IRIDIUM CERTUS UPDATE – ISPAGC/FIT
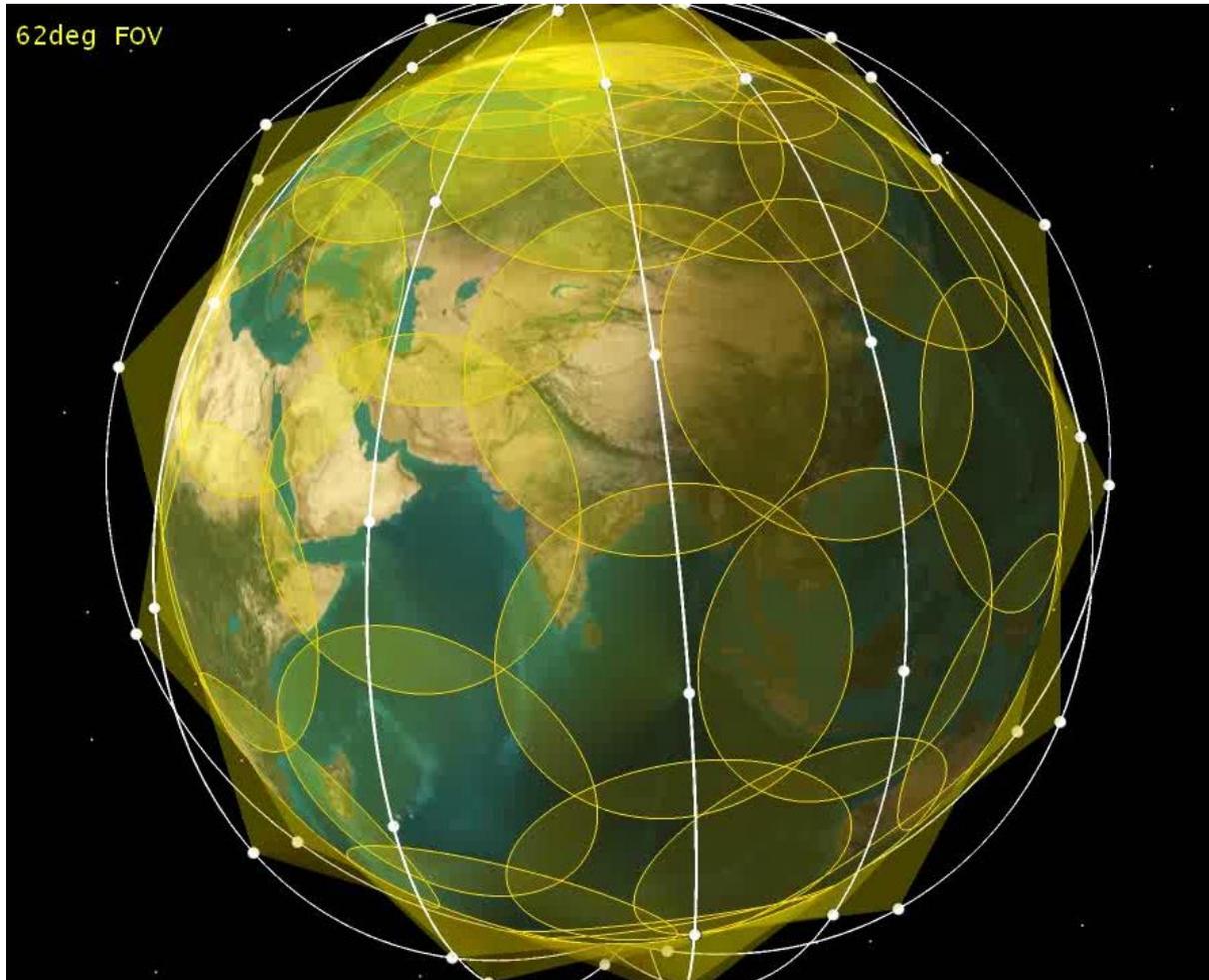
MIKE HOOPER –SR. MANAGER, AVIATION LOB

- 6 orbital planes of 11 satellites each + 1 spare
- North bound on one side of earth and south bound on other
- 780 km altitude, 86.4^o inclination, 100 minute orbital period

IRIDIUM LEO NETWORK CROSS-LINK DIVERSITY

- Iridium network uses cross-links to create a mesh network for voice and data communications

- Supports both Ground-to-Air and Air-to-Ground communications

- Voice and data traffic is routed through the network for service delivery

- Path diversity is ensured for data delivery

- Gateway diversity in place with encrypted teleport network

Block 1 Satellite

cross-links

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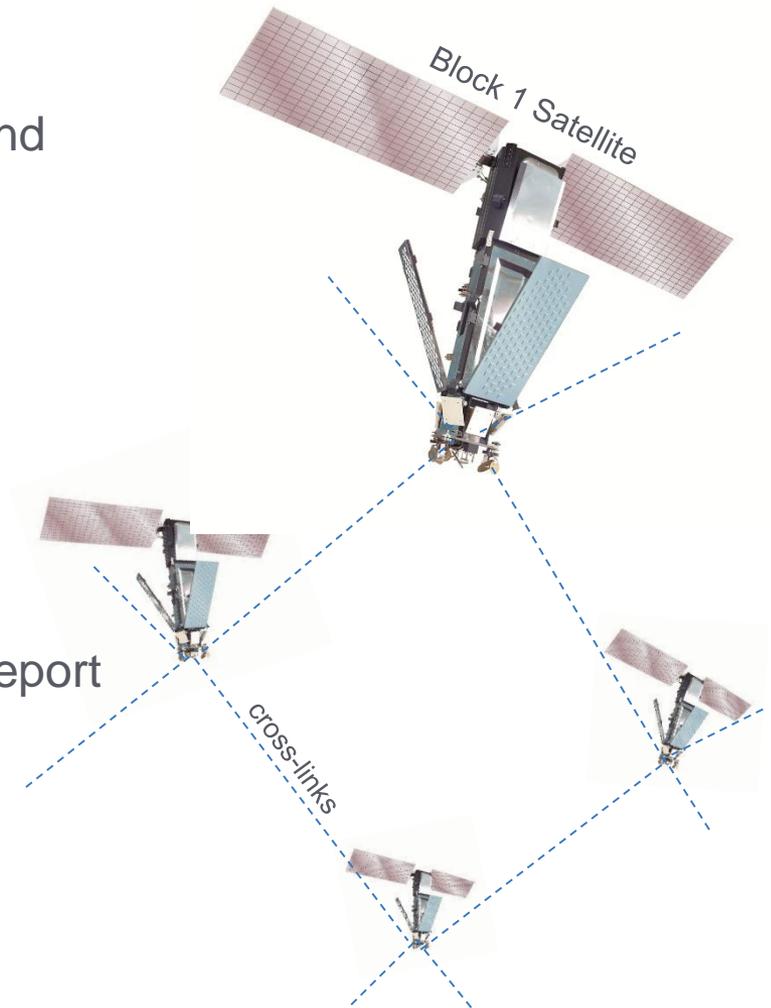
IRIDIUM PBCS PERFORMANCE

- In the PBCS airspace reporting, Iridium performance is all over the map

- There are good, bad and just ugly operation in the airspaces around the world

- Iridium is working hard to launch new satellites which has largest impact on performance but this will not resolve all issues of performance

- Variety of issues exist on aircraft – no silver bullet single fix

- In the FAA PARC, Iridium has opened a task to work with airlines on poor performers to gather data to look for factors impacting performance

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IRIDIUM NETWORK VALUE ADDERS AS AMS(R)S PROVIDER

The Iridium network provides several advantages given the nature of the LEO network and distributed ground station configuration.

- Space Weather Resilience
- Ground Network Resilience
- Geo-location Capability without GPS
- Continuity of Service Commitment (long-term)
- True Global Coverage – pole to pole
- Ownership/control of network
- Iridium Network Engineering Team

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TRANSITION TO IRIDIUM NEXT

Iridium is committed to the complete update/replacement of the Iridium network with the Iridium NEXT program. Work has been underway for the past four years or more. The program has been fully funded with total cost over $3 Billion.

- Complete replacement of all satellites and in-orbit spares
  - Underway with Thales Alenia Space and 70+ partners on the build
- New ground station systems for message handling and service enhancements
  - Update to Tempe ground system architecture
- Enhanced TPN network – encryption between ground stations
- Enhancements of TTAC sites
- Updated network management controls

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IRIDIUM NETWORK TRANSITION STATUS

January 14th , 2017

- Successful Falcon 9 launch for Iridium-1
- 10 satellites placed into holding lower orbit

January 15th – Jan 31st 2017

- Satellite BUS system validation begins on all satellites
- All systems and interfaces validated
- In-orbit insertion planning for 1st satellite and successive satellites
- Cross-links established between satellites
- Primary downlinks validated for higher data rates for Certus
- Aireon payload validation

February 1st 2017 – Ongoing

- Movement of satellites to "storage orbit of 700km"
- In-orbit transitions planned10 satellites
- Satellite SV106 inserted into operational network - fantastic data and voice performance tested
- Insertion of other seven satellites planned in March and drift of 2 satellites to Plane 5

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IRIDIUM LAUNCH ACTIVITIES (TENTATIVE)

- Next Launch –on SpaceX (delay with build of SpaceX rockets)
  - June 2017

- Future launches past June are TBD at this time
  - SpaceX is working on backlog of commitments
  - Iridium supports as rapid deployment as possible with minimum delay between launches
  - Confirmed plans for 5 additional launches will be announced mid-2017

- Eighth launch recently added with SpaceX under ride-share for remaining satellites in mid-2018 under separate schedule than above
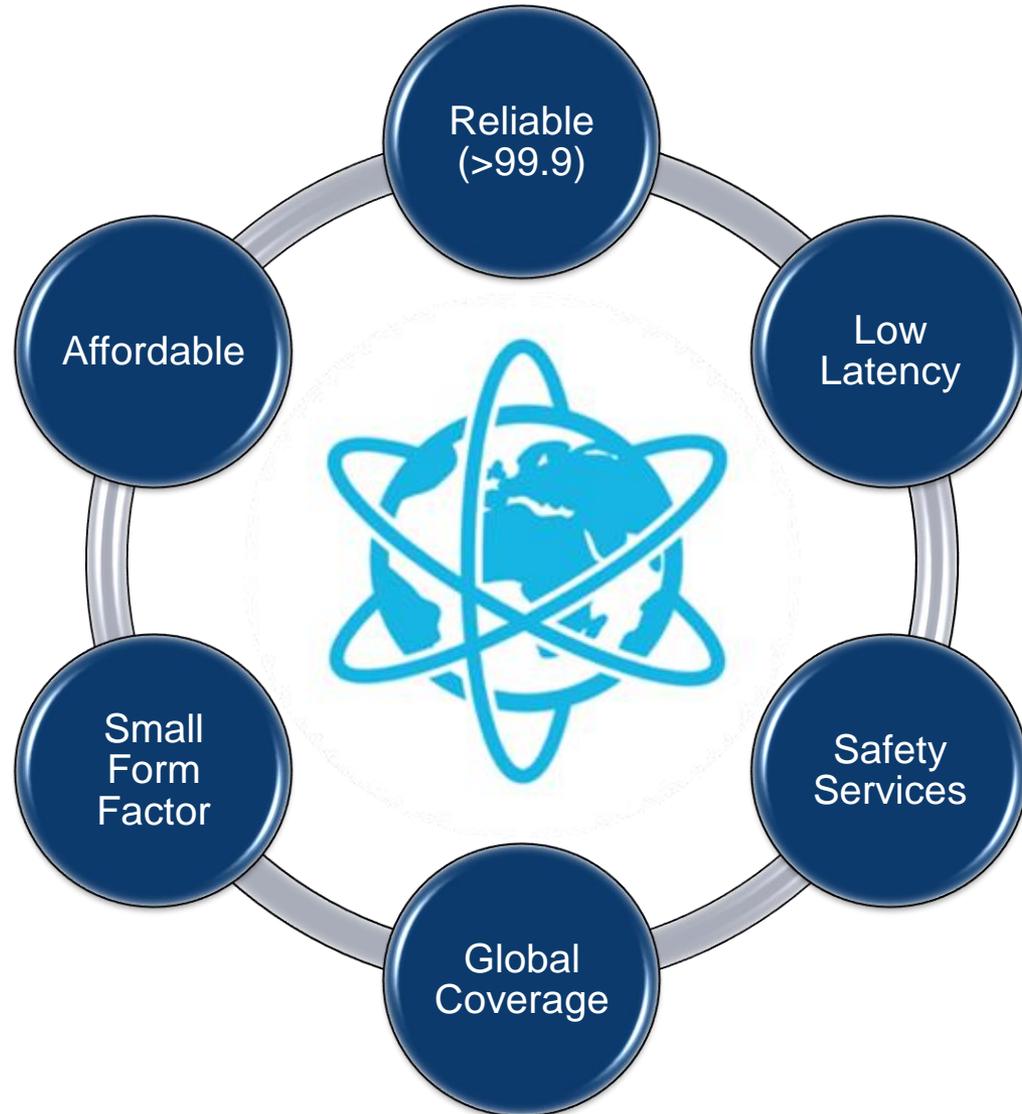
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IRIDIUM CERTUS BROADBAND SERVICES

All Iridium Certus devices are multi-service terminals up to maximum Tx/Rx of the system:

- Streaming IP data
- Background IP data
- Broadcast data (one to many)
- Short Burst Data (SBD)
- Voice x 3 independent lines (standard 2.4Khz and/or high quality 5.2Khz)
- Prepaid/Post Paid
- PTT - future

Simultaneous service use up to maximum data rates of the Iridium Certus service class.

IRIDIUM CERTUS: KEY ATTRIBUTES

- Reliable (>99.9)
- Low Latency
- Safety Services
- Global Coverage
- Small Form Factor
- Affordable

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IRIDIUM CERTUS SERVICE CLASSES

- The Iridium Certus service will support a range of data speeds for the variety of aeronautical platforms
- Antenna and transceiver types will determine the service class for the subscriber
- All Iridium Certus broadband service classes support all Iridium Certus services
- Not all configurations shown in table – only Max Tx and Max Rx shown

Service Class	Max TX Speed	Max RX Speed	Antenna Type
Iridium Certus 100	176Kbps	88Kbps	LGA
Iridium Certus 200	176Kbps	176Kbps	LGA/ALGA
Iridium Certus 350	352Kbps	352Kbps	HGA
Iridium Certus 700	352Kbps	704Kbps	HGA
Iridium Certus 1400	524Kbps	1408Kbps	HGA

* Service introduction dependent on completion of Iridium NEXT deployment

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AIREON UPDATE

SPACE BASED ADS-B

AIREON PAYLOAD VALIDATION

Full networking and interfaces are being validated on the initial Iridium NEXT satellites, including the Aireon payload. The following outlines the first Aireon payload "wake-up."

- The test, performed on January 26th was an initial "power-on" for the Aireon ADS-B payload. The purpose was a self-diagnostic to validate launch survival.
- Aireon DID NOT expect to see any aircraft, but by chance, Iridium had the antennas running.
- 150 ADS-B aircraft were detected over multiple-passes of the satellite with thousands of ADS-B messages received and decoded.
- Overall, this very positive result for Iridium, Aireon and the Harris team. Aireon will be conducting more tests over the next 60 days.
- Aireon plans to begin testing in Q2 2017 with NAV CANADA, the FAA and Polaris Flight Systems.

Official Firsts:

The first officially received ADS-B message was Korean Airlines 530

The first full ADS-B position message decode from space was SAS 4576

The first U.S. carrier ADS-B message was UA 86 to Shanghai

The first business jet ADS-B was NextJet 594 landing in Sweden. *This is an interesting proof-point of the power of the Aireon ADS-B payload and the ability to detect aircraft close to the ground and in terminal airspace.*

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