

Inmarsat Update

ISPACG 35 / FIT 17

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Director, Air Traffic Services
28-29 July 2020

Agenda

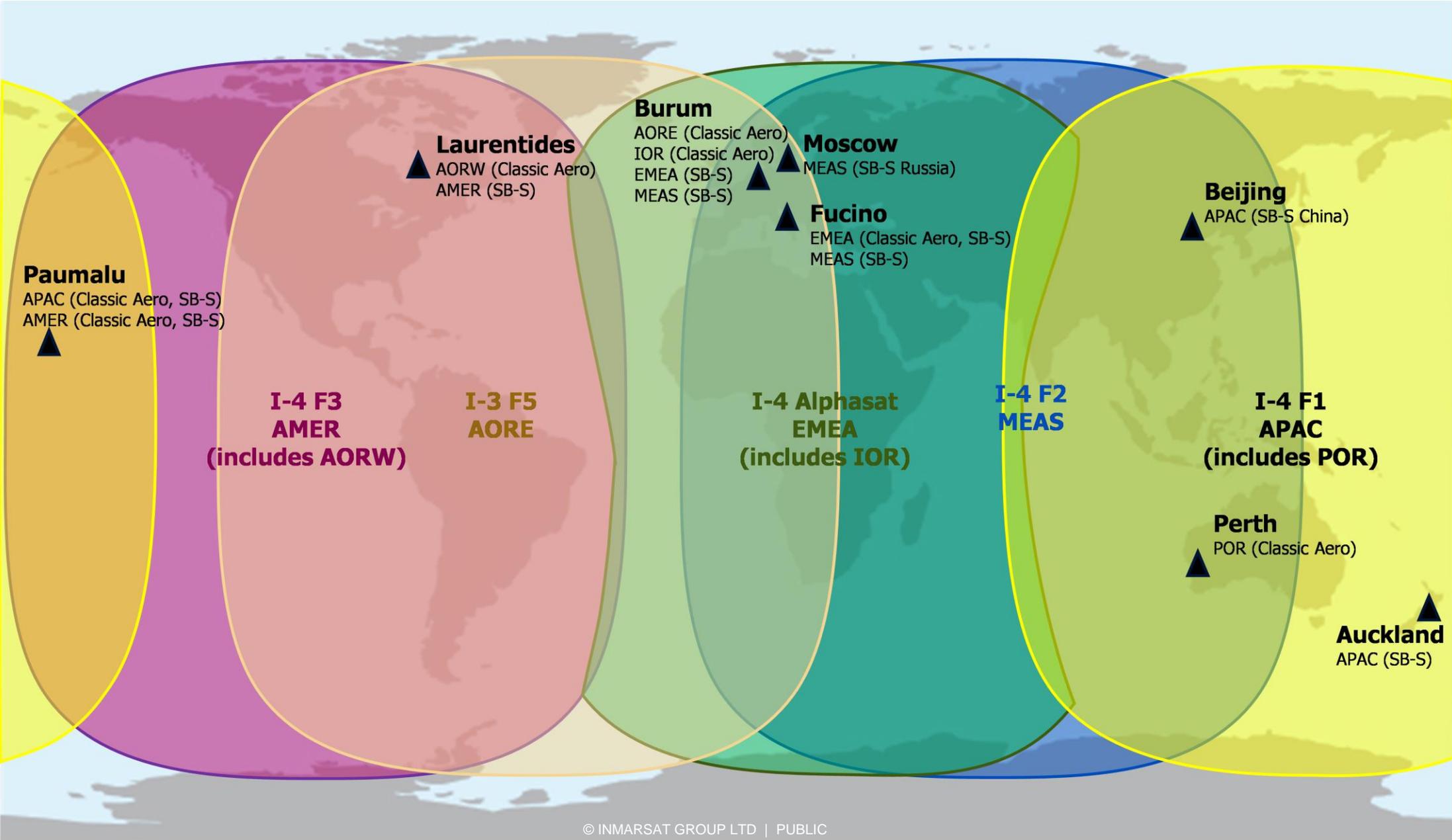
Update on Classic Aero

- Current status
- Network improvements
- Cybersecurity

Update on SB Safety and IRIS

- Current status
- Inmarsat message timing analysis for PT-Satcom
- IRIS

Inmarsat Operational Coverage Map (Classic Aero and SB-Safety)



MTSAT Service Closure

After almost 14 years of Interoperability with the Inmarsat Classic Aero System, the JCAB MTSAT service has closed:

- Removal of reference to the MTSAT satellite from the global Classic Aero network global system table transmissions occurred on Tuesday 4th February (15:00 UTC), allowing MTSAT users to migrate to Inmarsat service prior to the planned JCAB cessation of the reference P-channel transmissions on Thursday 6th February at (15:00 UTC)
- Inmarsat and SITAONAIR closely monitored the transition of aircraft to Inmarsat/SITAONAIR service prior to the cessation of the reference channel transmission, which marked formal closure of the satellite availability

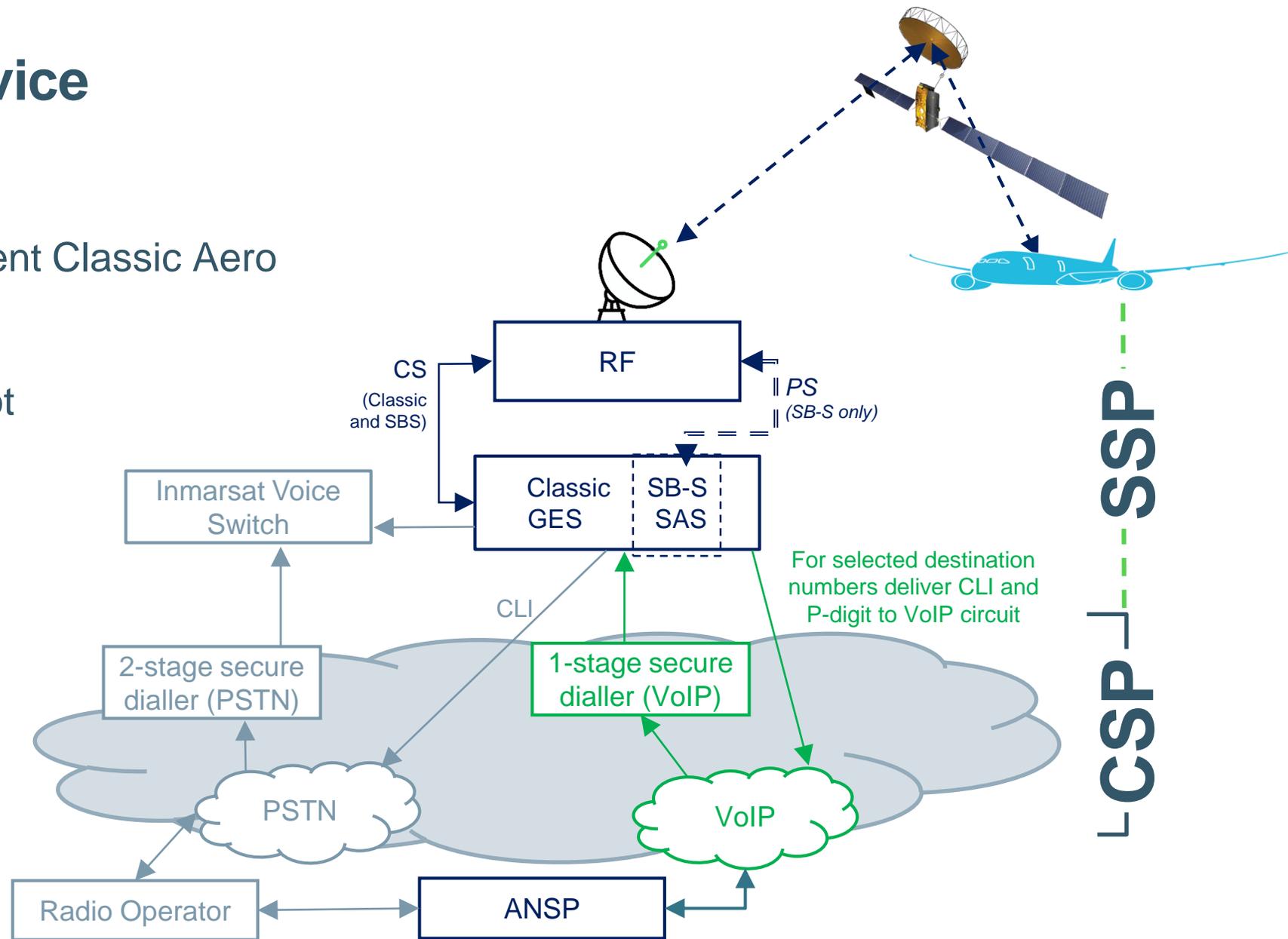
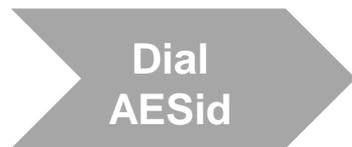
GES Software & Hardware Upgrades

- Due to essential maintenance at Paumalu, dormant half of Perth modified to carry APAC traffic as if 17 June
- Enhanced the Radio Frequency System (RFS) at Fucino (both antennas fully refurbished with new equipment and new rack interfaces) — Completed
- GES software upgrade 9.1.3: Laurentides, Perth, Burum, Fucino, Paumalu. (This includes the new T-channel enhanced management software, for the mitigation of certain mis-bursting terminals, which has been operating from 19th February)
- Updates to support SATVOICE VoIP Service — Completed
- Contract in place to refresh GES hardware:
 - Virtualising the system on powerful servers
 - This includes Paumalu and Fucino as the first phase (target mid Q2), Burum and Perth to follow (end Q2)

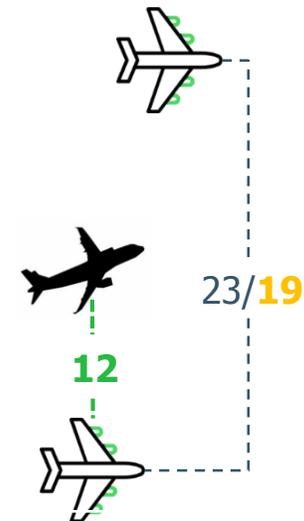
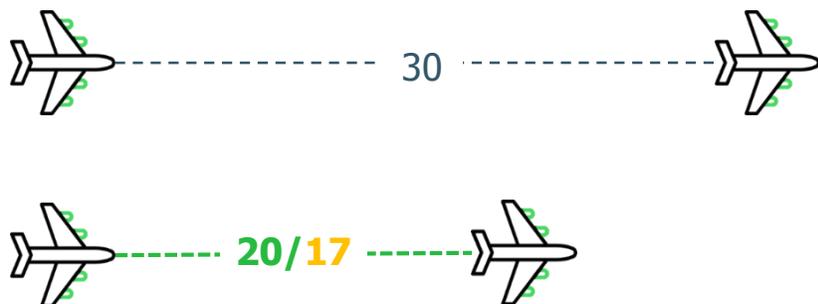
SATVOICE VoIP Service

- Fast satellite VoIP with current Classic Aero network & equipage
- Enables direct controller pilot communications

≈ 15 sec GTA call setup



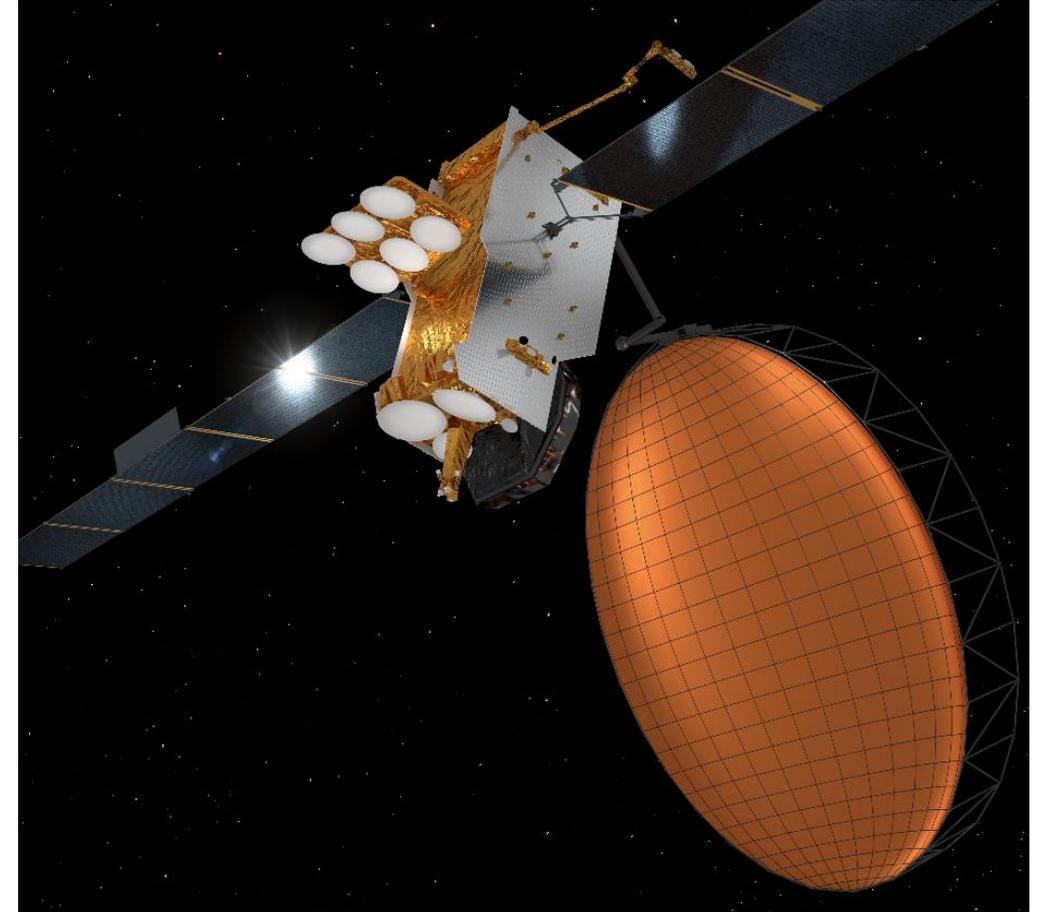
Performance Based Separation Standards



| Date | Communication | Surveillance | Other |
|---------|----------------|-------------------------|------------------|
| Current | CPDLC (RCP240) | ADS-C (RSP180) | HF backup + RNP4 |
| 2020 | CPDLC (RCP240) | ADS-C (RSP180) | HF backup + RNP4 |
| 2020 | CPDLC (RCP240) | ATS Surveillance System | HF backup + RNP4 |

I-6 Constellation

- Two I-6 satellites are being constructed by Airbus Defence and Space. Both scheduled for launch in 2021
 - Based on Airbus' Eurostar platform in its E3000e variant, which exclusively uses electric propulsion for orbit raising
 - Designed to remain in service for a minimum of 15 years
 - Features Ka-band payloads hosted on L-band satellites
- The Inmarsat-6 satellites confirm our commitment to L-band services, and will support a new generation of capabilities for global safety services

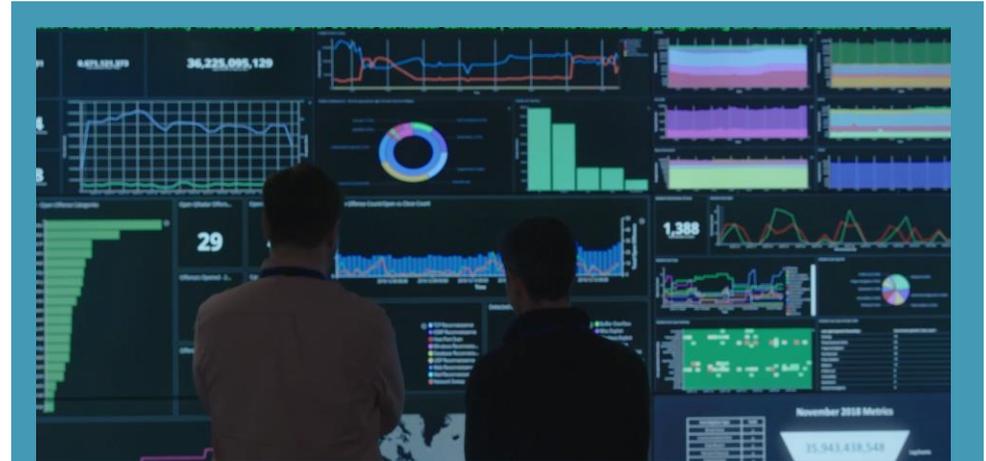


Cybersecurity

- ISO 27000 certified, to ensure we have a complete information security management system
- Dedicated Threat Intelligence Analyst
- Managing End-to-End Risk
- Regular Penetration Tests
- Follow Industry Standards & Structured Framework
- Active Member of the Aviation ISAC



- ▶ Information sharing
- ▶ Threat intelligence



Cybersecurity Operations Centre

- 24/7/365 Monitoring
- Highly skilled security experts
- Threat Intelligence
- Immediate response
- Investigations & Forensics
- Proactive and reactive

Constant Improvements to Meet New Challenges



SB-Safety Programme Status

- SB-S ACARS Ground Gateways may now be configured in two ways:
 - As an AGGW, as part of the SB-S 1.0 service, supporting terminals such as Cobham Aviator 300D
 - As a GDGW, as part of the SB-S 2.0 service, supporting terminals such as Cobham Aviator S and Honeywell Aspire 400, providing PKI VPN tunnel authentication between the terminal and the GDGW
- Additional security controls being applied to AGGW (SB-S 1.0) gateways
- SB-S 2.0 service expected to become available in H2 2020

Live, Flying, and Proven

UNITED 



深圳航空
Shenzhen Airlines



HAWAIIAN
AIRLINES. 



重庆航空
CHONGQING AIRLINES



- SB-S entered commercial service on 17 April 2018
- Now in use on over 100 aircraft using Cobham Aviator 300D/350D

Capital Airlines,
a subsidiary of
AIR CHINA



azurair 



NextGEN



Powering



SESAR 

BUILT TO FLY

Retrofit & Linefit SB-S

SB-S: Retrofit

Available now



A320/neo



737



767

SB-S: Linefit

2020

2021



A320/neo



777X



A350



737



A330



SB-S 1.0 ADS-C Data from 1 September 2017 to 17 March 2020

Global map view, showing SB-Safety records from 1 September 2017 to 17 March 2020 Ocean Region = All

Tail No.=All Flight Id.= All DP Owner = All

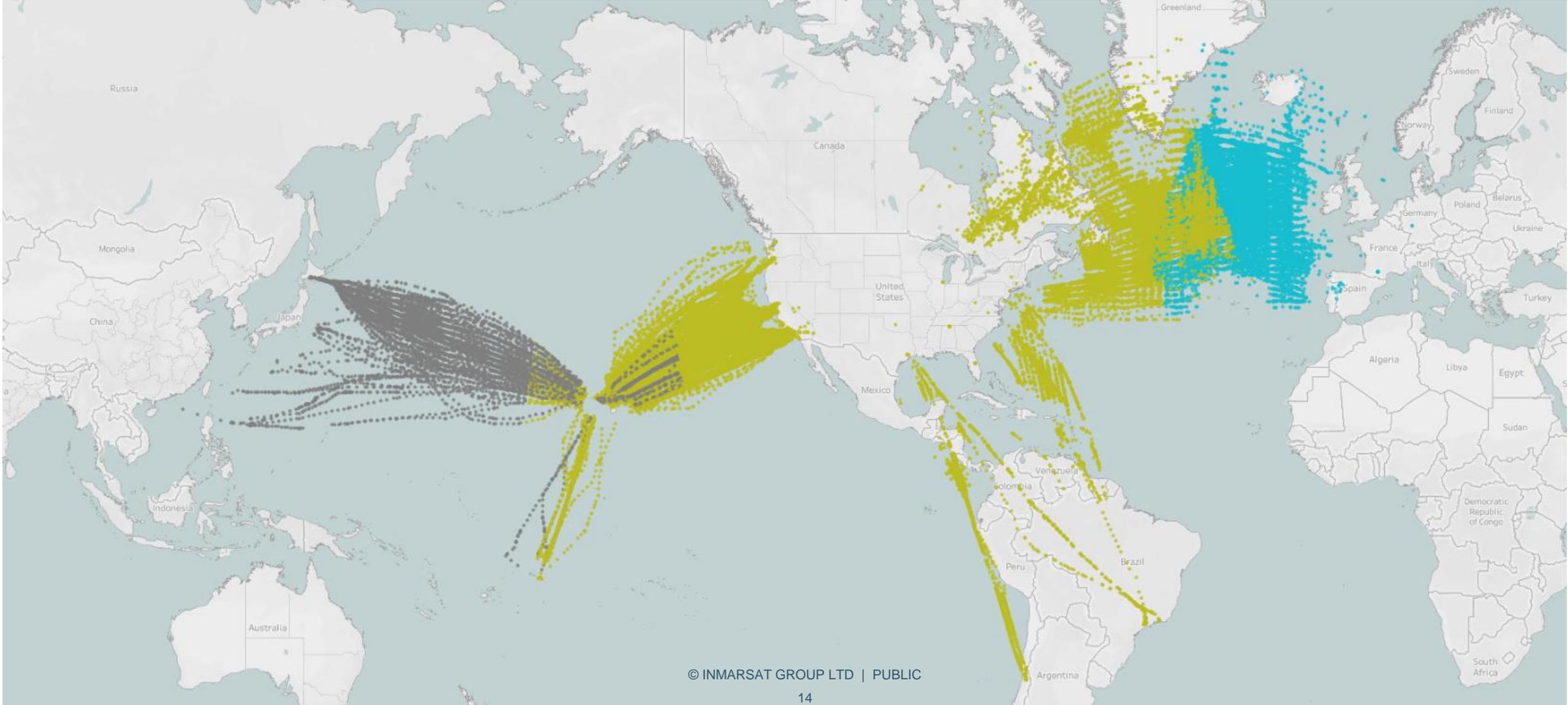
AES id. = All ADS Tag = All ATSP = All

Records with [4-6] latency values <= 280 milliseconds are excluded from the metrics and charts on this dashboard.

Ocean Region (No.)

- (4F1) APAC (5)
- (4F3) AMER (7)
- (AF1) EMEA (6)

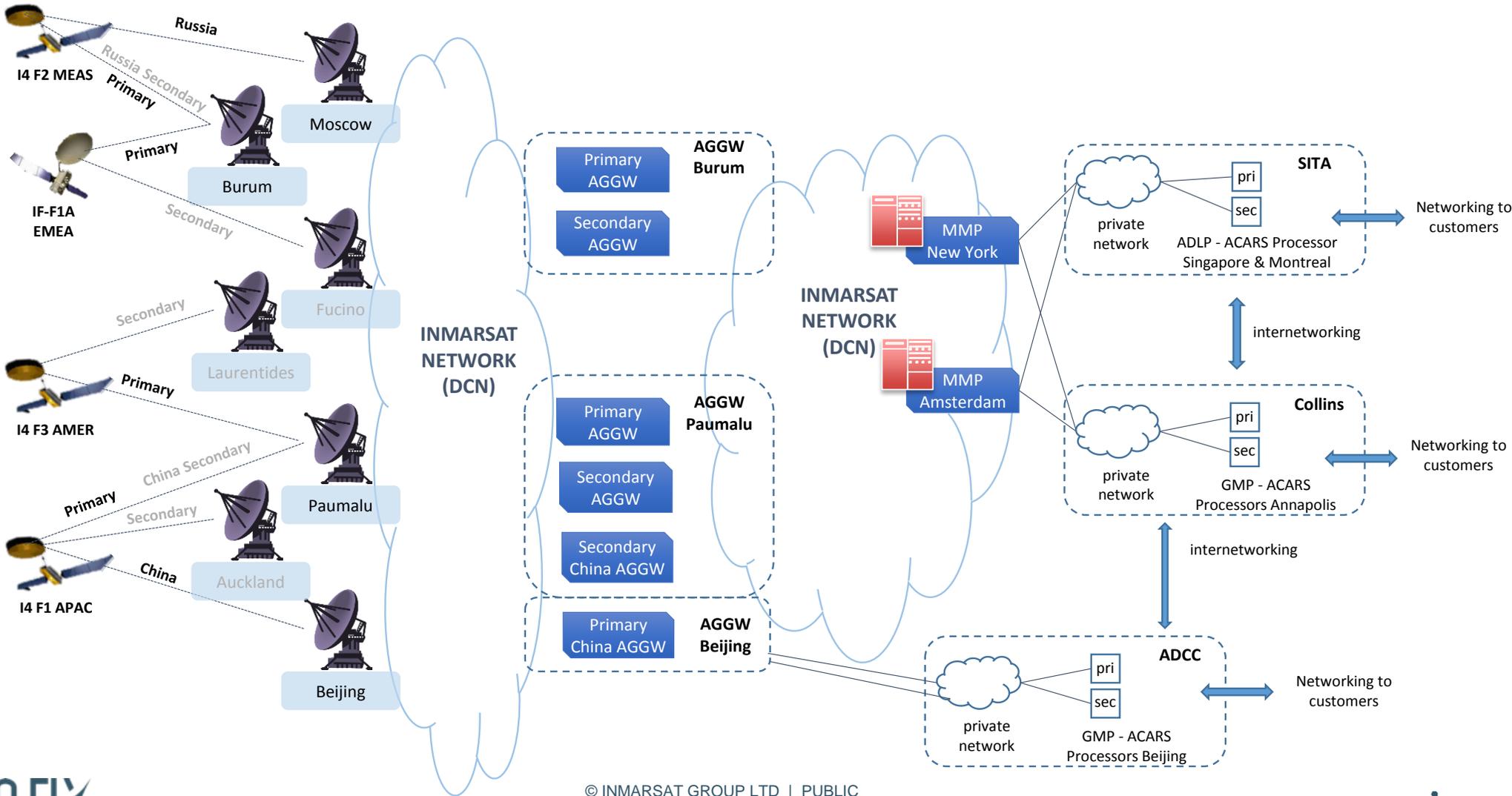
| (4F1) APAC (5) | (4F3) AMER (7) | (AF1) EMEA (6) | Grand Total |
|-------------------|-------------------|-------------------|----------------|
| 18,862 | 582,955 | 46,506 | 648,323 |



China SB-Safety ACARS Ground GATEWAY (AGGW)

- New SB-Safety dual ACARS Gateway installed at Beijing SAS, with additional backup dual gateway installed at Paumalu
- AGGW integration and test complete:
 - All ISAT Data Comms Network (DCN) infrastructure components integrated & tested
 - First Chinese SB-Safety test terminal sent and received ACARS messages through the CTTIC gateway to the ADCC Global Message Processor
- Await FANS aircraft for Beta testing

High Availability Design



SB-Safety Service and Enhancements

- SB-Safety gateway upgrade August 2019
 - AGGW upgrade (Functional and Security enhancements) deployed at Burum and Paumalu
- PBCS RCTP Assessment
 - ADS-C data presented to ICAO SAT-PT (Oct 2018) as contribution to new SATCOM SARPS developments showing compliance with DO-350 message latency targets
 - Initial CPDLC timing analysis from Hawaiian Airline A321 neo data (Oct 2019) (thanks to HAL for pioneering this work)

Initial CPDLC latency up & downlink KPI analytics (format & layout)

CPDLC Statistics

CPDLC Thresholds (s)

| | | RCMP [4]-[1] | RCTPCSP [5]-[1] + [4]-[3] | Ground to air | PORT [3]-[5] | Downlink response |
|----------|--------|--------------|---------------------------|---------------|--------------|-------------------|
| TT 95.0% | RCP240 | 180 | 100 | 60 | 60 | 60 |
| | RCP130 | 60 | 10 | 5 | 44 | 5 |
| ET 99.9% | RCP240 | 210 | 120 | 60 | 60 | 60 |
| | RCP130 | 120 | 18 | 9 | 100 | 9 |

TT 95%

| RCP | ocean region (no) | Count of CPDLC | ACP [4]-[1] within RCP | ACTP ((5)-[1])+([4]-[3]) within RCTP | CPDLC Ground to Air latency [5]-[1] within RCP | PORT GPS [3]-[5] within RCP | Downlink response time [4]-[3] within RCP |
|--------|-------------------|----------------|------------------------|--------------------------------------|--|-----------------------------|---|
| RCP240 | 4F1 APAC (5) | 64 | 100.00% | 100.00% | 100.00% | 96.88% | 100.00% |
| | 4F3 AMER (7) | 21,235 | 99.92% | 99.98% | 100.00% | 99.11% | 99.94% |
| | AF1 EMEA (6) | 1,801 | 99.89% | 100.00% | 100.00% | 98.83% | 100.00% |

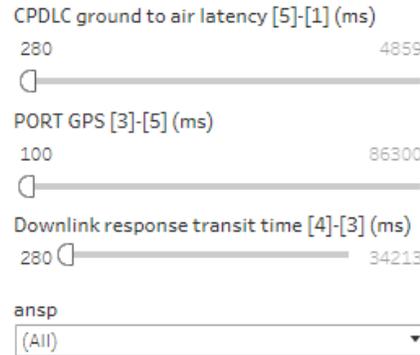
ET 99.9%

| RCP | ocean region (no) | Count of CPDLC | ACP [4]-[1] within RCP | ACTP ((5)-[1])+([4]-[3]) within RCTP | CPDLC Ground to Air latency [5]-[1] within RCP | PORT GPS [3]-[5] within RCP | Downlink response time [4]-[3] within RCP |
|--------|-------------------|----------------|------------------------|--------------------------------------|--|-----------------------------|---|
| RCP240 | 4F1 APAC (5) | 64 | 100.00% | 100.00% | 100.00% | 96.88% | 100.00% |
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| | AF1 EMEA (6) | 1,801 | 99.94% | 100.00% | 100.00% | 98.83% | 100.00% |

Click on bars to filter on time. Deselect and use -+ at the bottom left to switch granularity of filter (D/W/M/Q/Y)



x<95%
x>=95



- DP Owner
- (All)
 - ARINC [3034]
 - SITA [5009]

x<99%
99%<=x<99.9%
x>=99.9%

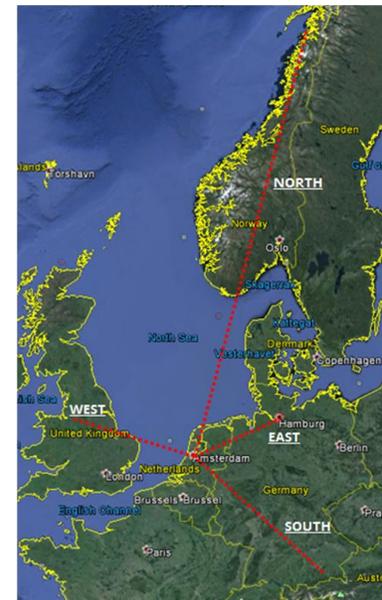
Conditions:

- Draft analysis of 2019 data
- Cobham Aviator 300D (HGA) & 350D (IGA)
- FANS/ACARS messages
- 3 Ocean Regions
- Data could include test transmissions
- Only uplink transactions that have an associated downlink (i.e involving pilot response) have been analysed
- CPDLC data cleansed for unrealistic delivery times; any delay less than the minimum Gateway-Satellite-Aircraft delay, has been removed

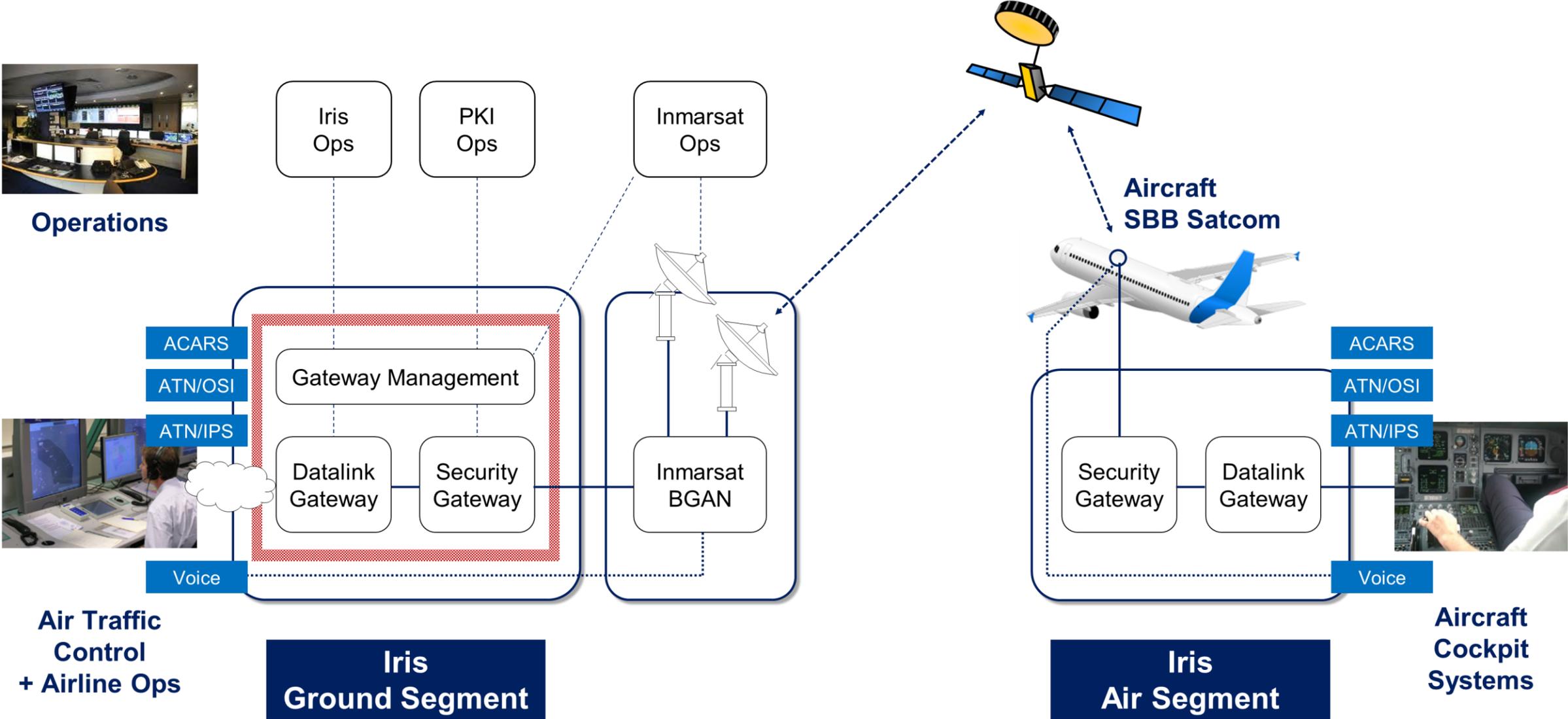
Note: This is an early example of the analytics capability, threshold values and results still undergoing validation.

ESA And Inmarsat are Opening Up the Skies with Iris

- **Iris** is a partnership to enable continental satellite communications over Europe
- A safe, secure satellite-based air traffic management data link to relieve congested radio frequencies
- Iris Precursor (**2016 - 2018**) made performance measurements on the bench and in flight.
- **Iris with IOC** (2018 – 2021) is implementing operational ground infrastructure and will equip up to 20 narrow-bodied aircraft for service validation.
- Iris with IOC trials are focused on Europe, however the infrastructure is being deployed globally (Burum and Paumalu).



Security layer



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Thank You