Iridium's Space Operations Experience Through the Decades

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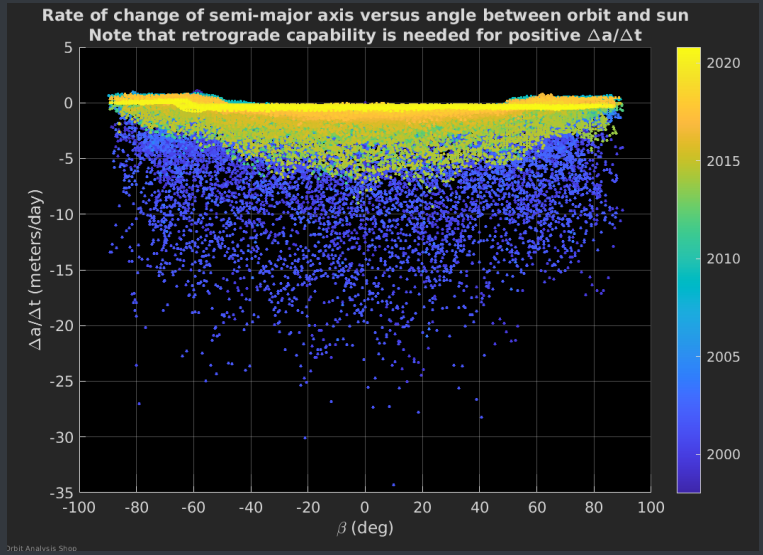
Defining Space Weather From an Owner/Operator Perspective

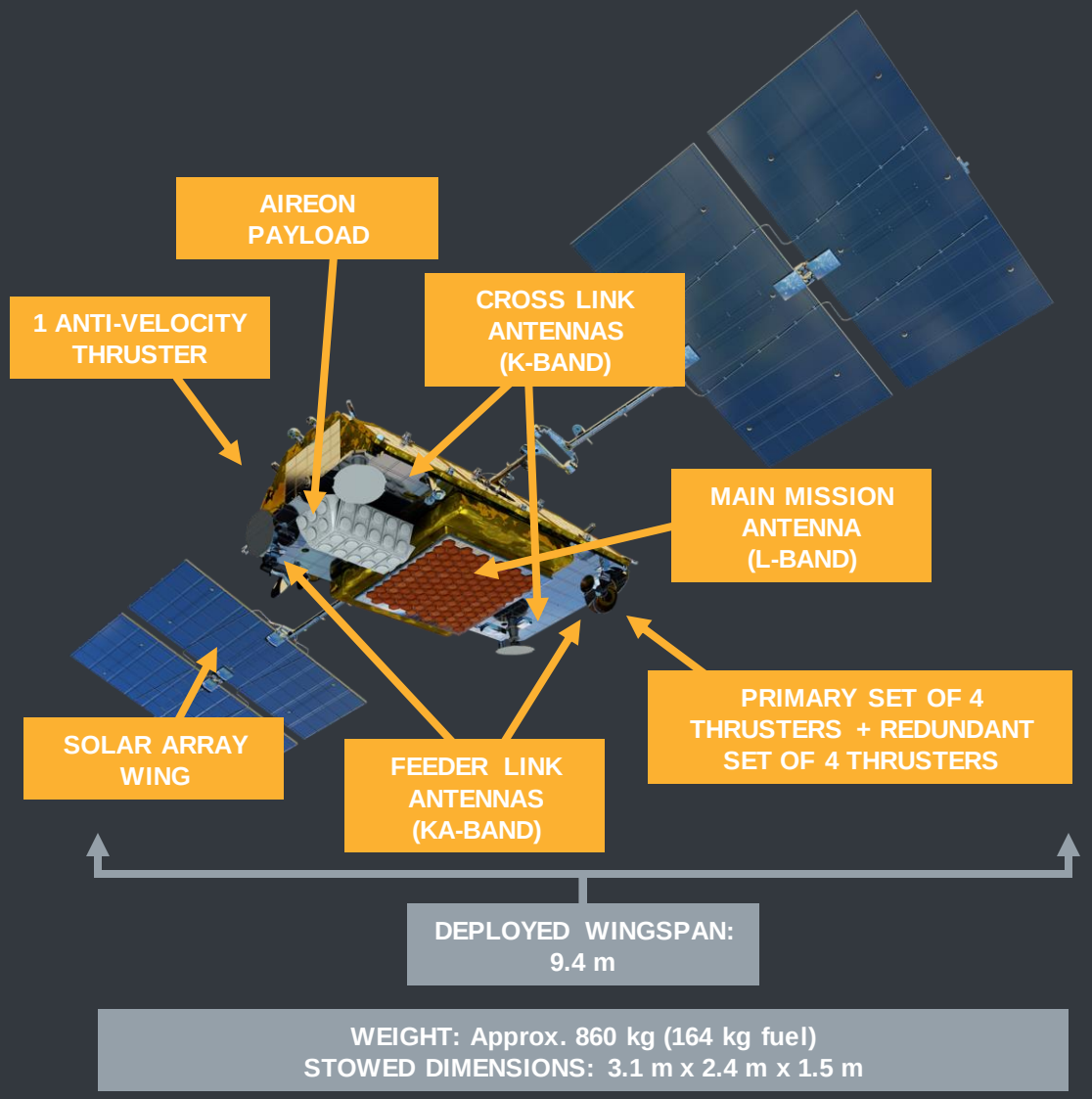
- Iridium has been through two solar cycles.
- Operators need to be prepared to reassess their chosen thresholds and algorithms when the space weather background changes.
- For operators of larger constellations, experience with space weather related issues is gained more quickly than operators of fewer vehicles
- Operations Team responses to on-orbit anomalies can be aided by:
  - Cognizance of SV position (in SAA or Polar region at time of event)
  - Access/awareness of significant space weather events
  - CME, Flares, Geomagnetic storms, Charged Particles, Spacecraft Charging



What Does That Mean for Optimal Design?

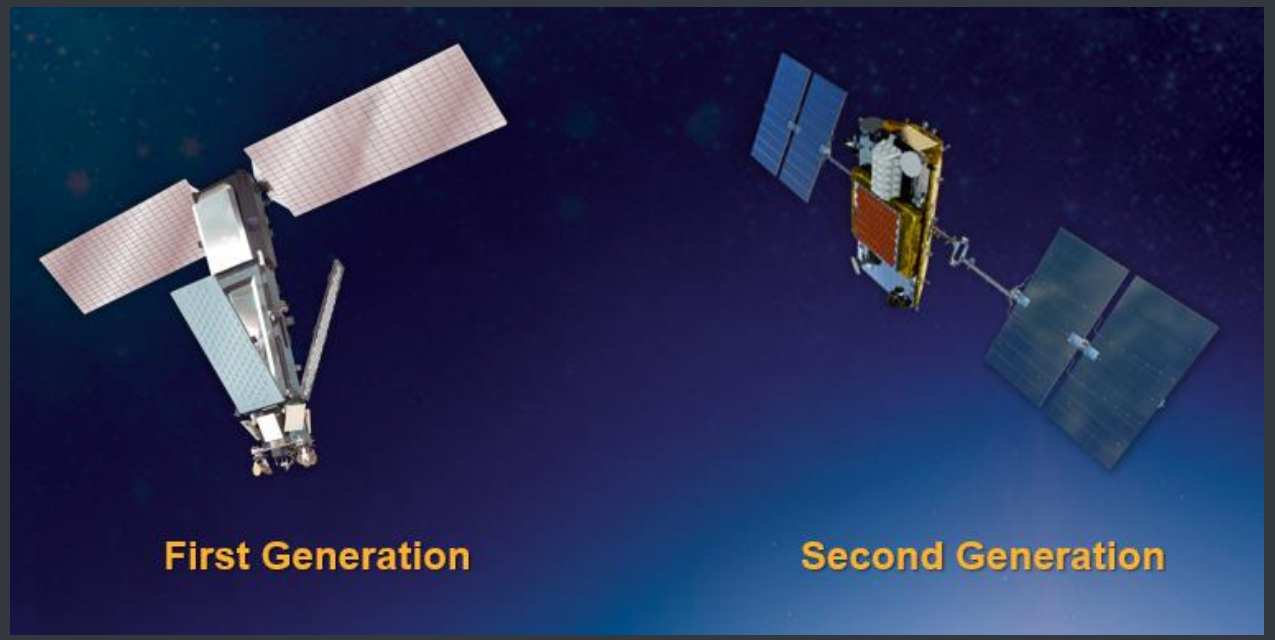
ADVICE & LESSONS LEARNED

- Based on Iridium's experience as well as the new reality of collision avoidance, we added a retrograde thruster to the Iridium® NEXT satellites to be as nimble as possible.
- Iridium's highest drag predates modern collision avoidance thresholds and algorithms.
- Incorporate multi-level, rules-based limit checking to detect impossible/improbable conditions that may be caused by an SEU and protect against an incorrect response that may take the satellite out-of-service.



Iridium’s Contribution to Space Weather

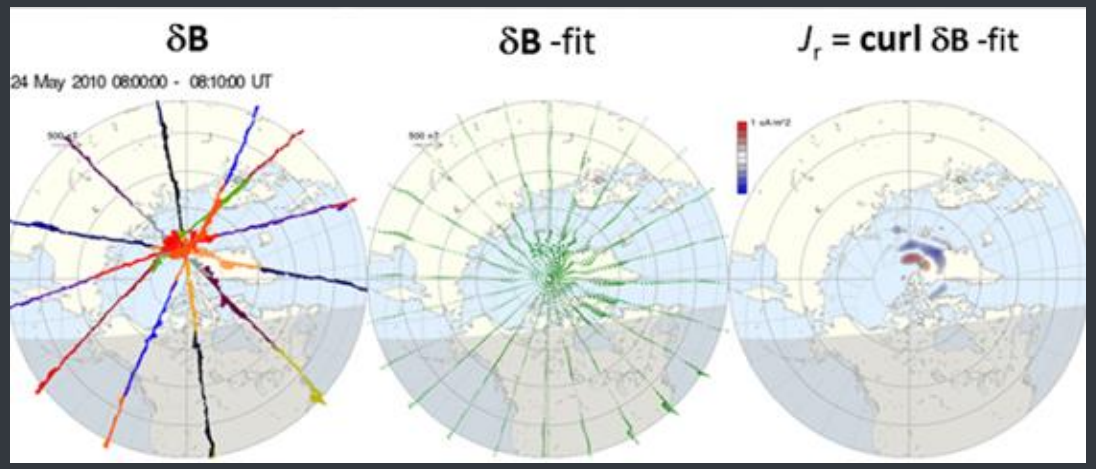
- Iridium recognized early on that constellations not only provided operational challenges and opportunities but allowed for increasing space weather data capabilities.
- Satellite equipment and hosted payload opportunities were used to increase space weather information.
- Future Iridium systems will present opportunities to further the scientific community's drive to gather information and help increase space weather awareness.



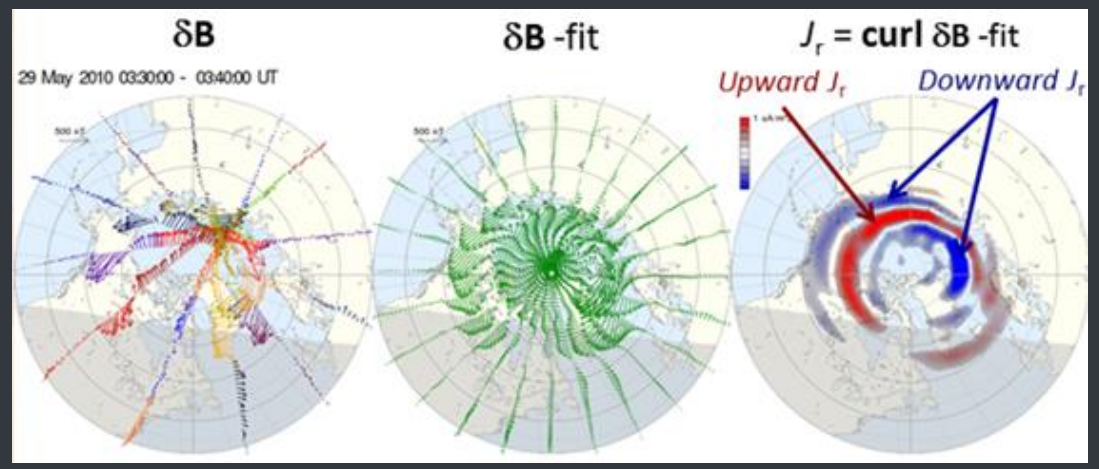
Expanding Our Mission: AMPERE

- Iridium recognized early on that constellations not only provided operational challenges/opportunities, but opportunities for increasing space weather data capabilities.
- Active Magnetosphere and Planetary Electrodynamics Response Experiment (AMPERE) leverages Iridium to collect global space weather data in real time, enabling high-quality and direct analysis of space-based solar storms that can disrupt aviation and terrestrial telecom and satellite systems.

QUIET



ACTIVE



Expanding Our Mission: REACH

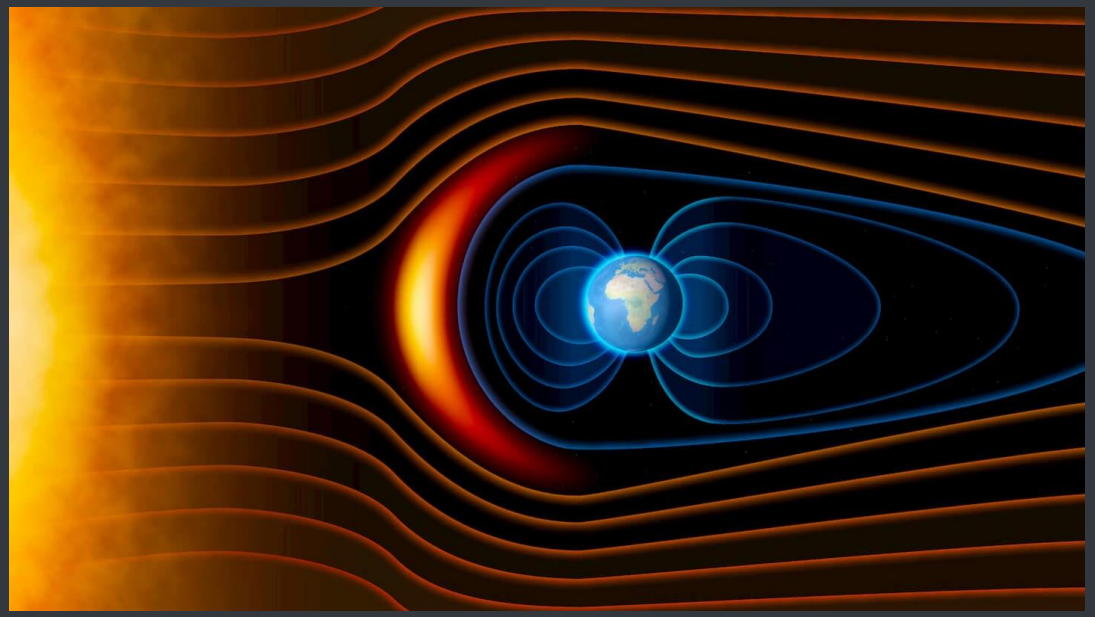
Responsive Environmental Assessment Commercially Hosted (REACH)

The second-generation Iridium satellites also host invaluable scientific instruments. REACH is a space weather monitoring system comprised of 32 space radiation sensors installed on Iridium's new satellites.

REACH was created through a partnership between the U.S. Air Force, The Aerospace Corporation, Johns Hopkins Applied Physics Laboratory (APL), Harris Corporation, and Iridium. The program provides an unprecedented capability to monitor Earth's radiation environment in Low-Earth Orbit.

This space radiation–sensing technology provides resilient detection and characterization of space weather hazards, such as solar flares. REACH data is being applied to analyzing current and forecasted space weather phenomena, as well as determining the role of charged particles in upper atmosphere chemistry, and the dynamics of the Van Allen radiation belts. Applications of the data include monitoring the radiation environment for aircraft at high latitudes, as well as for crewed missions in Earth orbit.

Data from the REACH program is playing a critical role in helping us understand and prepare for space weather hazards. This information can be vital in the protection of the Earth's infrastructure, including the electrical grid and other utilities, such as water systems.



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Questions?

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