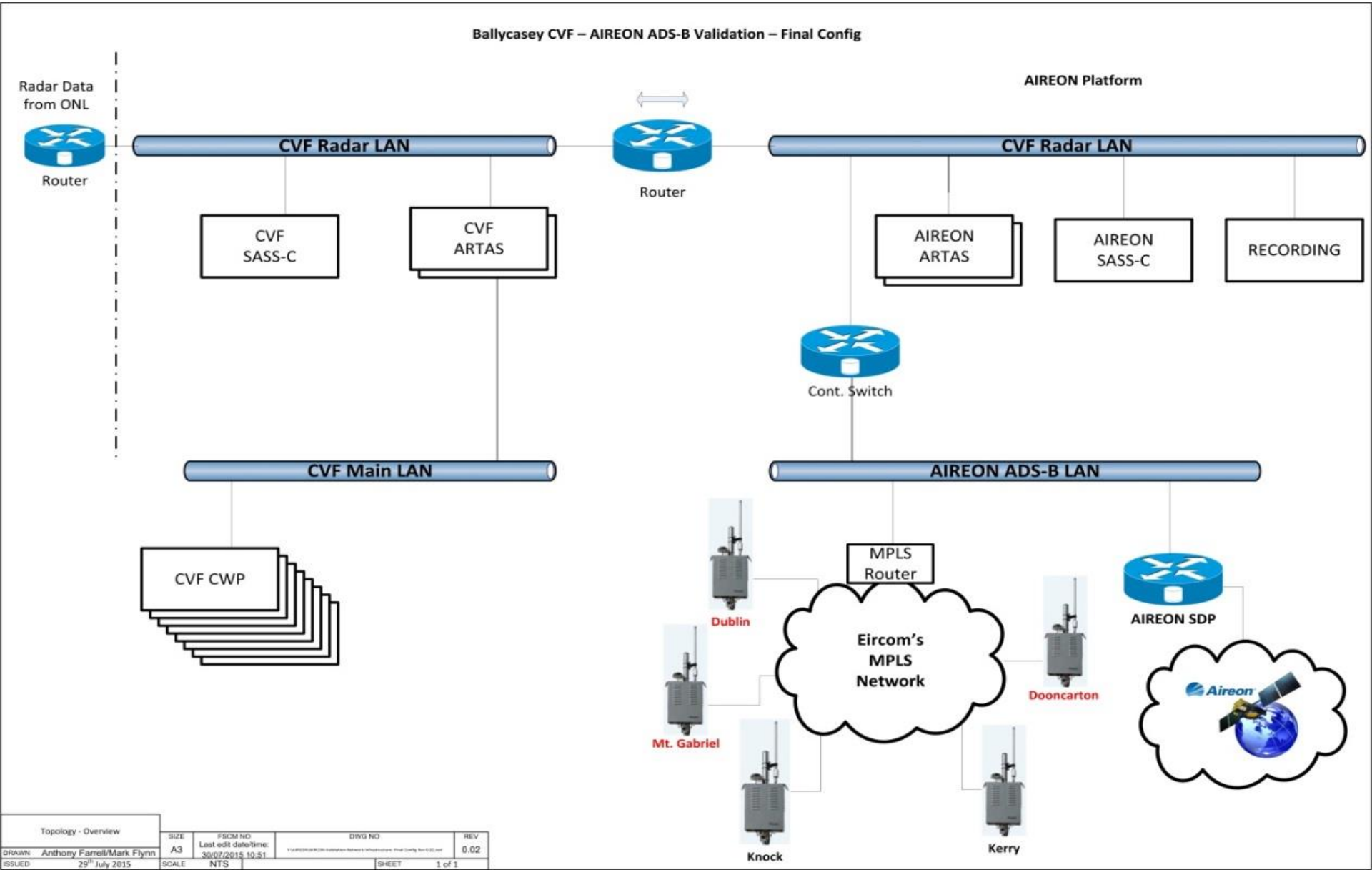


Iridium NEXT Constellation

Aireon System Architecture



IAA ADS-B Validation Infrastructure



Aircraft Equipage Requirements

Aircraft avionics must be compliant with RTCA DO-260B/EUROCAE ED-102A (DO-260 are supported)

1. Avionics certified to FAA TSO-C166b or international equivalent
2. Top mounted omni ADS-B antenna
3. ADS-B transponder equipage class is one of the following:

Aireon Supported ADS-B Transmitter Classes:

Transmitter Class	Minimum Transmit Power
A1	125W
A2	125W
A3	200W
B1	125W

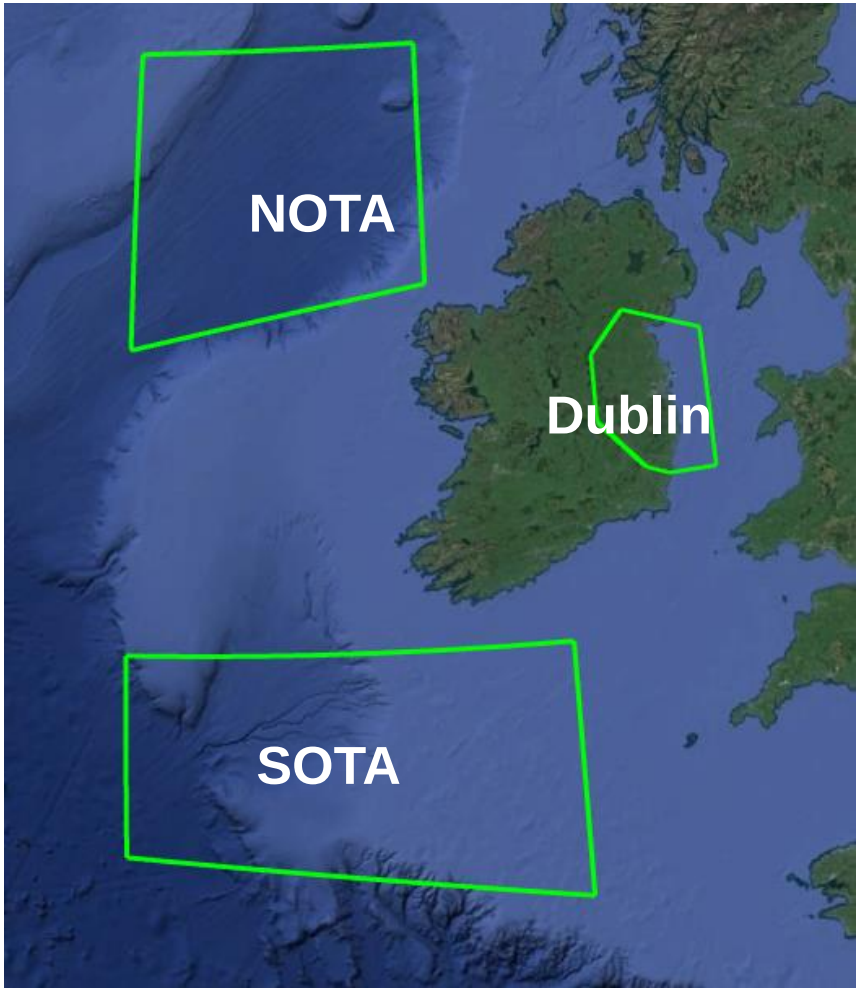
ADS-B Validation Steps

- Integration of space-based ADS-B into the IAA's ADS-B validation platform (Q3 2017)
- Integration of SOTA, NOTA and Dublin terrestrial ED129B compliant ADS-B sensors. (Q1 2018)
- Using SASS-C measure the ESASSP surveillance performance of "ARTAS with Radar" Vs "ARTAS with radar and space-based ADS-B." (Q1 2018)
- Using SASS-C measure the ESASSP surveillance performance of "ARTAS with radar" Vs "ARTAS with radar and ground ADS-B." (Q2 2018)

ADS-B Validation Scope

IAA will focus on specific volumes of airspace with Radar, Terrestrial ADS-B and space-based ADS-B coverage.

- Space-based ADS-B for 5NM separation will be evaluated in NOTA and SOTA airspace.
- Space-based ADS-B for 3NM separation will be evaluated in Dublin CTA airspace.

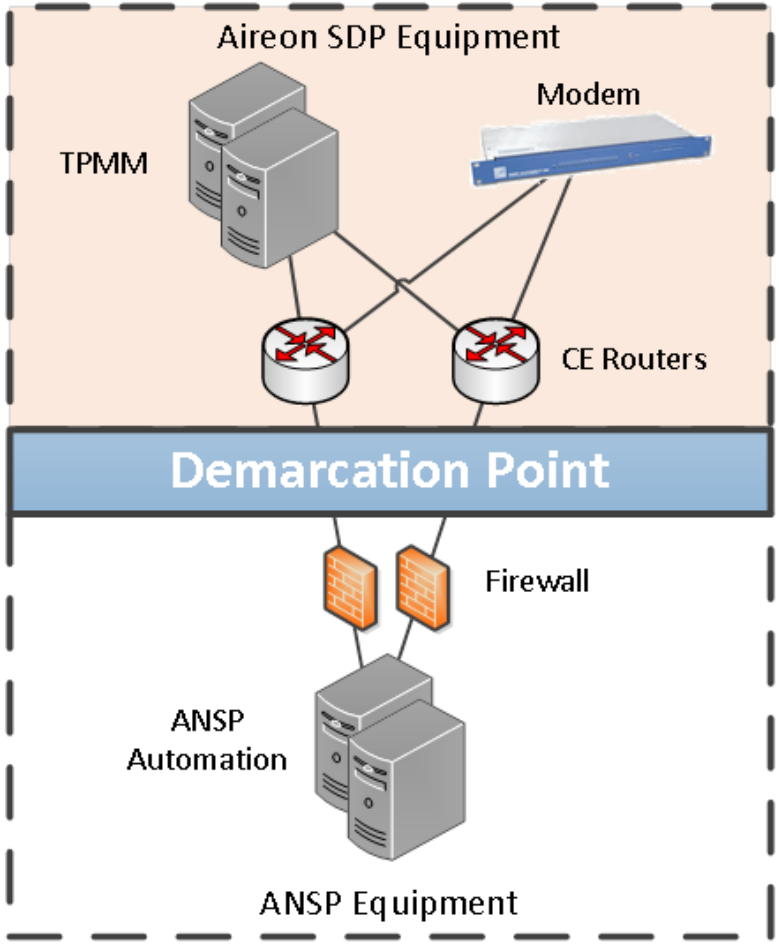


ADS-B Validation Concepts

- ADS-B augmenting ARTAS, means the ADS-B position report can be used to improve the accuracy of a track initiated by a radar. Initially ADS-B reports are to be used in ARTAS track continuation not ARTAS track initiation.
- Terrestrial ADS-B to augment ARTAS when the addition of terrestrial ADS-B improves the surveillance performance of ARTAS.
- Space-based ADS-B to augment ARTAS when the addition of space-based ADS-B improves the surveillance performance of ARTAS.
- IAA strategy is to always have at least two independent sources of all aircraft positions.
- The introduction of space-based ADS-B as a sole surveillance source can only occur once all aircraft in the FIR are ADS-B capable. (Q3 2020+)

Aireon Safety Certification

- EASA has confirmed Aireon is a surveillance data service provider rather than a surveillance system.
- Aireon is working to achieve EASA certification.
- Aireon's safety responsibility ends at the output of their service selivery point.



IAA Space-Based ADS-B Safety Certification

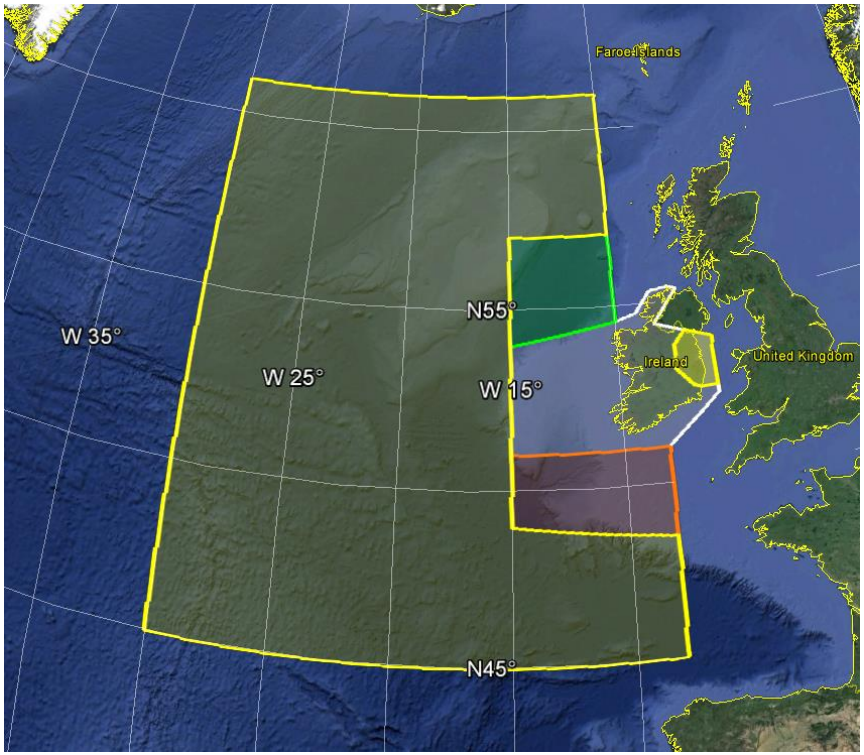
- IAA initially introducing terrestrial ADS-B into operation prior to introducing space-based ADS-B.
- IAA will develop the safety case required for IAA operational use of the Aireon space-based ADS-B data, in the same way we would for the operational use of surveillance data received from another ANSP.
- IAA will carry out ATC controller operational evaluations, and SASS-C technical evaluations to support the safety case for the operational use of space-based ADS-B.

IAA Aireon Service Volumes

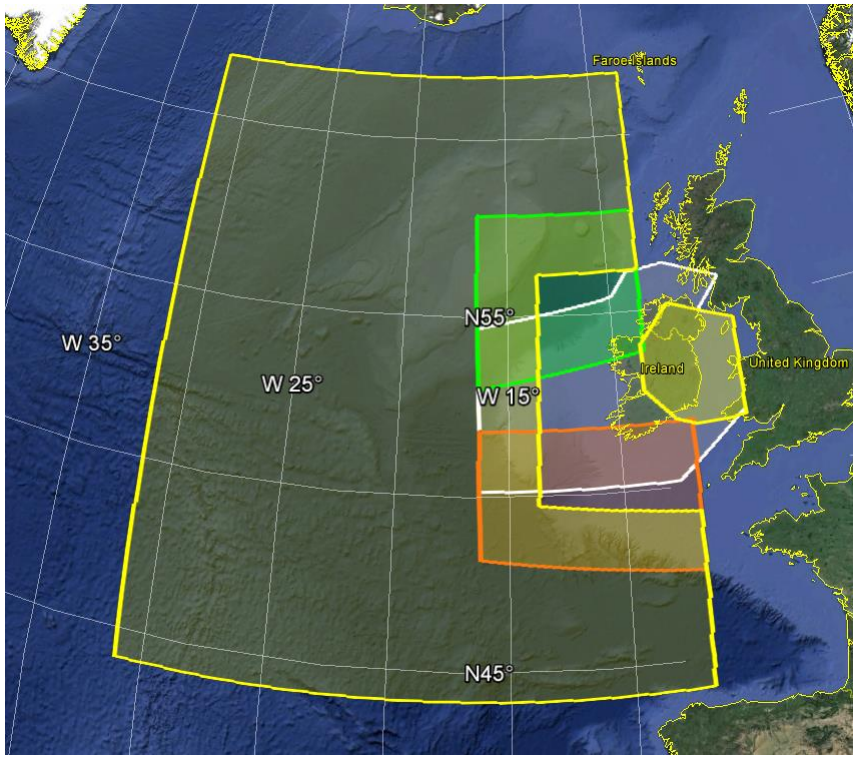
The Geographical scope of IAA Aireon Data is;

Irish FIR, SOTA, NOTA and SHANWICK & 50Nm buffer.

Original Service Volumes



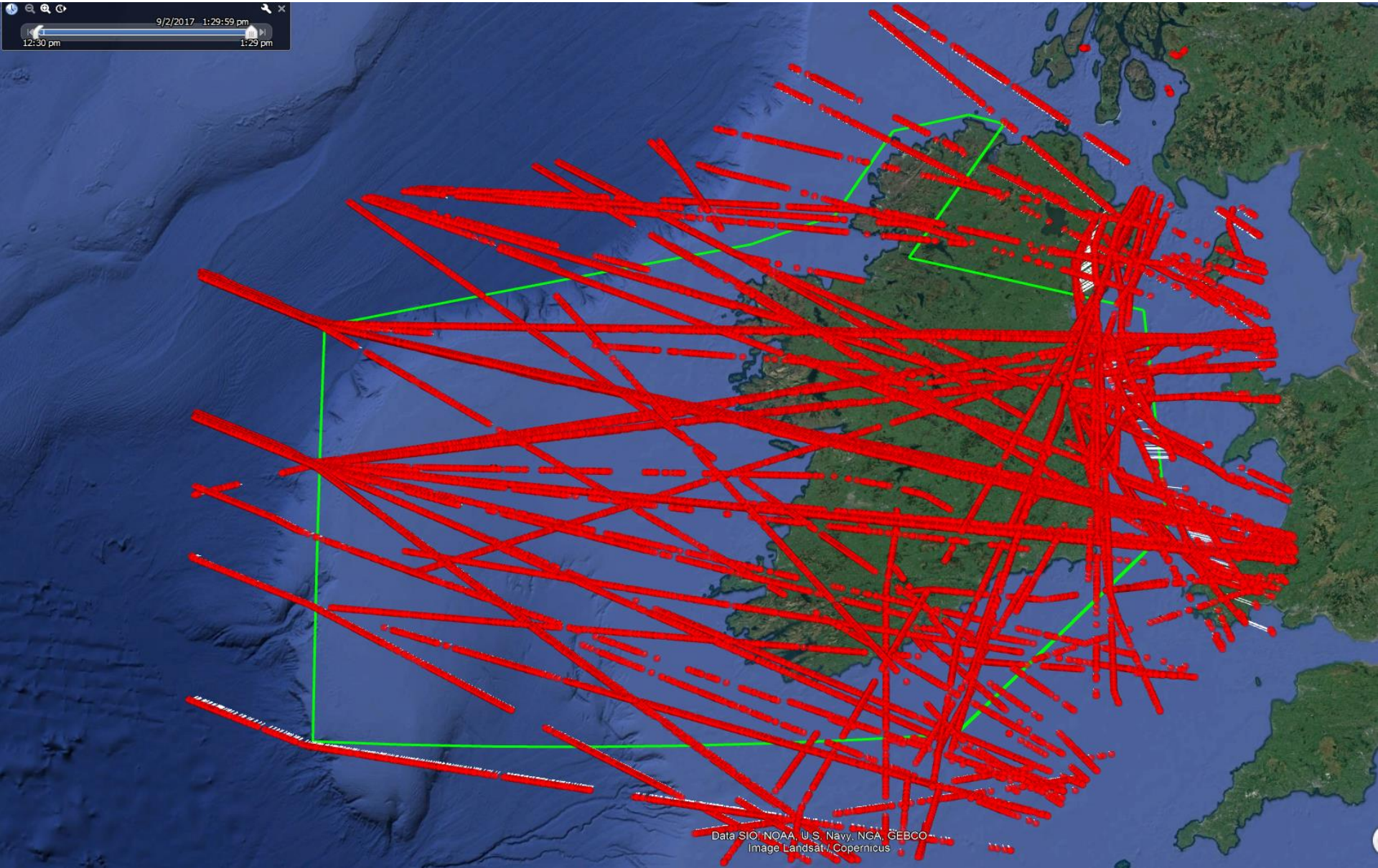
Buffered Service Volumes



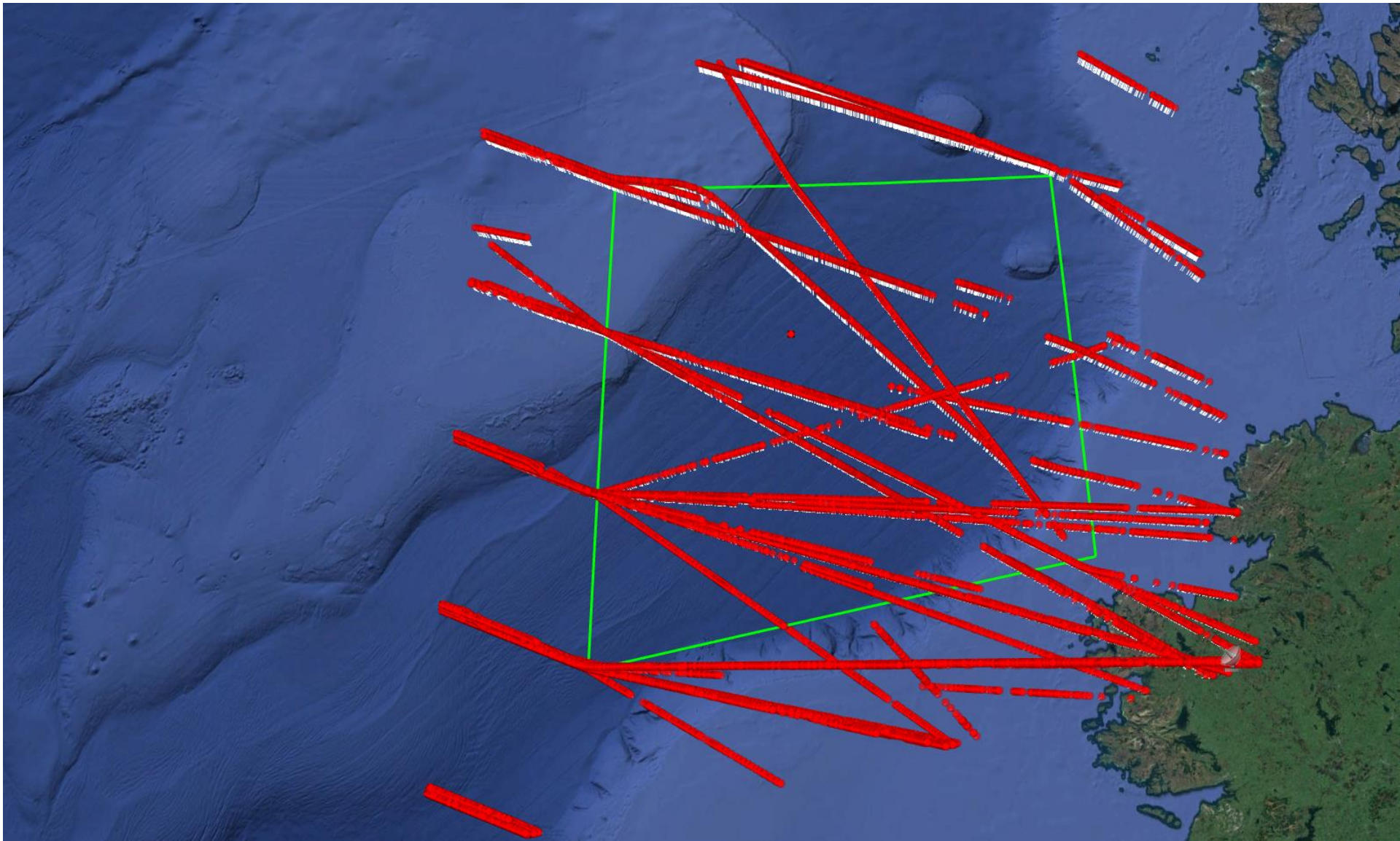
Aireon ARTAS Interface

- Aireon data is delivered over MPLS connections.
- Aireon ADS-B compliant with EUROCAE ED129B.
- Aireon ADS-B data is ASTERIX Cat 21 Ver 2.4
- IAA has five Aireon service volumes, IAA FIR, NOTA, SOTA, Dublin CTA and Shanwick.
- IAA space-based ADS-B certification will focus on NOTA, SOTA and Dublin CTA service volumes.
- Each service volume has a unique SAC/SIC.
- Each service volume has a virtual Radio, with a defined location and 24bit ICAO address, similar to a radar beacon.

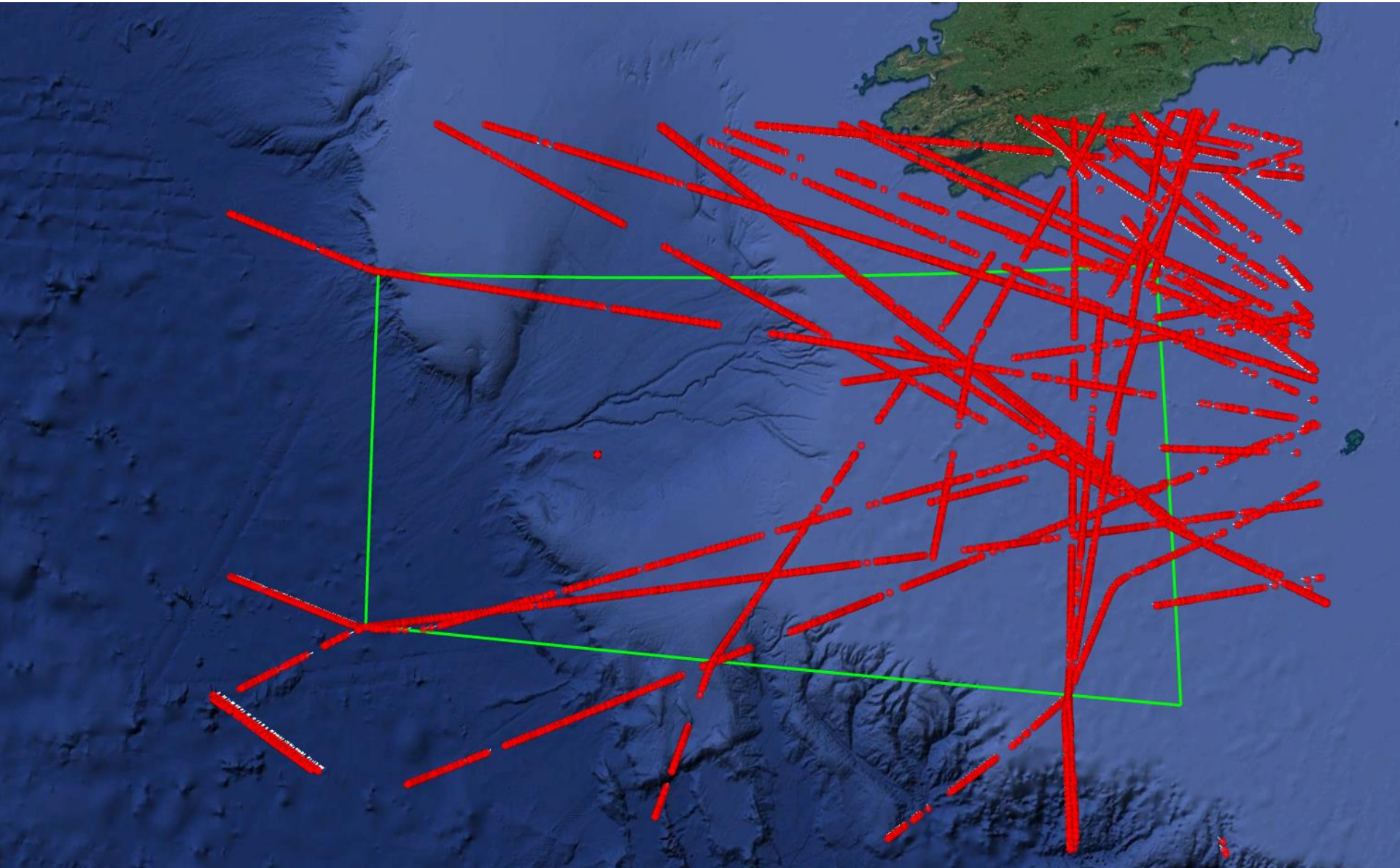
IAA FIR


9/2/2017 1:29:59 pm
12:30 pm
1:29 pm
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

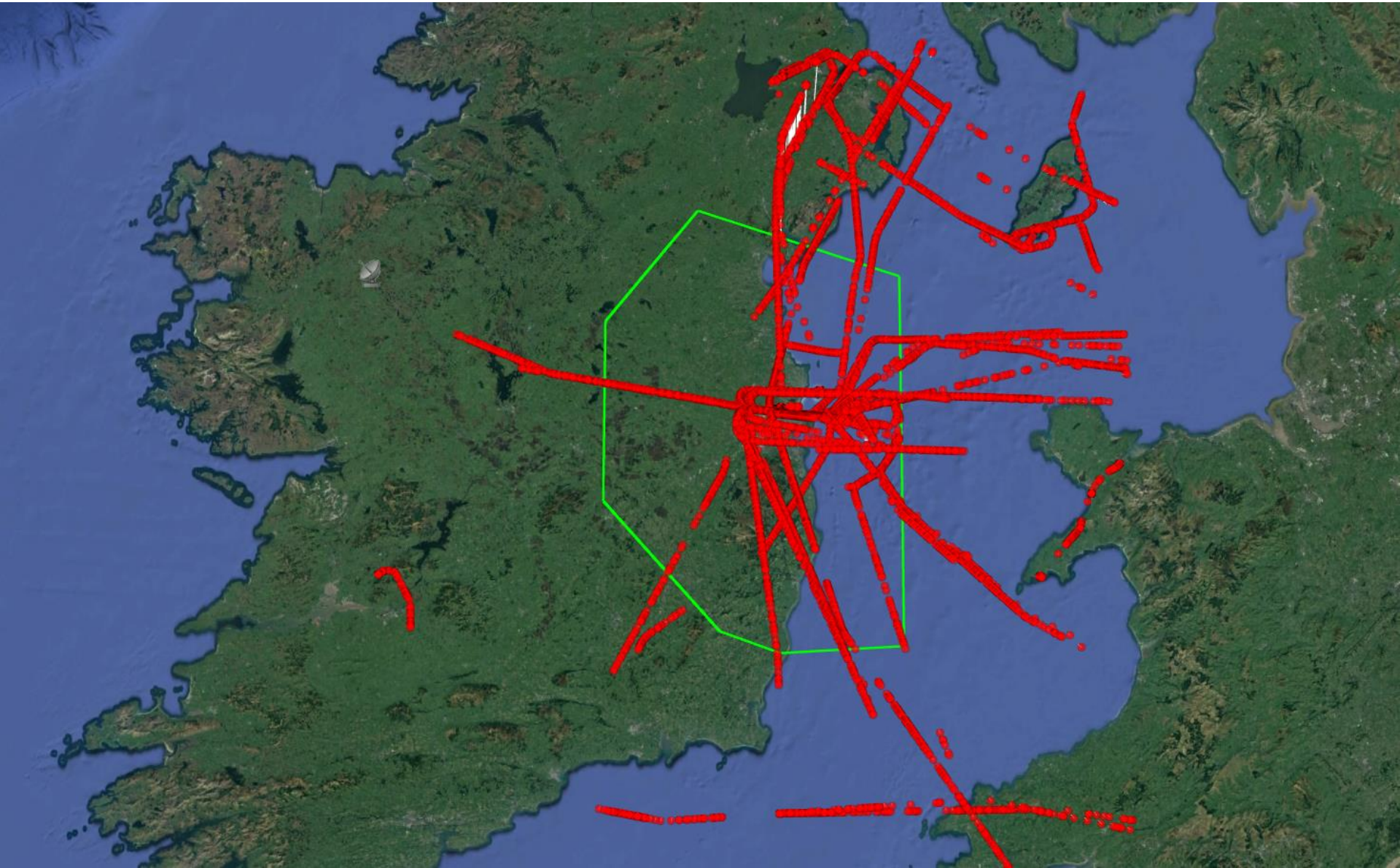
NOTA



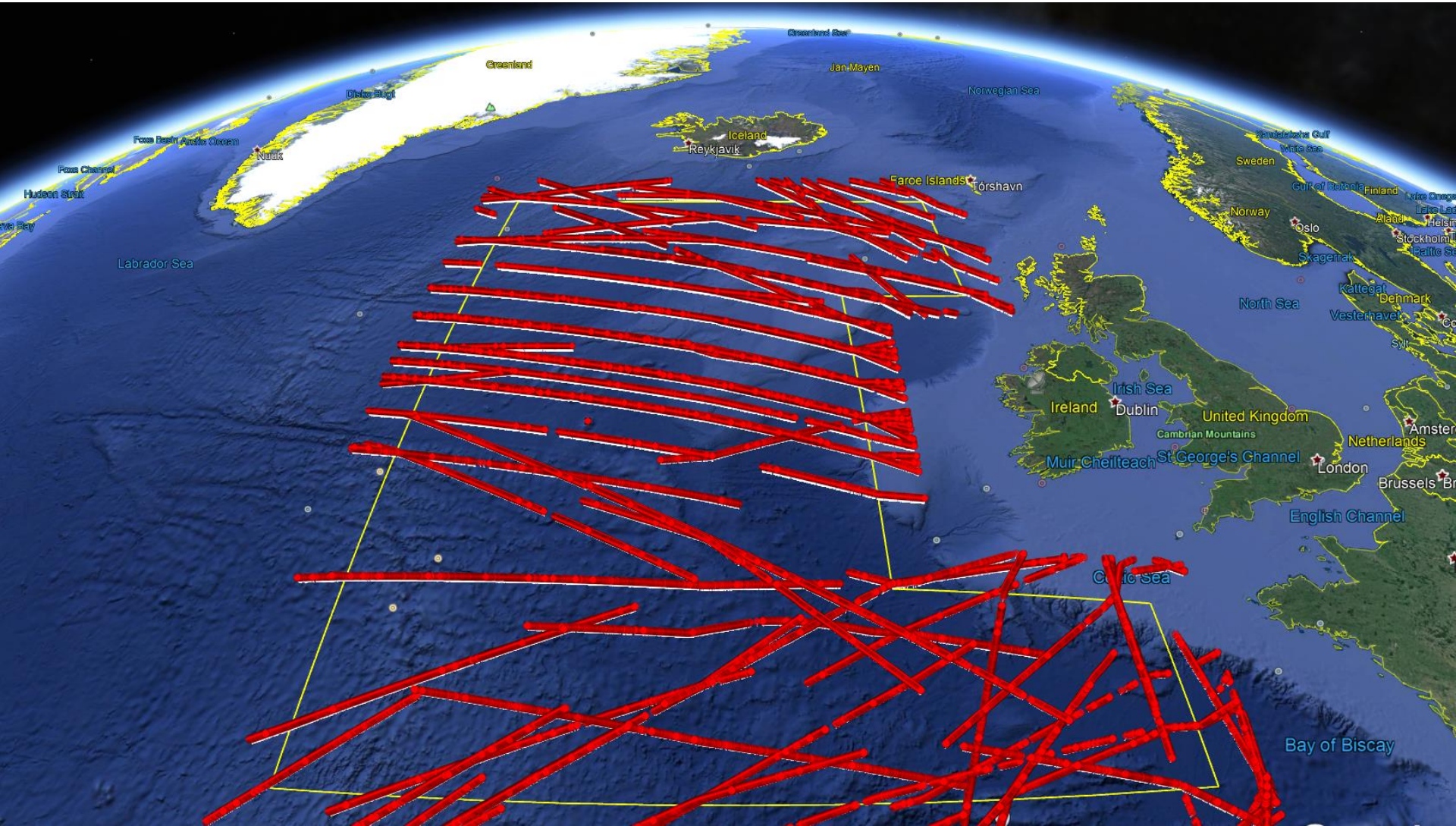
SOTA



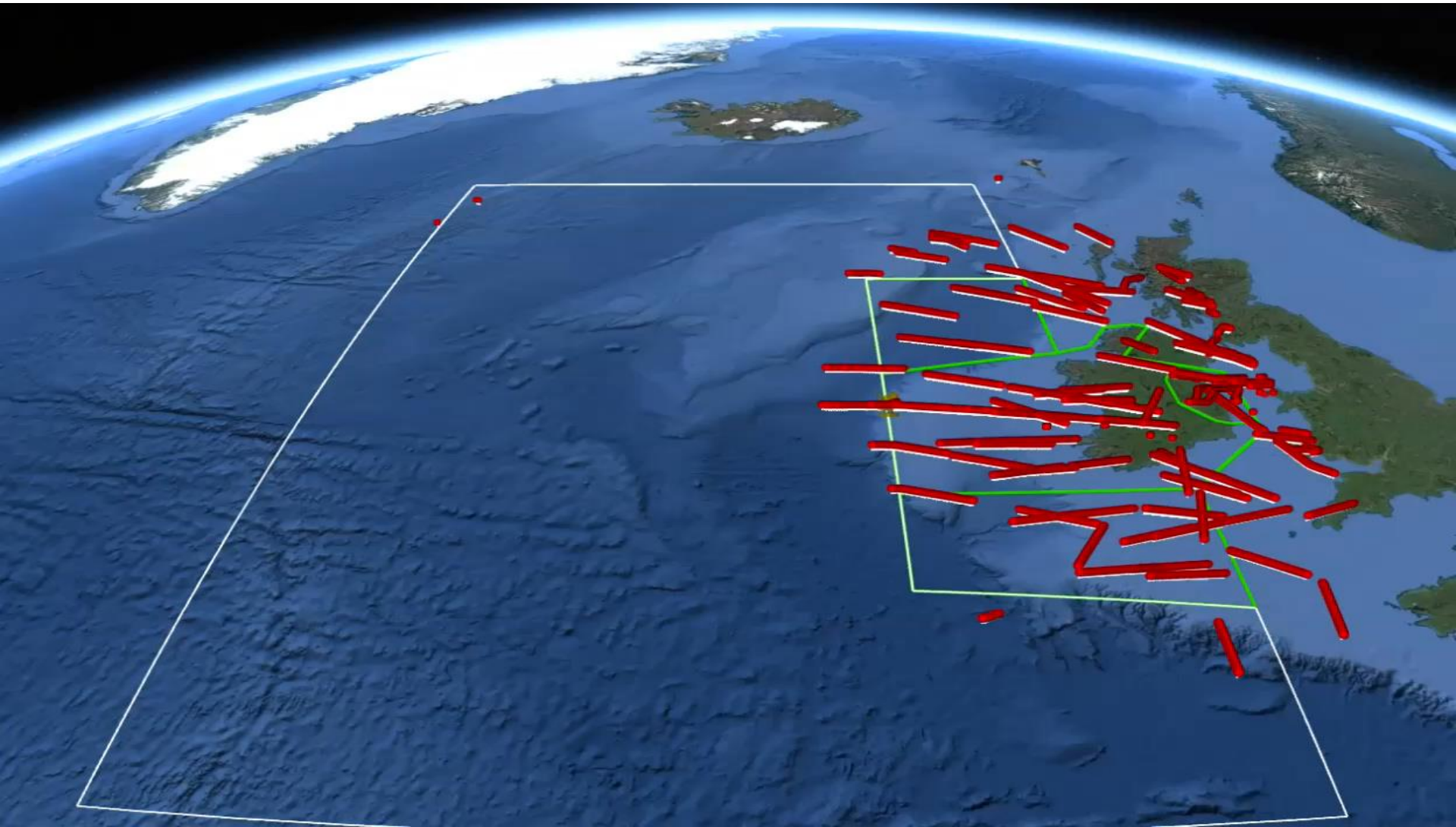
Dublin



Shanwick

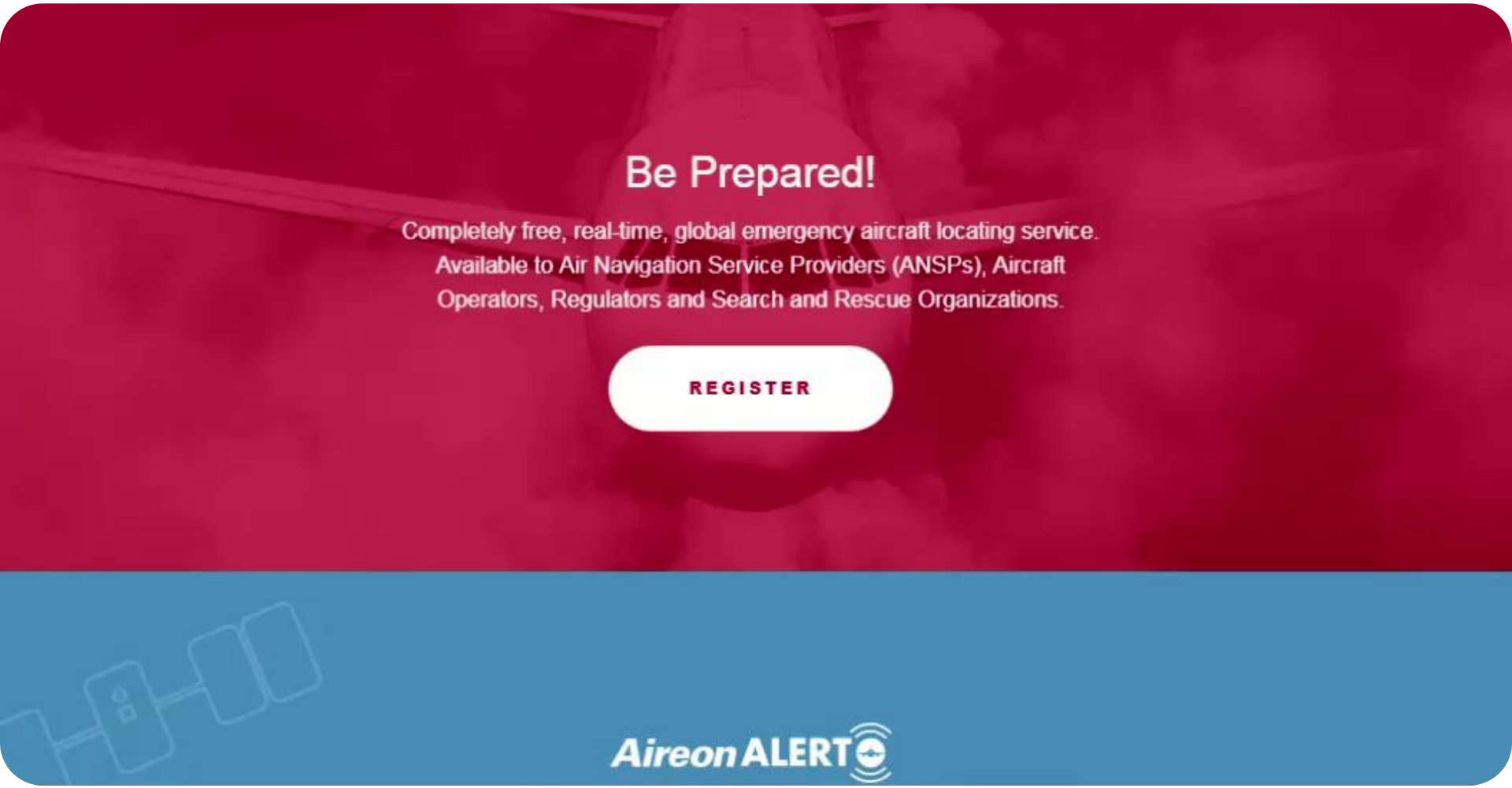

Greenland
Jan Mayen
Norwegian Sea
Iceland
Reykjavik
Faroe Islands
Tórshavn
Nuuk
Labrador Sea
Sweden
Norway
Oslo
Finland
Stockholm
Denmark
North Sea
Irish Sea
Ireland
Dublin
United Kingdom
Cambrian Mountains
Netherlands
London
Brussels
St George's Channel
Muir Cheilteach
English Channel
Bay of Biscay

ARTAS with Radar and Space-Based ADS-B



Aireon ALERT

POWERED BY IAA



Be Prepared!

Completely free, real-time, global emergency aircraft locating service. Available to Air Navigation Service Providers (ANSPs), Aircraft Operators, Regulators and Search and Rescue Organizations.

REGISTER

Aireon ALERT

How Does Aireon ALERT Work?

Aireon ALERT will utilize Aireon's space-based ADS-B data and will be operated H24/365 by IAA at its North Atlantic Comms Centre in Ireland.

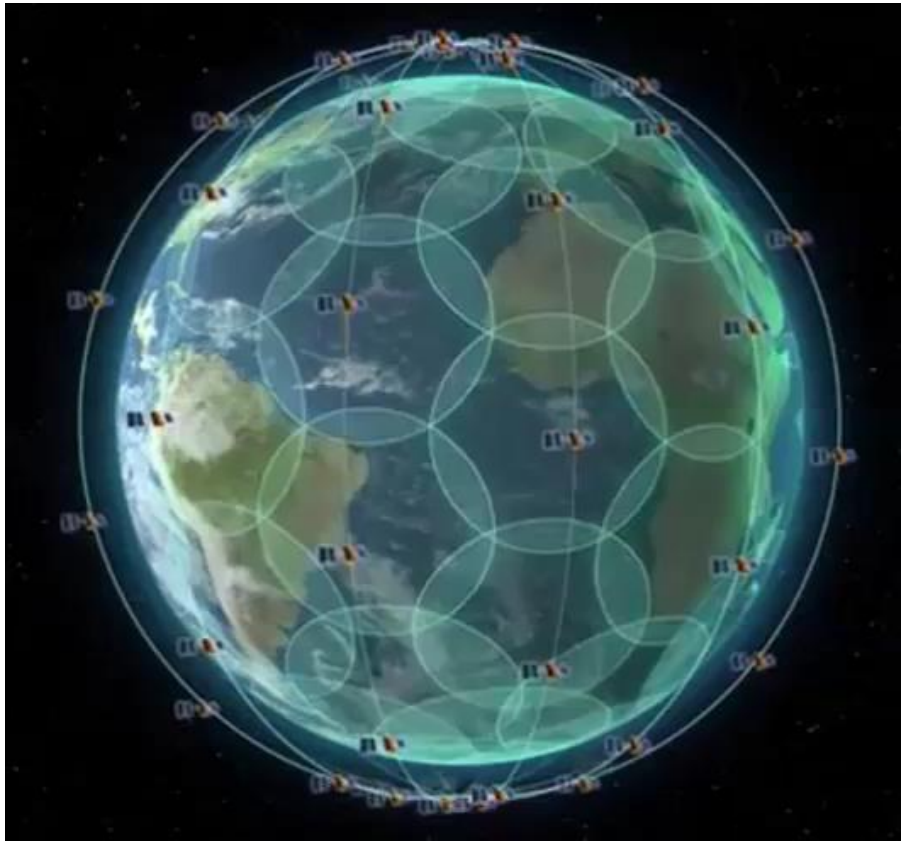
Why is Aireon ALERT Needed?

Before the Aireon space-based ADS-B system, real-time aircraft surveillance wasn't possible for remote, oceanic and arctic regions. To accurately know the last reported location of an aircraft is an invaluable asset in emergency situations.

Who Can Sign up for Aireon ALERT?

- ANSPs
- Aircraft Operators (Airlines)
- Search & Rescue Organizations
- Aviation Regulators

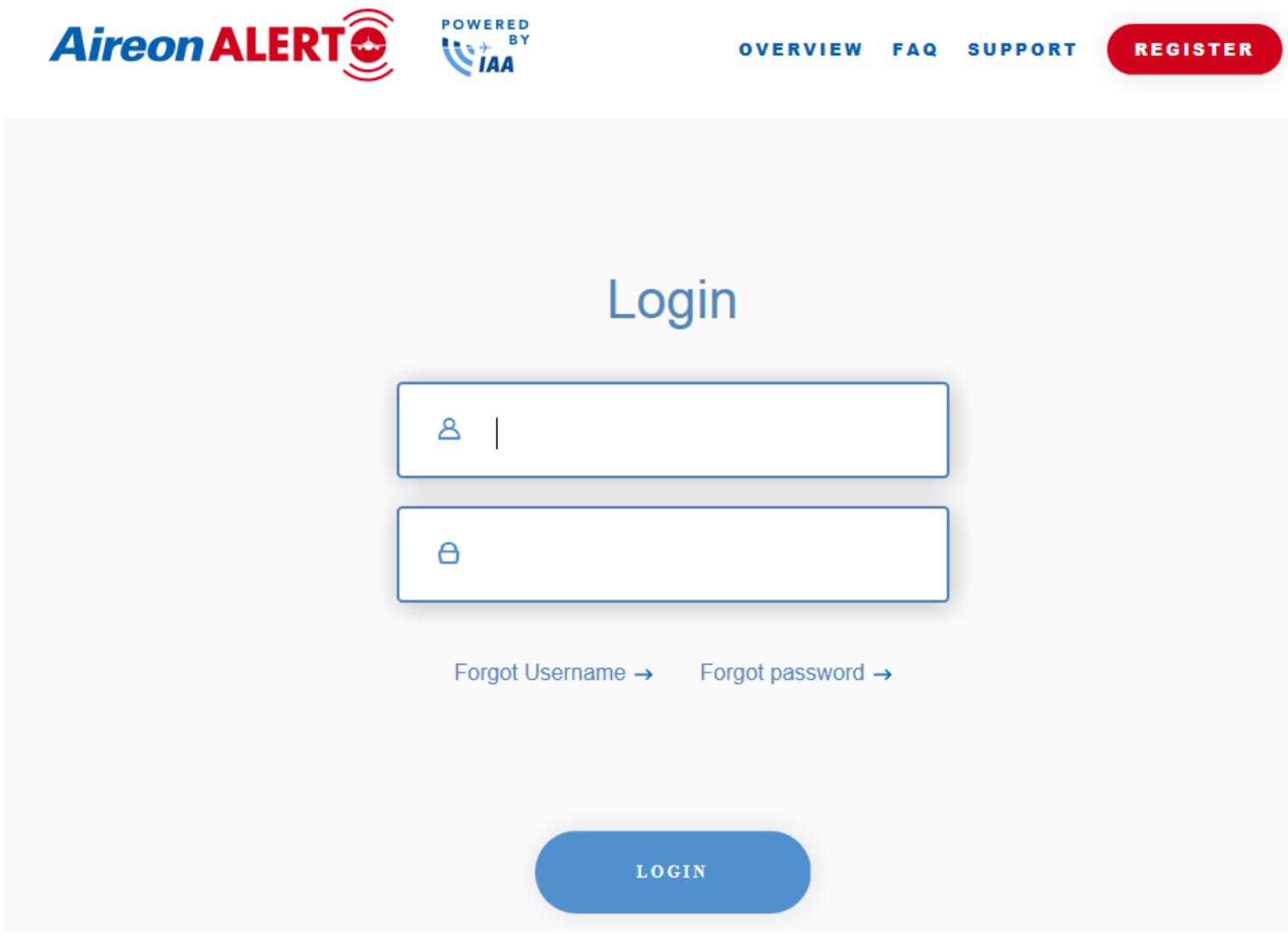
Aireon ALERT is completely free



How Does the Aireon ALERT Service Work?

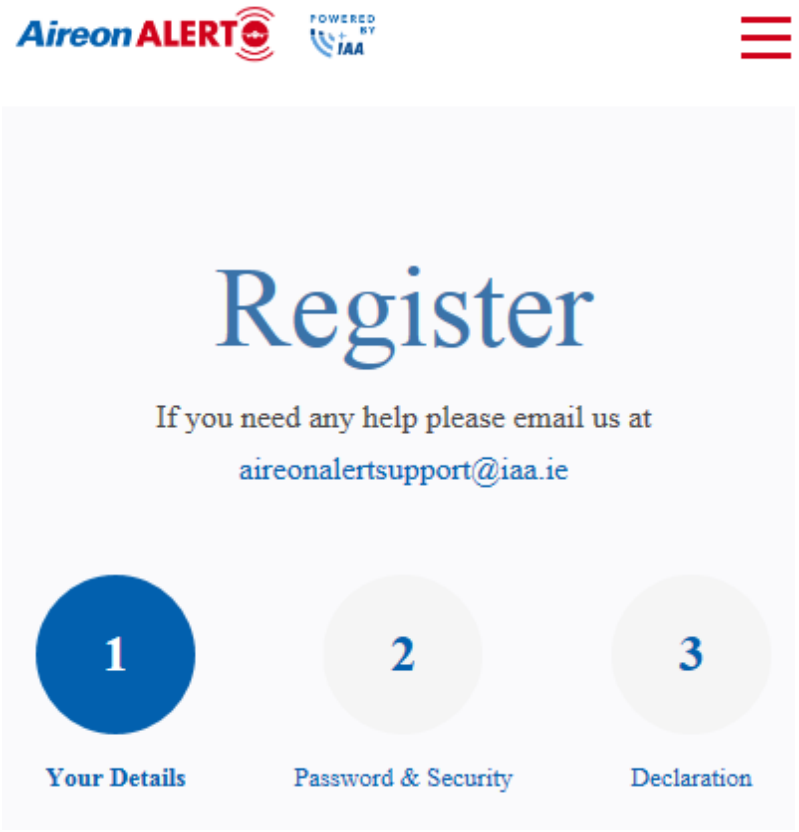
- In emergency situations where an aircraft cannot be located, a pre-registered ANSP, aircraft operator (airlines), search & rescue organization or aviation regulator can call the Aireon ALERT 24/7 phone number and provide the missing Aircraft's Unique ICAO 24Bit Address (in HEX i.e. 4CA123)
- The Aireon ALERT operator will then locate the last reported position of the aircraft, and if found, will provide that location in WGS84 coordinates to the stakeholder over the phone.
- The Aireon ALERT operator will also email a report of the missing aircraft to the Aviation stakeholder.

Aireon ALERT Login



When will Aireon ALERT be Operational?

- Aireon ALERT will be available once the full constellation of 66 Iridium NEXT satellites hosting the Aireon ADS-B payloads are in orbit and operational.
- It is planned that this will occur in Q4 2018.
- **Pre-registration for Aireon ALERT will commence Q1 2018.**



Questions?

Please email questions to charlie.oloughlin@iaa.ie