ITU REGIONAL SEMINAR FOR CIS AND EUROPE DEVELOPMENT OF MODERN RADIOCOMMUNICATION ECOSYSTEMS
SESSION II. SATELLITE COMMUNICATIONS

IRIDIUM AS A TRULY GLOBAL MOBILE SATELLITE NETWORK

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ST. PETERSBURG, 6-8 JUNE 2018

AGENDA

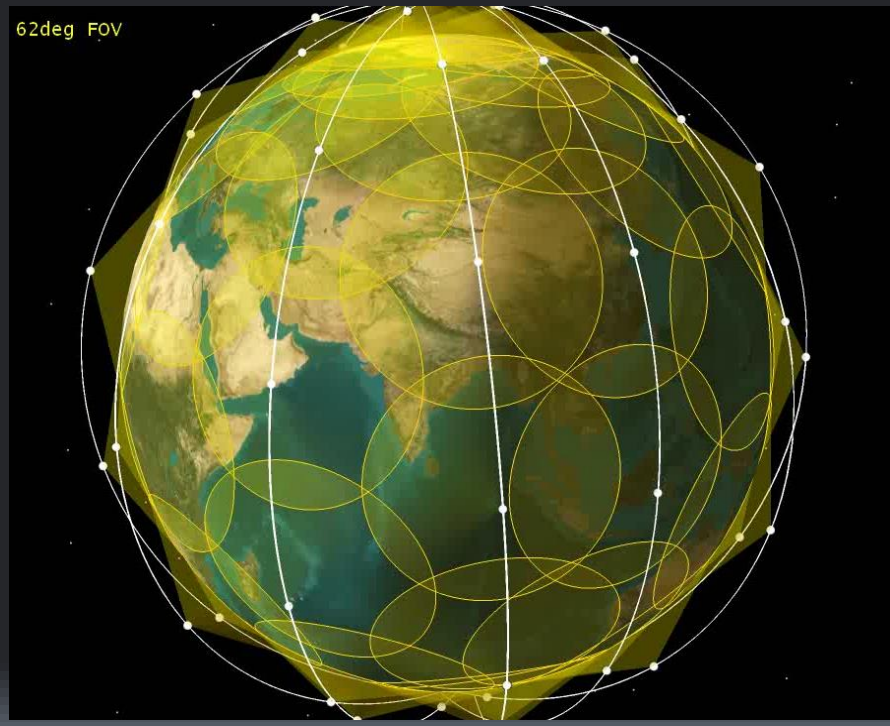
- The only truly global network
- Iridium NEXT update
- Leader in safety services
- Iridium IMO recognition for GMDSS
- Iridium air safety services
- Aireon. Space based ADS-B and Global air traffic surveillance

THE IRIDIUM SATELLITE NETWORK

THE ONLY COMMERCIAL SATELLITE NETWORK COVERING THE ENTIRE GLOBE

- 66 Low Earth Orbiting (LEO) cross-linked satellites operating in 6 orbital planes each with 11 satellites
- Satellites orbit 485 miles above the earth in a north-south/south-north polar orbit travelling at 17,000 miles per hour
- Each satellite accomplishes a complete orbit around the earth every 100 minutes
- Communications are cross-linked from satellite-to-satellite and grounded at teleport locations around the world
- The dynamic nature of the Iridium constellation provides unequaled redundancy and network flexibility

Iridium's constellation provides 100% global service area



THE IRIDIUM LOW EARTH ORBIT NETWORK

Low Latency

781 km versus 36,000 km
Over **40 times** closer to user than GSO system

Redundancy

Multiple points of redundancy
Call path **unaffected by local conditions**

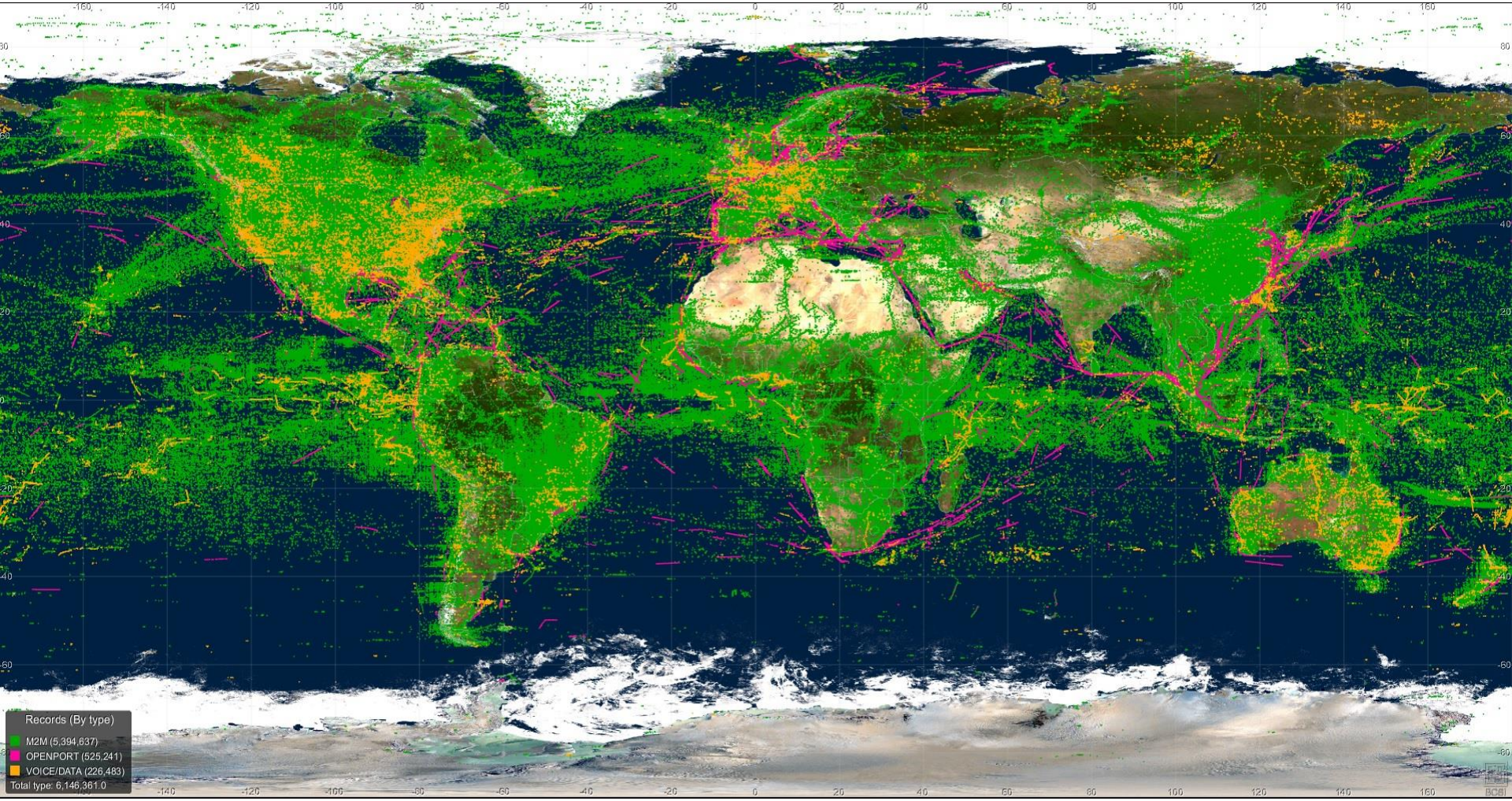
Truly Global Coverage

Mesh network provides
pole-to-pole connectivity

Key Information

In business for 20 years
1 Million Subscribers
$3B Iridium NEXT Program

PEOPLE USE IRIDIUM - EVERYWHERE



Note: Single day plot of M2M/SBD session, voice call and Iridium OpenPort® broadband data origination points taking place on May 31

Iridium NEXT

Eight rockets. 75 satellites.

The largest commercial satellite constellation replacement ever attempted.

Without interrupting current service.

iridium®

Iridium NEXT

Iridium is committed to the complete replacement of our network with the Iridium NEXT program. The $3 Billion fully-financed program has been underway for more than four years.

SV Manufacturing

Partnership with Thales Alenia Space, Orbital ATK and more than 70 others

Improvements

New ground station systems for message handling and service enhancements

Enhancements

TTAC sites and TPN Network, including encryption between ground stations, and updated network management controls

COMPLETED IRIDIUM NEXT LAUNCHES

Launch 1 – January 14, 2017

- 10 satellites launched
- 10 satellites now in operation

Launch 2 – June 25, 2017

- 10 satellites launched
- 8 now in operation; 2 moving to final locations

Launch 3 – October 9, 2017

- 10 satellites launched
- 10 now in service

Launch 4 – December 22, 2017

- 10 satellites launched
- 9 now in service; 1 moving to final location

Launch 5 – March 30, 2018

- 10 satellites launched
- 10 in service early May

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UPCOMING IRIDIUM NEXT LAUNCHES

Launch 6 – May 22, 2018
- 5 satellites launched
- Rideshare with GRACE-FO

Launch 7 – summer 2018 (targeted)
- 10 satellites to be launched

Launch 8 – 3Q 2018 (targeted)
- 10 satellites to be launched

Iridium NEXT Constellation Complete in 2018

IRIDIUM CERTUS MULTI-SERVICE & SATCOM PLATFORM

Streaming IP Data

Background IP Data

Short Burst Data

Iridium Burst

Application Platform

High Quality Voice

Push-to-Talk

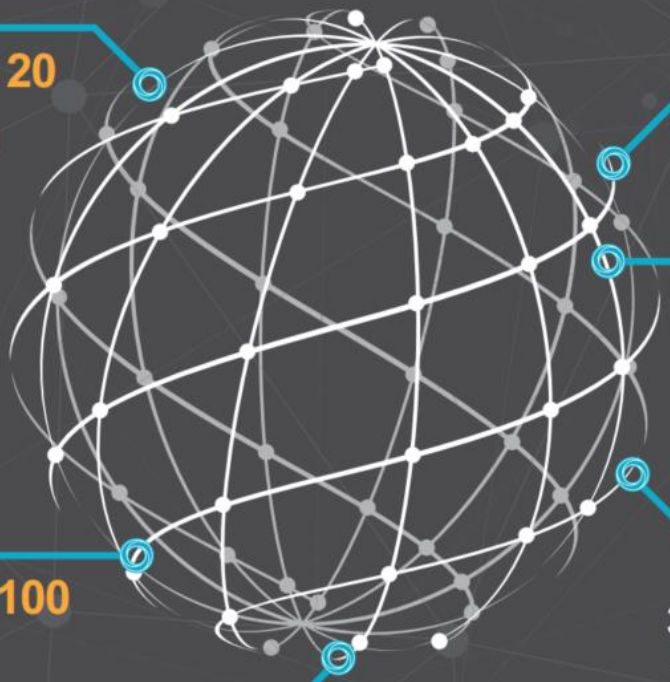
Safety Services

GMDSS

Prepaid Platform

Iridium Certus℠

Reliable. Everywhere.



1408 kbps — Iridium Certus 1400

- Standard Definition Video
- Video Conferencing
- Multi-User Internet / VPN
- Telemedicine

22 kbps — Iridium Certus 20

- Global Maritime Distress & Safety System (GMDSS)
- ACARS
- Asset Tracking
- eLog Book
- Telemetry
- Remote Monitoring

704 kbps — Iridium Certus 700

- Standard Definition Video
- Video Conferencing
- Multi-User Internet / VPN
- Telemedicine

88 kbps — Iridium Certus 100

- Internet/VPN
- Email
- Graphical Weather (WX)
- Photo Transfer
- Credit Card Validation

352 kbps — Iridium Certus 350

- Flight Data Recorder Streaming
- VSAT Redundancy
- Low Res. Video

176 kbps — Iridium Certus 200

- ECDIS Updates
- Aeronautical Charts
- Streaming Audio

iridium Everywhere

IRIDIUM: A LEADER IN SAFETY SERVICES

EXISTING MARITIME SAFETY AND SECURITY SOLUTIONS

- Iridium equipment is already used on 50,000 vessels (10,000 of them SOLAS vessels) for non-GMDSS safety and security purposes
  - Examples include ship's business, crew-calling, weather fax, LRIT, SSAS, Anti-piracy
  - Demand from shipping industry for Iridium "red button"
- Tracking and alerting functions are used in many national vessel monitoring systems, especially for fishing vessels
- Ships use Iridium hand-portable terminals for tracking capability, and emergency alerting and calling

WHY CHOOSE IRIDIUM TO SUPPORT GMDSS?

Coverage

First and only truly global system – coverage over Polar areas (Sea Area A4) not served today

Capability

All functions in one terminal **– voice and data**

More efficient gathering of information by RCC

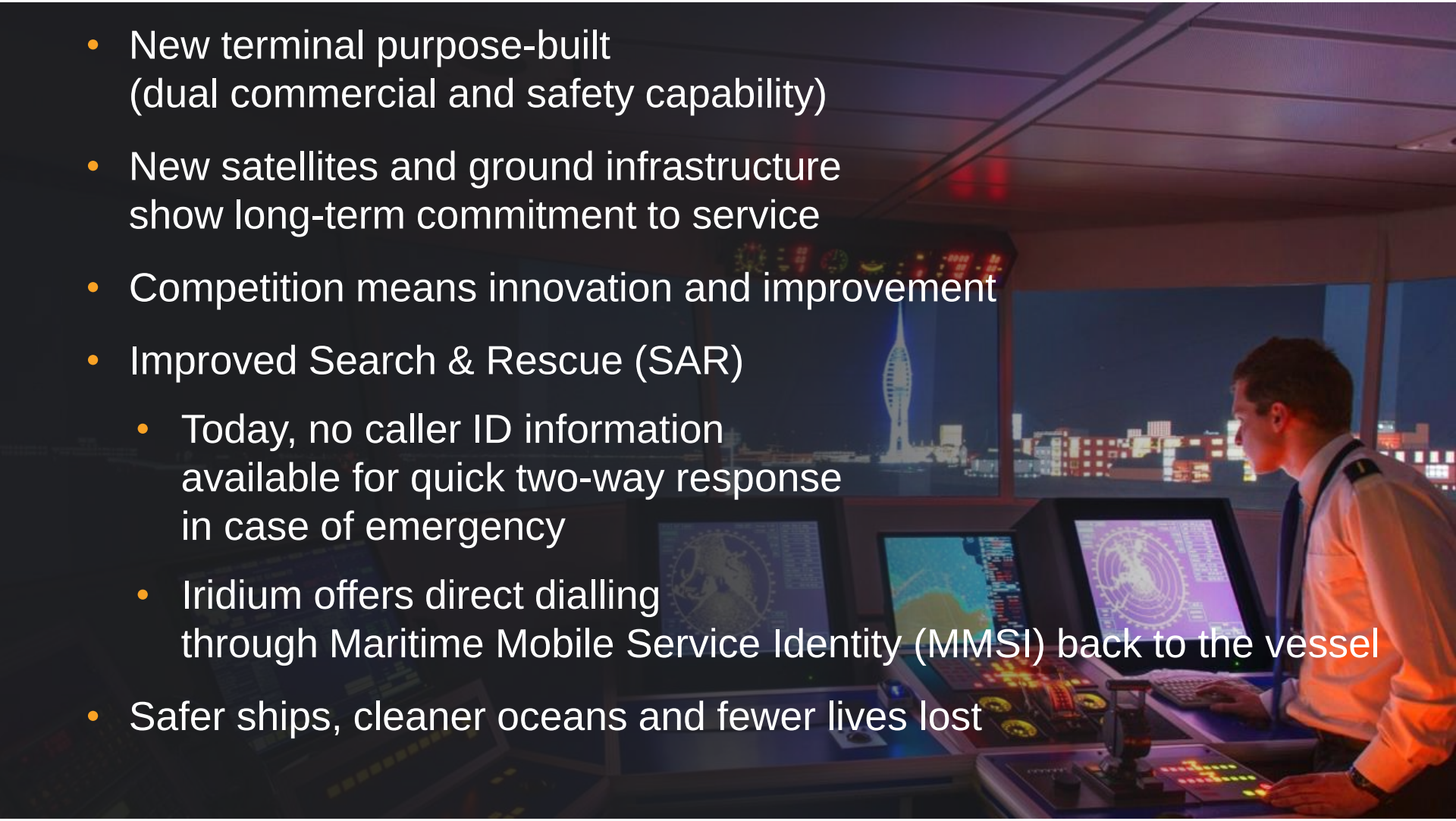
SAR response can be initiated earlier, with more information

Cost

~25% of the cost of current equipment

Iridium will provide GMDSS Service Provider Diversity and Enhances Safety at Sea

KEY ADVANTAGES OF IRIDIUM GMDSS



- New terminal purpose-built (dual commercial and safety capability)
- New satellites and ground infrastructure show long-term commitment to service
- Competition means innovation and improvement
- Improved Search & Rescue (SAR)
  - Today, no caller ID information available for quick two-way response in case of emergency
  - Iridium offers direct dialling through Maritime Mobile Service Identity (MMSI) back to the vessel
- Safer ships, cleaner oceans and fewer lives lost

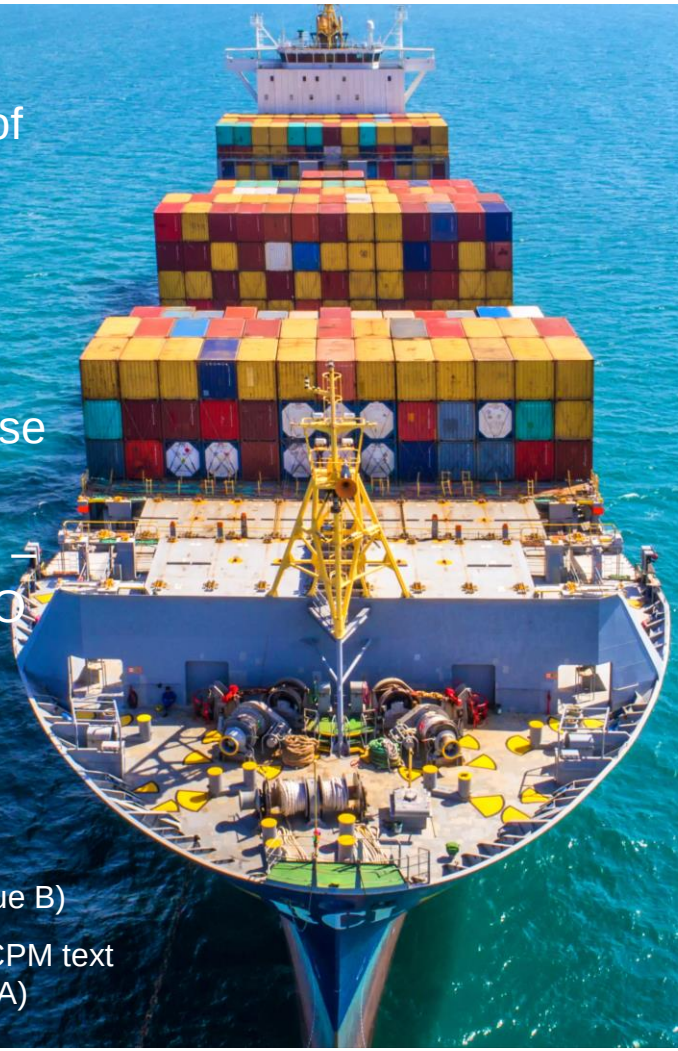
WORLD-CLASS EQUIPMENT: LT-3200

- Developed by Lars Thrane A/S
  - Experienced maritime manufacturer
- Familiar form-factor
  - Intuitive to use
- Performs all functions
  - Independent verification
  - Sea-trials underway
- Lower cost
- Simple installation
- Low-profile antenna

ITU. AGENDA ITEM 1.8 FOR WRC-19 ADDRESSING ISSUES TO GMDSS

…. to consider possible regulatory actions to support GMDSS modernization and to support the introduction of additional satellite systems into the GMDSS, in accordance with Resolution 359 (Rev. WRC 15)

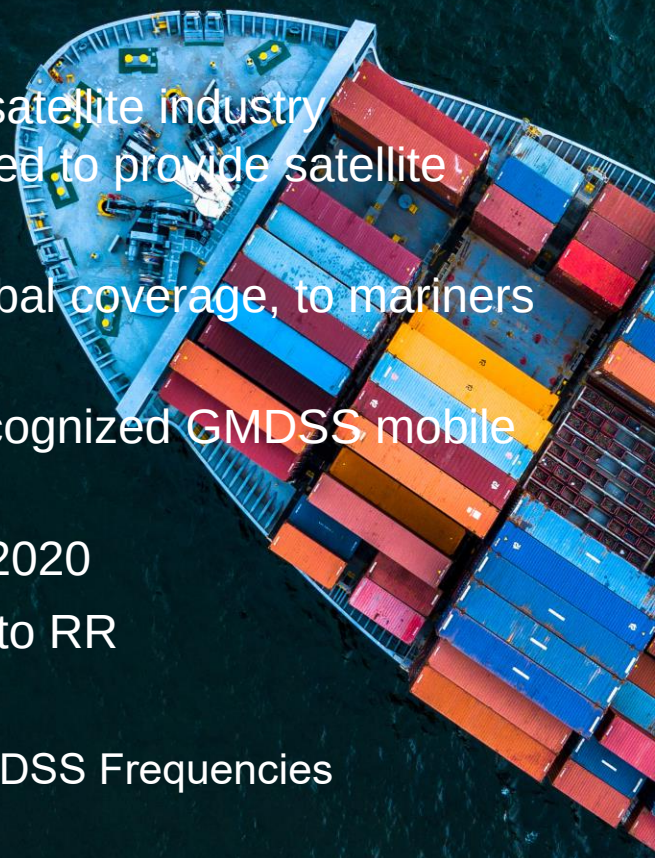
- **Issue A:** Modernisation of the GMDSS – considering Radio Regulations changes to reflect evolving IMO use of terrestrial GMDSS frequencies (HF/MF)
- **Issue B:** Addition of a new satellite GMDSS provider – considering Radio Regulations changes to reflect IMO recognition of a new satellite GMDSS provider



Responsible Group	**WP 5B**
Latest CPM Text	5B/411 Annex 1 (Issue A) & 4C/343 Annex 13 (Issue B)
Contributing Groups	**WP 4C**(in charge of developing studies and draft CPM text on resolves 2), **WP 7D,** (WP 1A), (WP 3M), (WP 5A)

IRIDIUM MAKES MARITIME INDUSTRY HISTORY

IMO approved Iridium network to provide GMDSS



- Significant achievement that ends a decades-long satellite industry monopoly in which only one company was authorized to provide satellite GMDSS service
- For the first time will bring competition and truly global coverage, to mariners sailing any of the world's oceans
- Iridium formally began the process to become a recognized GMDSS mobile satellite service provider in April 2013.
- Iridium to begin providing GMDSS service in early 2020
- WRC-19 will consider any necessary amendments to RR
  - Iridium frequencies allocated to MSS
  - Frequencies don't appear in Appendix 15, List of GMDSS Frequencies
  - Other provisions?

ISSUE B. ADDITIONAL SATELLITE SYSTEM

Canada and United States Support draft CPM Method B1 as most easy and efficient:

Method B1:

Maintain current allocations, with the addition of minor provisions to identify use of 1616-1626.5 MHz in both directions for GMDSS

Other methods/variations of B1:

- **Method B2.** As Method B1, but additionally adopt a footnote explicitly excluding protection of GMDSS from the impact of adjacent-band emissions
- **Method B3.** As Method B1 but identify only the uplink for use by GMDSS

Other methods:

- **Method B4.** This Method proposes no changes to the Radio Regulations.
- **Method B5.** Maintain current uplink allocation but upgrade the downlink allocation to primary status for use in GMDSS. In order to limit adverse impact on other services by this change, the action is proposed to be limited to the sub-band 1621.35-1626.5 MHz, and regulatory measures adopted to protect the radio astronomy service

IRIDIUM AIR SAFETY SERVICES AND AIREON PROJECT

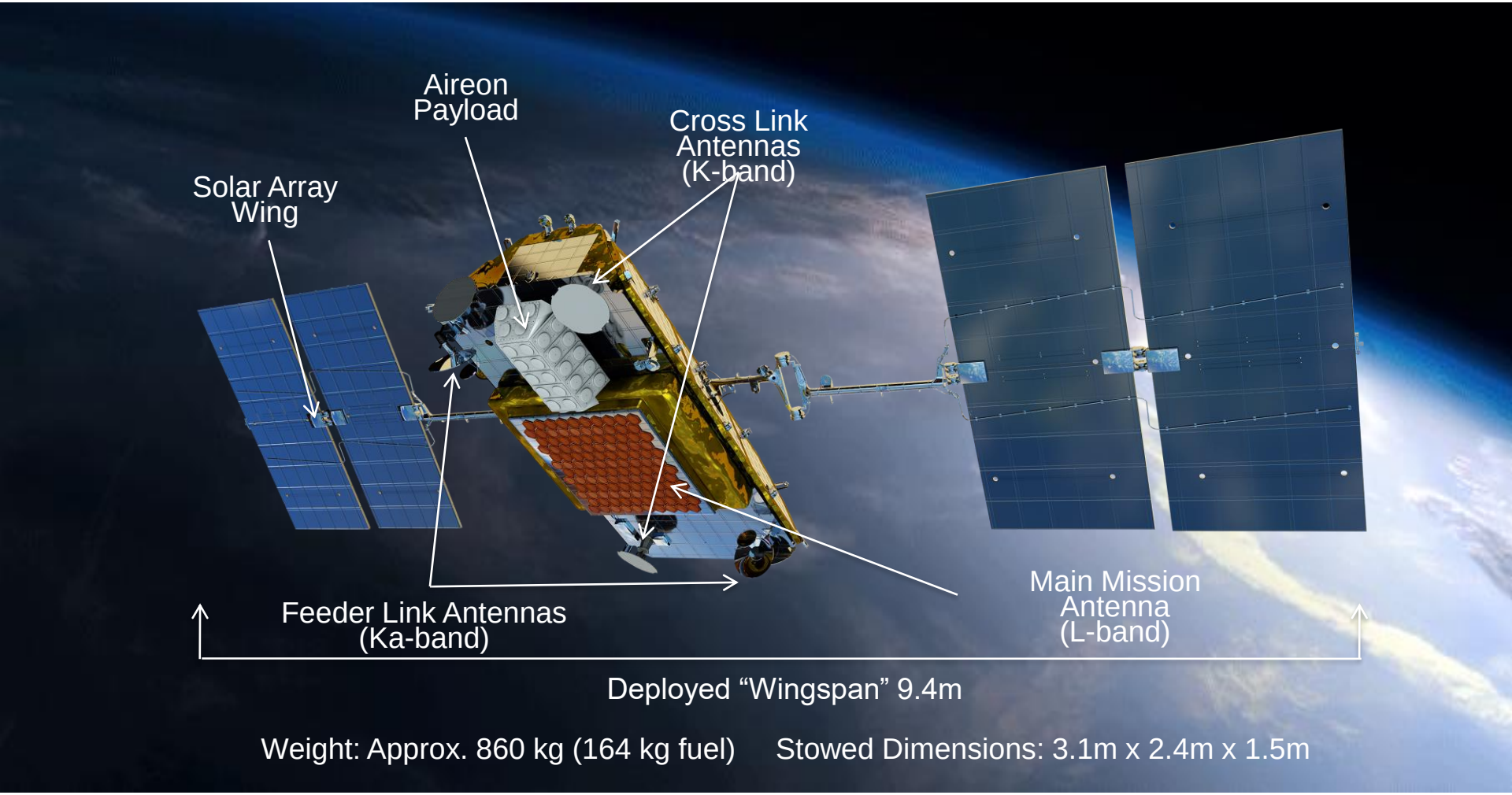
IRIDIUM PROVIDES AVIATION SAFETY SERVICES

- Iridium delivers critical services for the Aviation industry, including:
  - Future Air Navigation System (FANS)
  - Aeronautical Mobile Satellite (Route) Service (AMS(R)S)
  - Aircraft Tracking
  - Safety Voice
  - ACARS (Aircraft Communications Addressing and Reporting System)
  - Compliant with ICAO SATCOM Voice
  - Meets GOLD RSP/RCP latency and availability performance metrics for safety communications

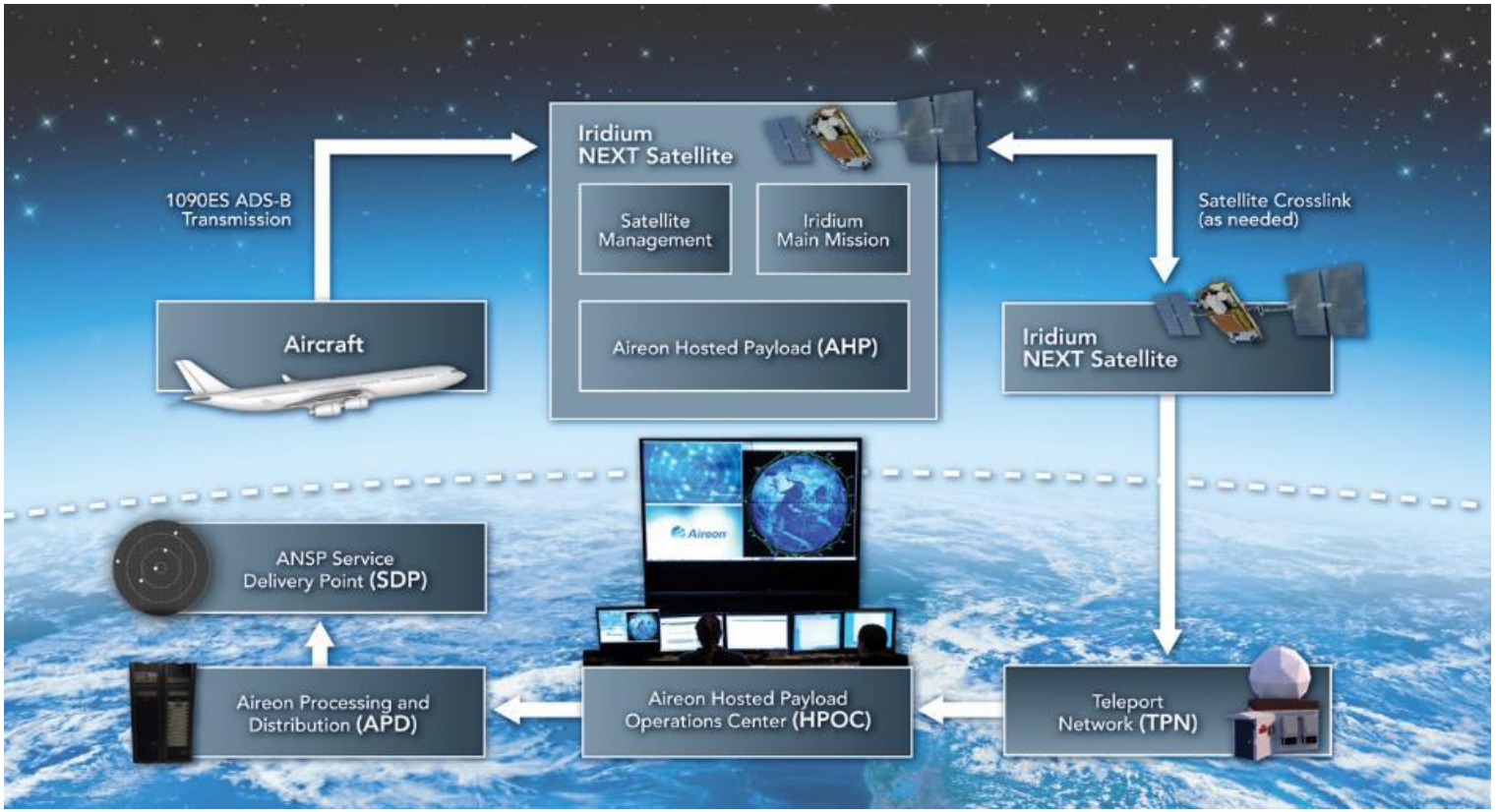
Iridium Already Adheres to the Strict Safety Standards of the Aviation Industry

NEXT SATELLITE – HOSTED PAYLOAD AND L BAND PAYLOAD

Hosted payload for exactEarth AIS maritime tracking, Aireon for Aero ADS-B, Harris



THE AIREON HOSTED PAYLOAD

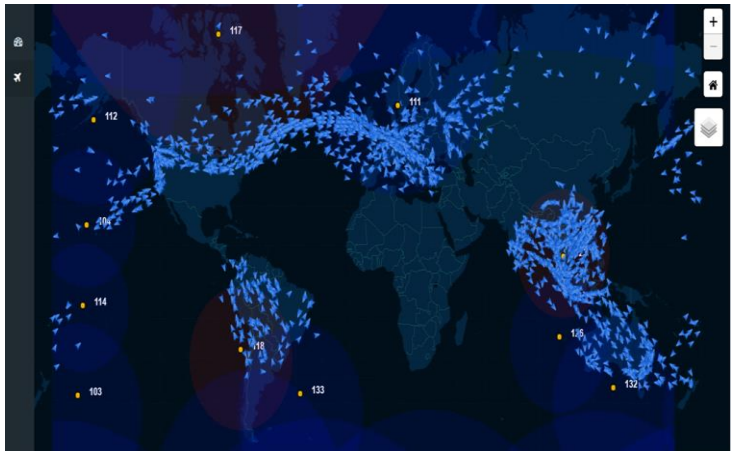


- The Aireon Hosted payload receives 1090ES ADS-B messages and forwards the data to the ground for processing.
- Firmware and adaptation re-programmable from ground.

GLOBAL AIR TRAFFIC SURVEILLANCE

- Surveillance as a Service enables rapid deployment
- Global ADS-B coverage over oceans, remote and terrestrial airspace will be available to all ANSPs in 2018
- An increasing number of ANSPs worldwide are preparing for integration of the Aireon signal into their Air Traffic Management (ATM) system
- Significant economic and safety benefits will be available to aviation stakeholders
- EASA Certification planned for 2018
- Customers could be ready for trials and operational use in 2019
- Global Aeronautical Distress Safety System (GADSS) initiative

Aireon Maintenance Dashboard Demonstration



Aireon

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