

Who's Concern is Space Weather?

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American Meteorological
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Space Weather and Radiation Risk – Part 1
3rd IAASS • Rome, Italy • 21-23 October 2008



Communications

Radiation Exposure

- Avionics
- Human

GPS/Satellite Navigation

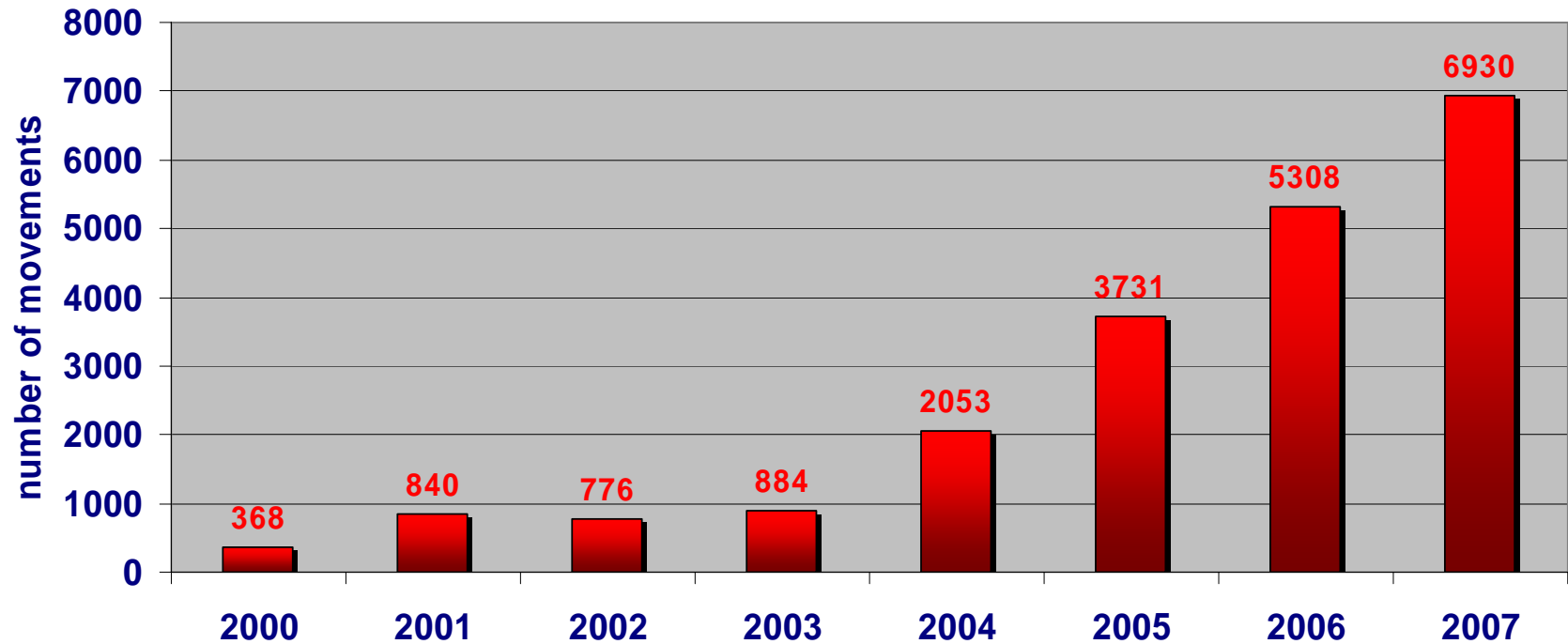


R
I
S
K

Technological Development



Crosspolar Traffic Levels from 2000 through 2007



Economic Drivers for Non-Stop Options (c.f. Stills March 2006)

Flight 829 ORD-HKG

POLAR 3

316 Pax and 5000 lbs Cargo (14:32)

Flight 829 ORD-HKG

Russia

246 Pax and No Cargo (15:41)

Flight 829 ORD-HKG

NOPAC

No Pax or Cargo (17:18)



Every Minute Saves \$3.3M

Every 1 Cent Adds \$25M

Radiation Exposure to Humans

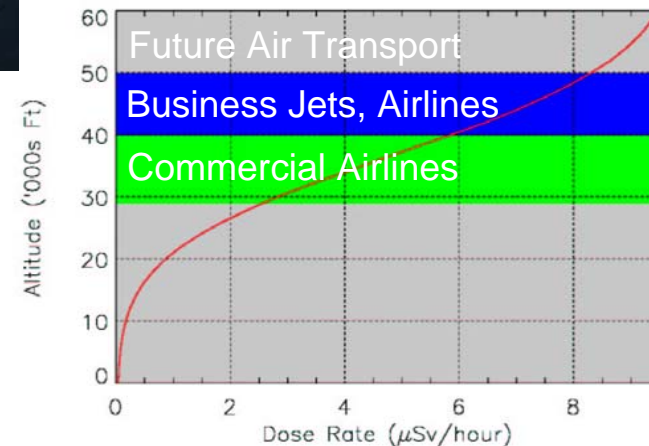
- Limit Exposure to Radiation – EU Legislation
 - Galactic Cosmic Rays (GCRs)
 - Solar Particle Events (SPEs)
- Higher, Longer, Polar
- Commercial Space Ops

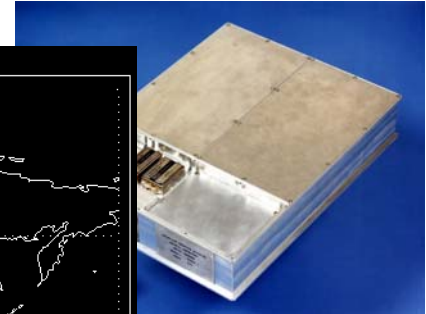
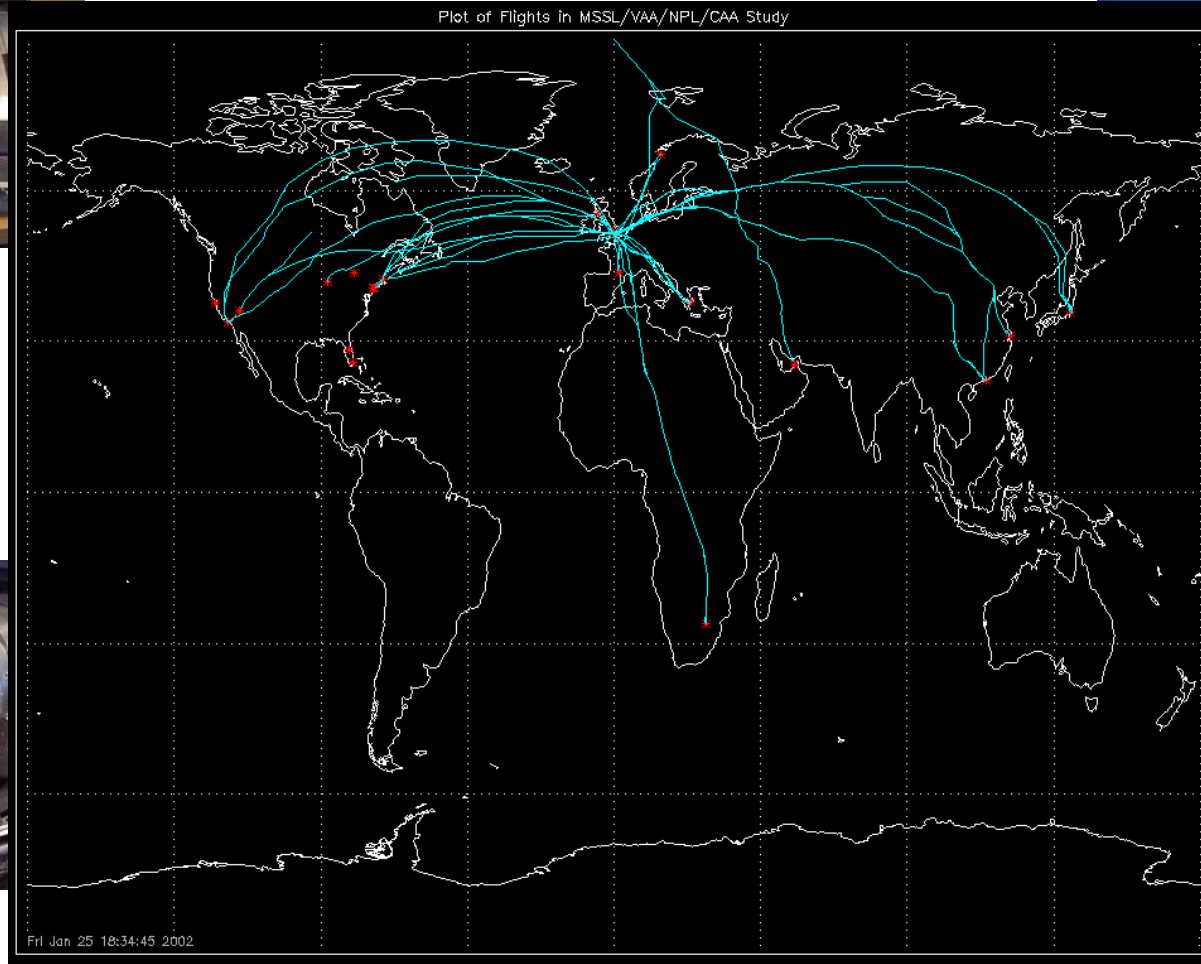
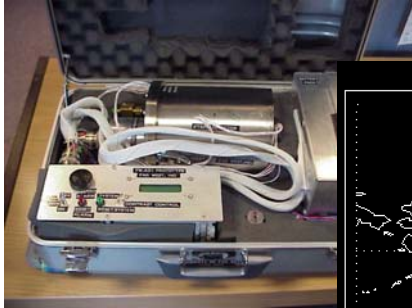


Next Generation

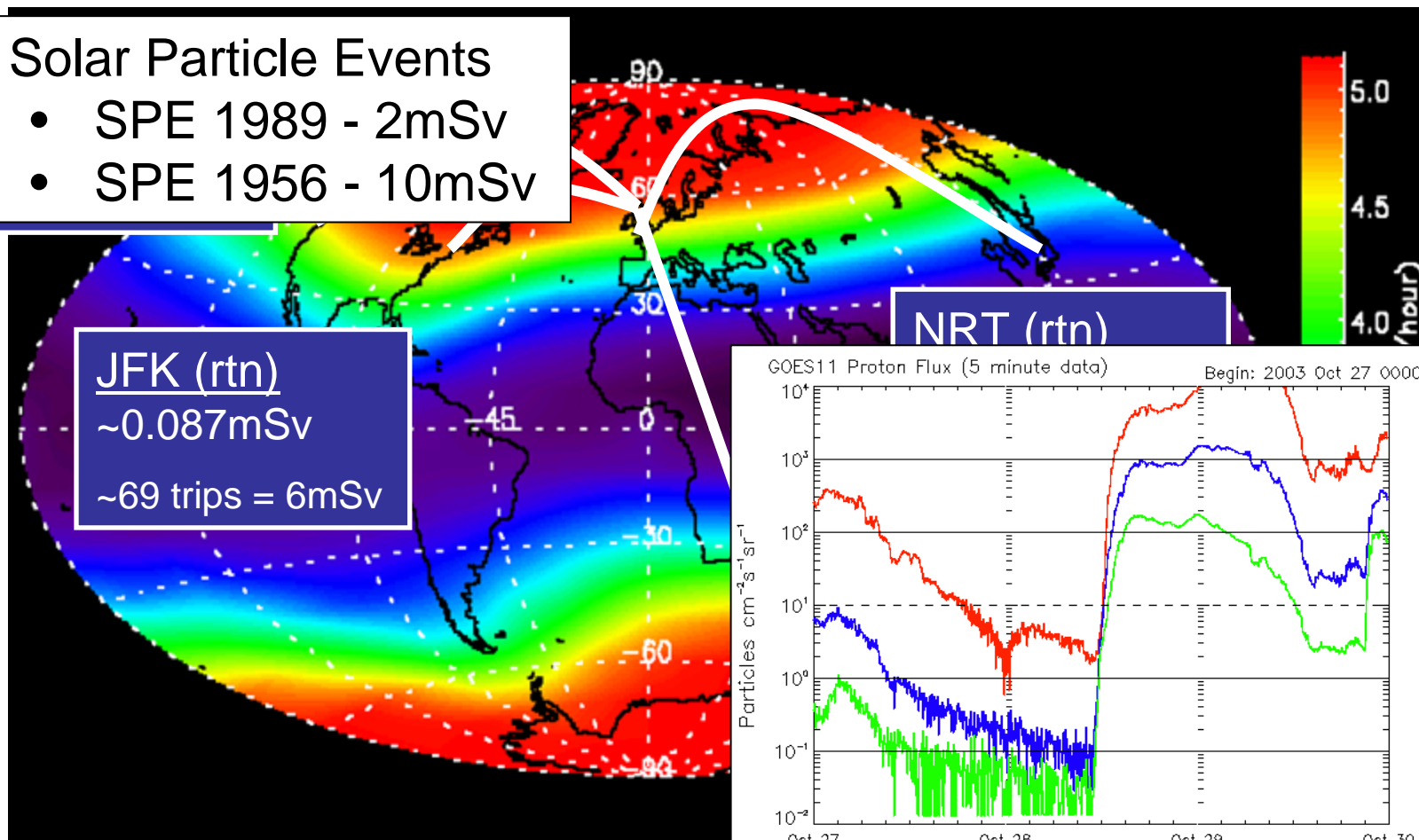
?

Air Transport





- Solar Particle Events
 - SPE 1989 - 2mSv
 - SPE 1956 - 10mSv



JFK (rtn)

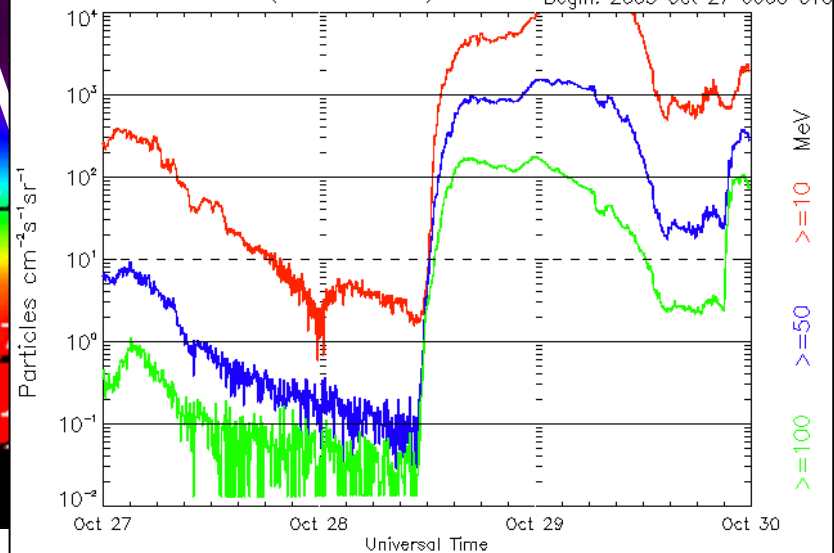
~0.087mSv

~69 trips = 6mSv

NRT (rtn)

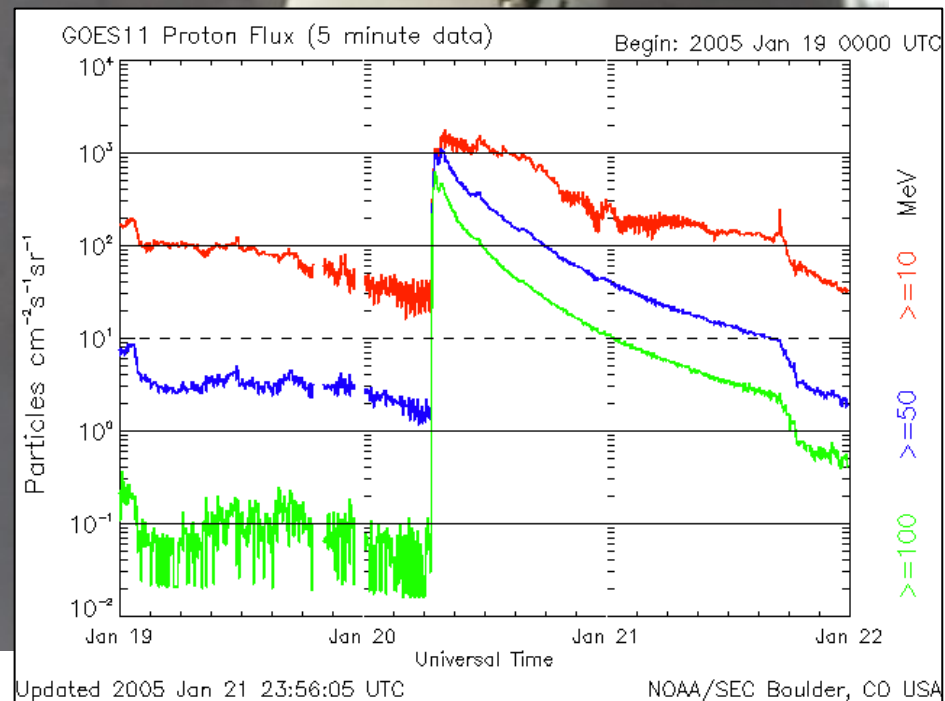
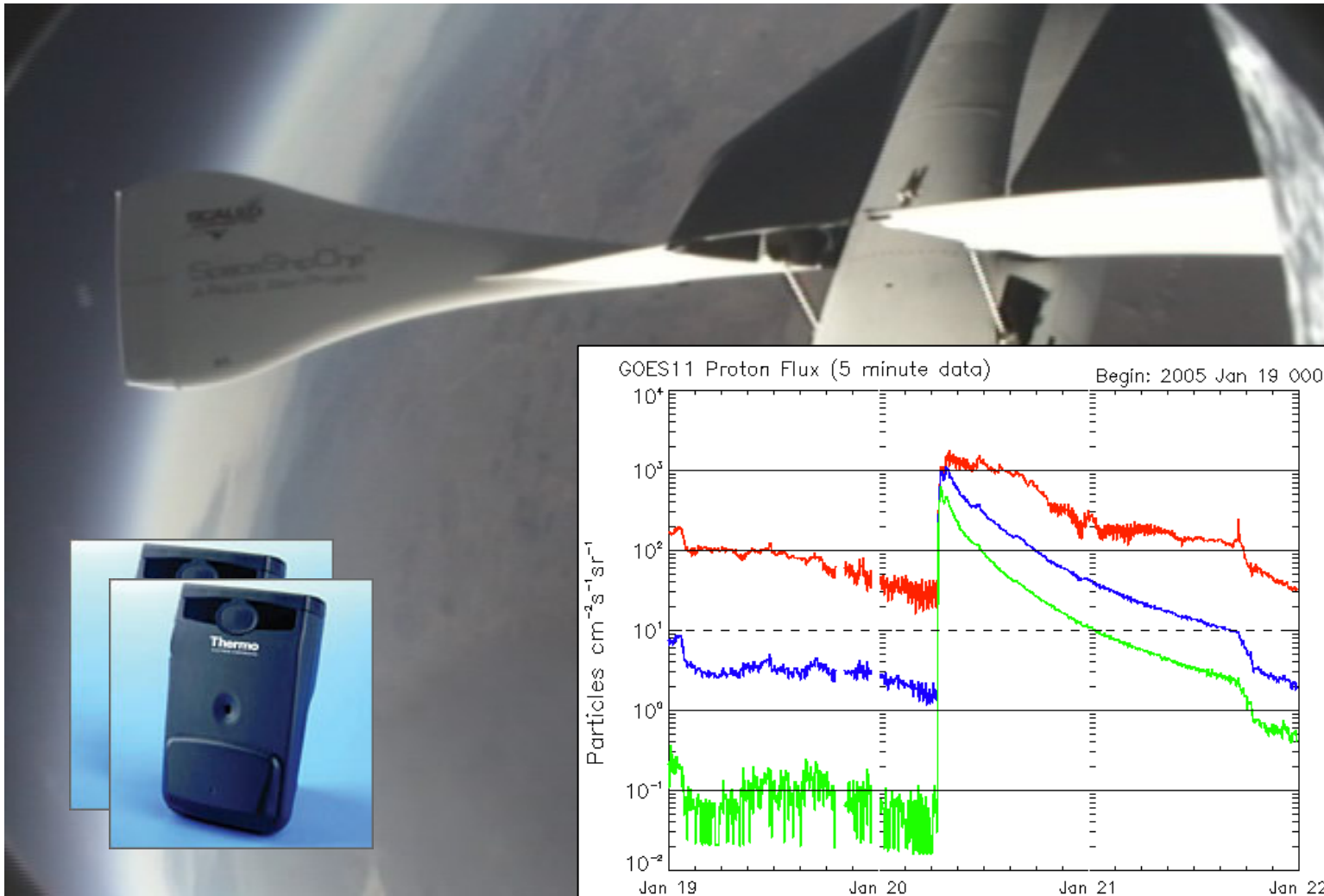
GOES11 Proton Flux (5 minute data)

Begin: 2003 Oct 27 0000 UTC



Updated 2003 Oct 29 23:56:03 UTC

NOAA/SEC Boulder, CO USA



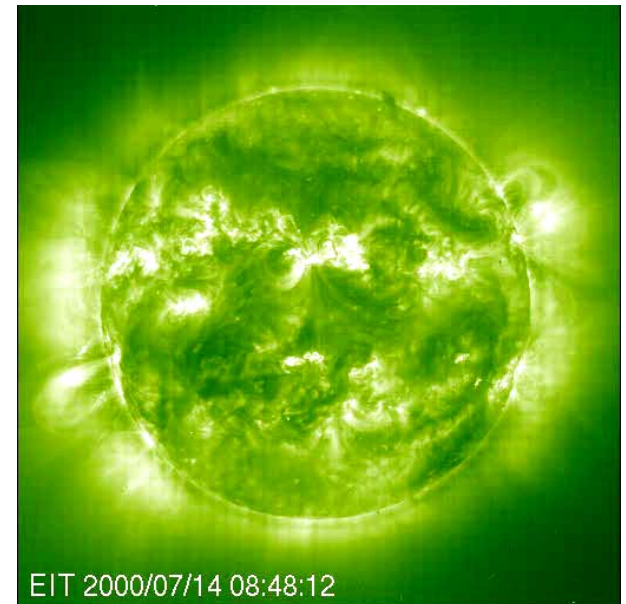
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Space Weather – Are we interested?

- Radiation Environment
 - Avionics
 - What micro-electronic safety critical systems?
 - What technological developments?



EIT 2000/07/14 08:48:12

Space Weather – Are we interested?

- Communication, Navigation
 - Type of Operation, Trajectory, Duration?
 - Comms systems?
 - Fair Weather only? Position tracking?



Space Weather – Operational considerations

- Launch sites – latitude
- Monitoring of SW environment



- Provision for onboard instruments
- Risk Assessment for operation & technology
- Early Liaison with the FAA AST

Summary

- Closes airspace gap between aircraft & spacecraft
- New operational environment – R/A required
- Fantastic research opportunity
 - Required for Future Orbital Operations
- Fantastic educational opportunity
- SW Monitoring, Warning, Measurements
- New era – Commercial Space Operations

Safety is Critical to Success

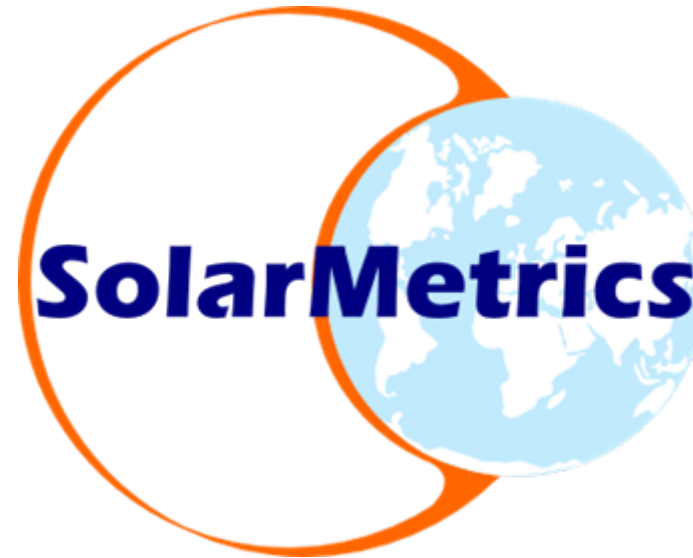


Commercial Aerospace Operators Should Be Concerned About Space Weather



SolarMetrics

Professional Space Weather Services for Aerospace



Bringing Space Weather Down to Earth

www.solarmetrics.com