Iodine Small Satellite Propulsion Demonstration

iSAT

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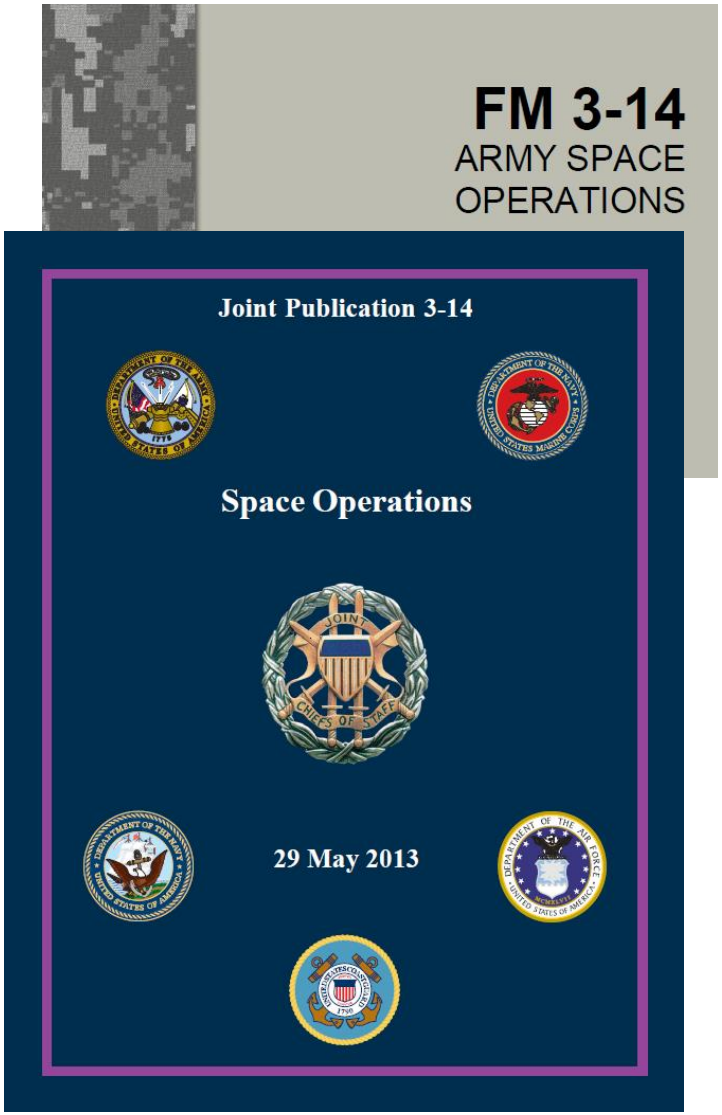
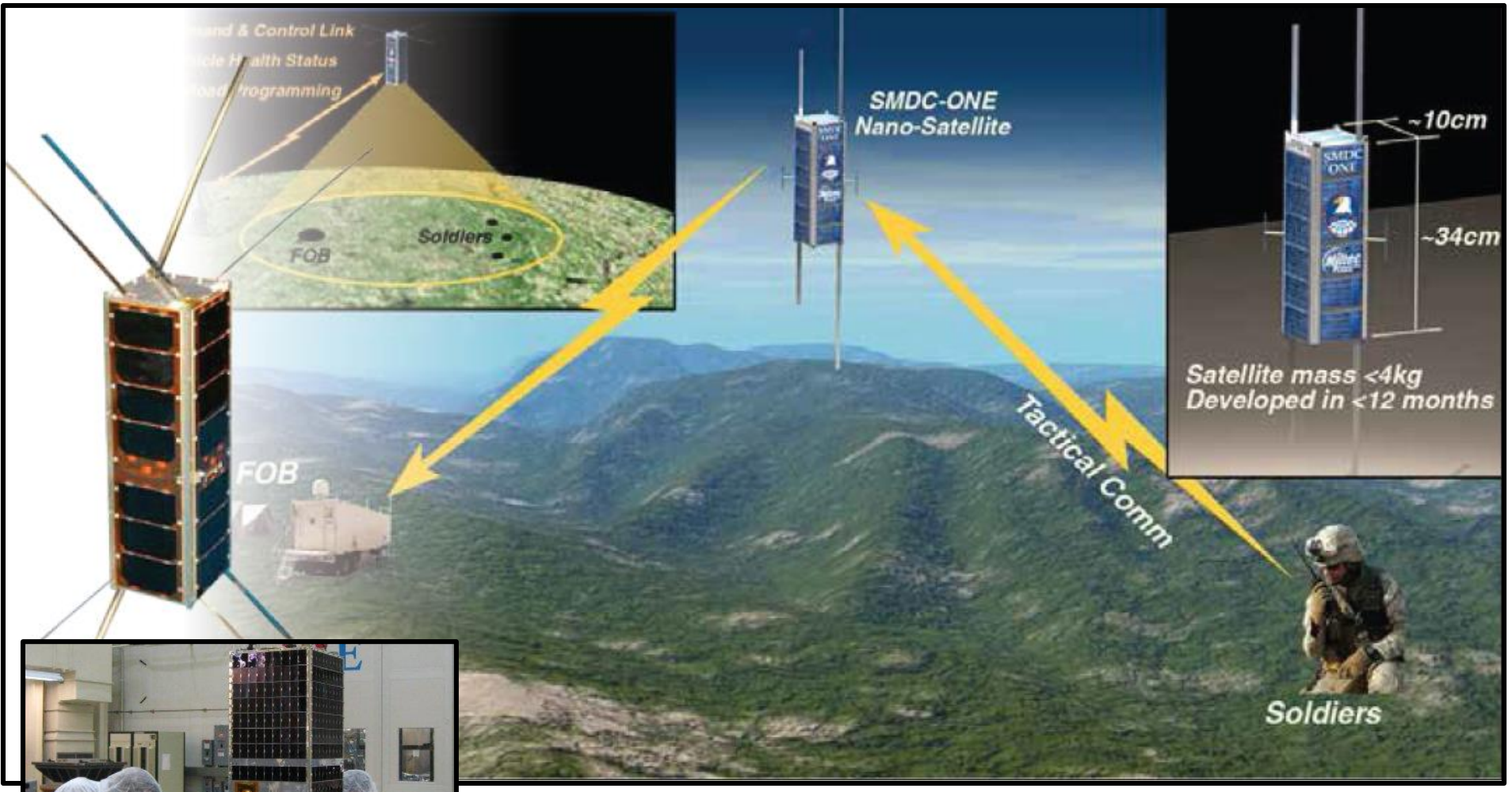
U.S. Army Space and Missile Defense Command/Army Strategic Command

Army Space

- Space Mission Areas
  - Space Situational Awareness
  - Space Control
  - Space Force Enhancement
  - Space Support
  - Space Force Application



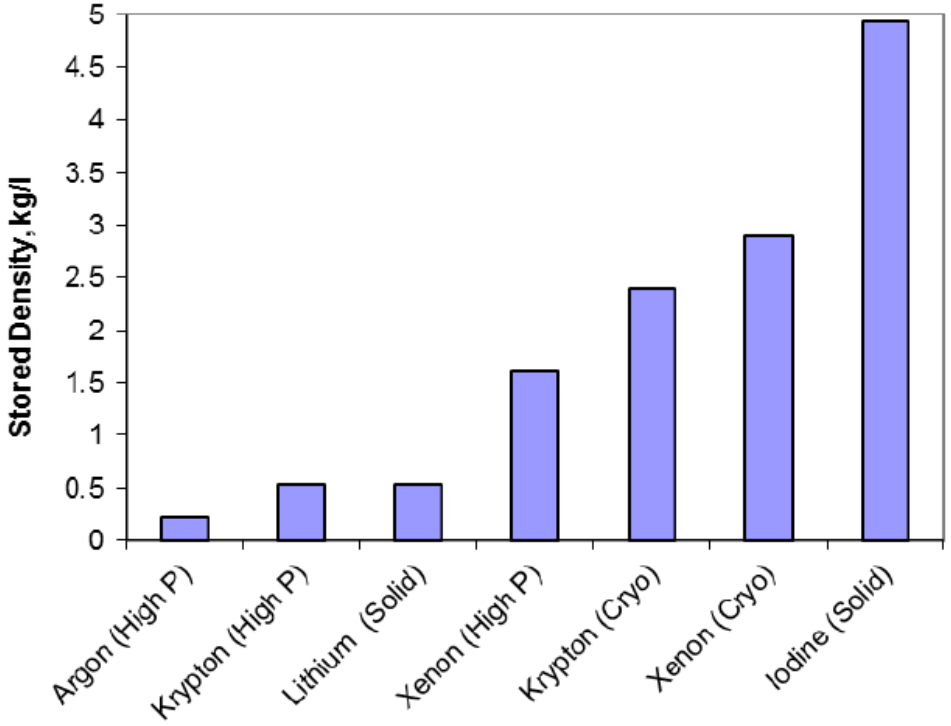
US Army Space and Missile Defense Command SMDC



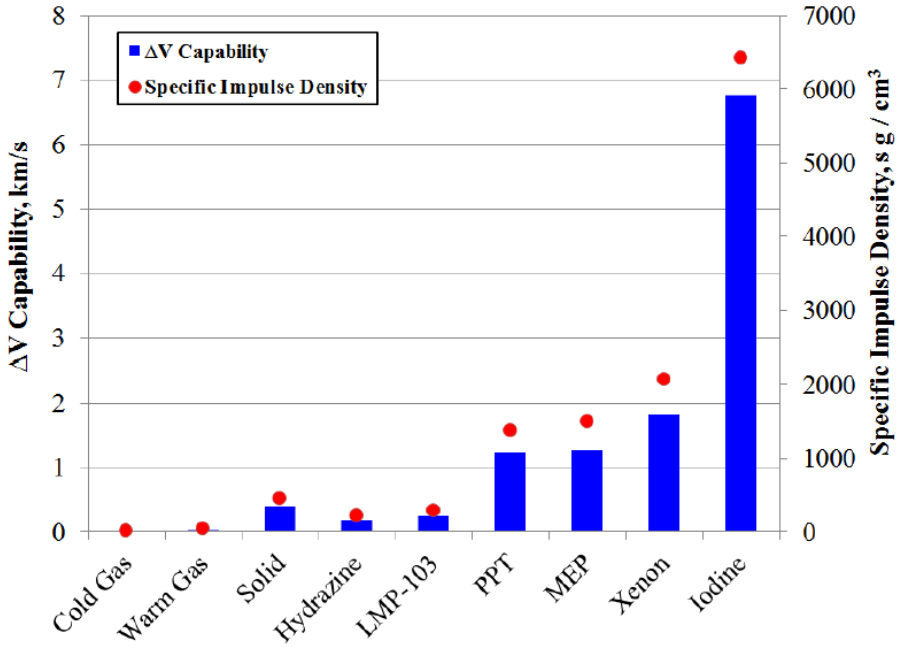
SMDC-One: Over the Horizon Comms
Kestrel Eye: EO Imagery for a Brigade Combat Team

Why Iodine?

Stored Density of Electric Rocket Propellants in kg/l (high pressure at 14-MPa, 50oC).



ISP-Density and 1U ΔV capability for a 6U Spacecraft.

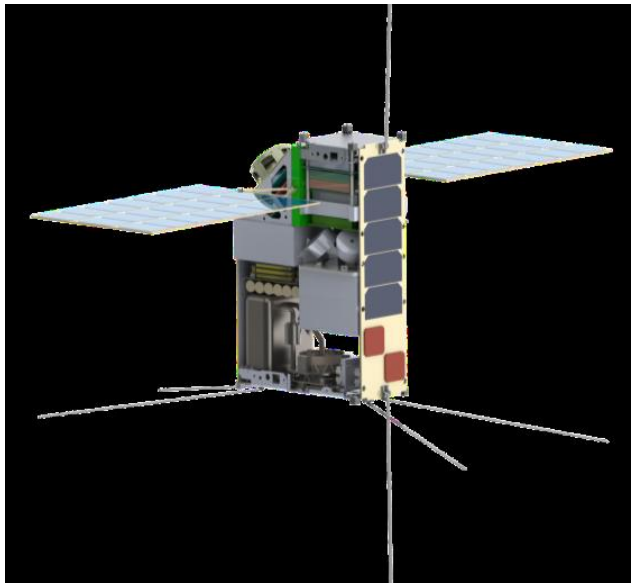


Saves Mass & Money
Reduces Risk
Increases Performance

NASA Missions

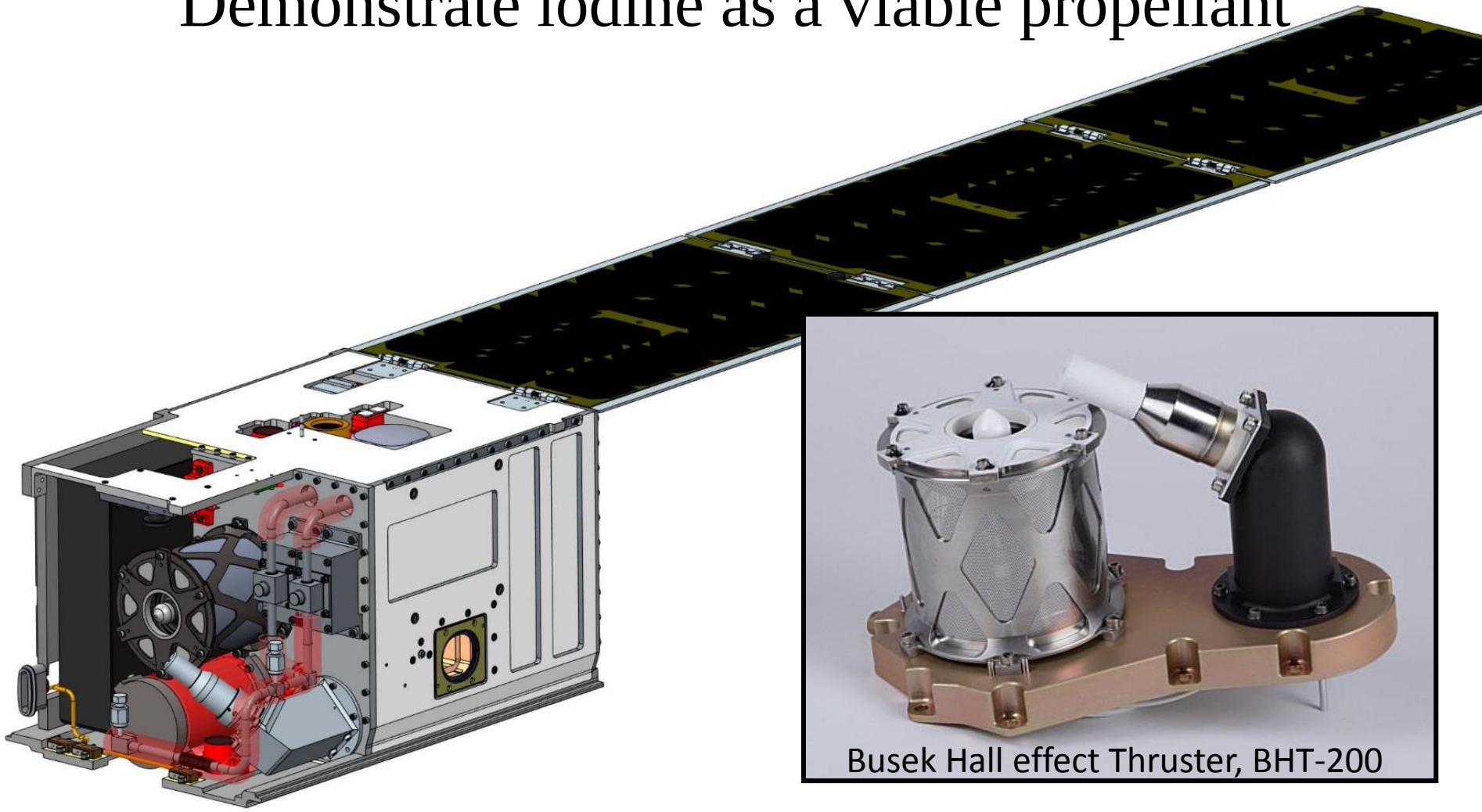
- Geocentric Missions
- Interplanetary Missions
- Discovery Mission Smallsats

- Lunar Cube
  - 6U/12kg CubeSat with over
    3.0 km/s delta-V
    - Reach lunar orbit
    - Rendezvous with an asteroid



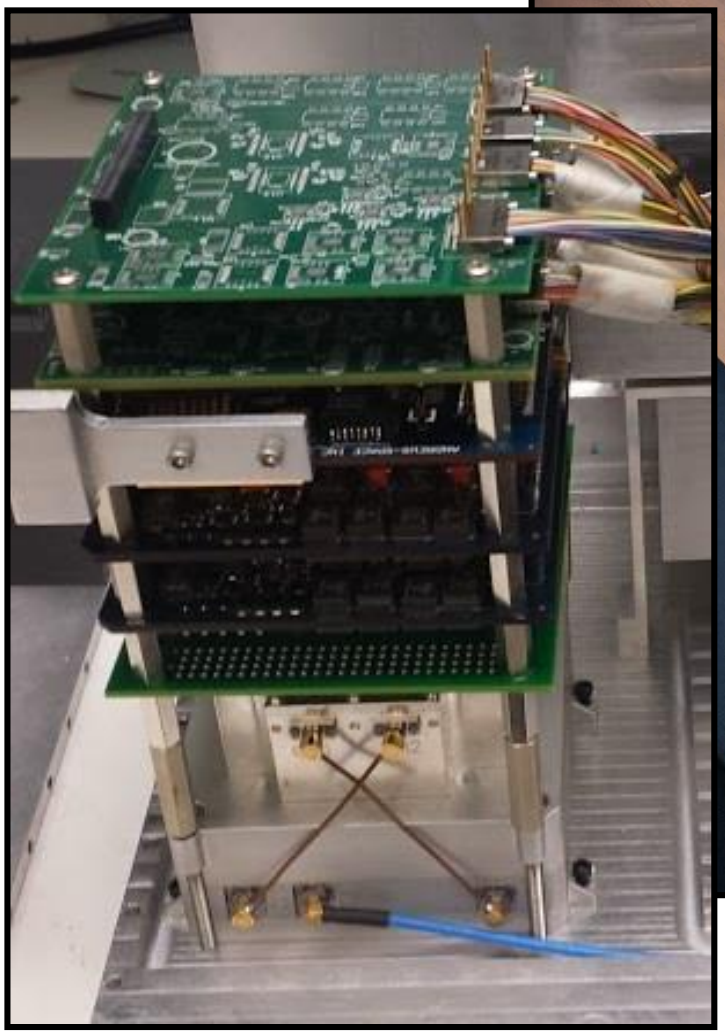
iSAT Mission

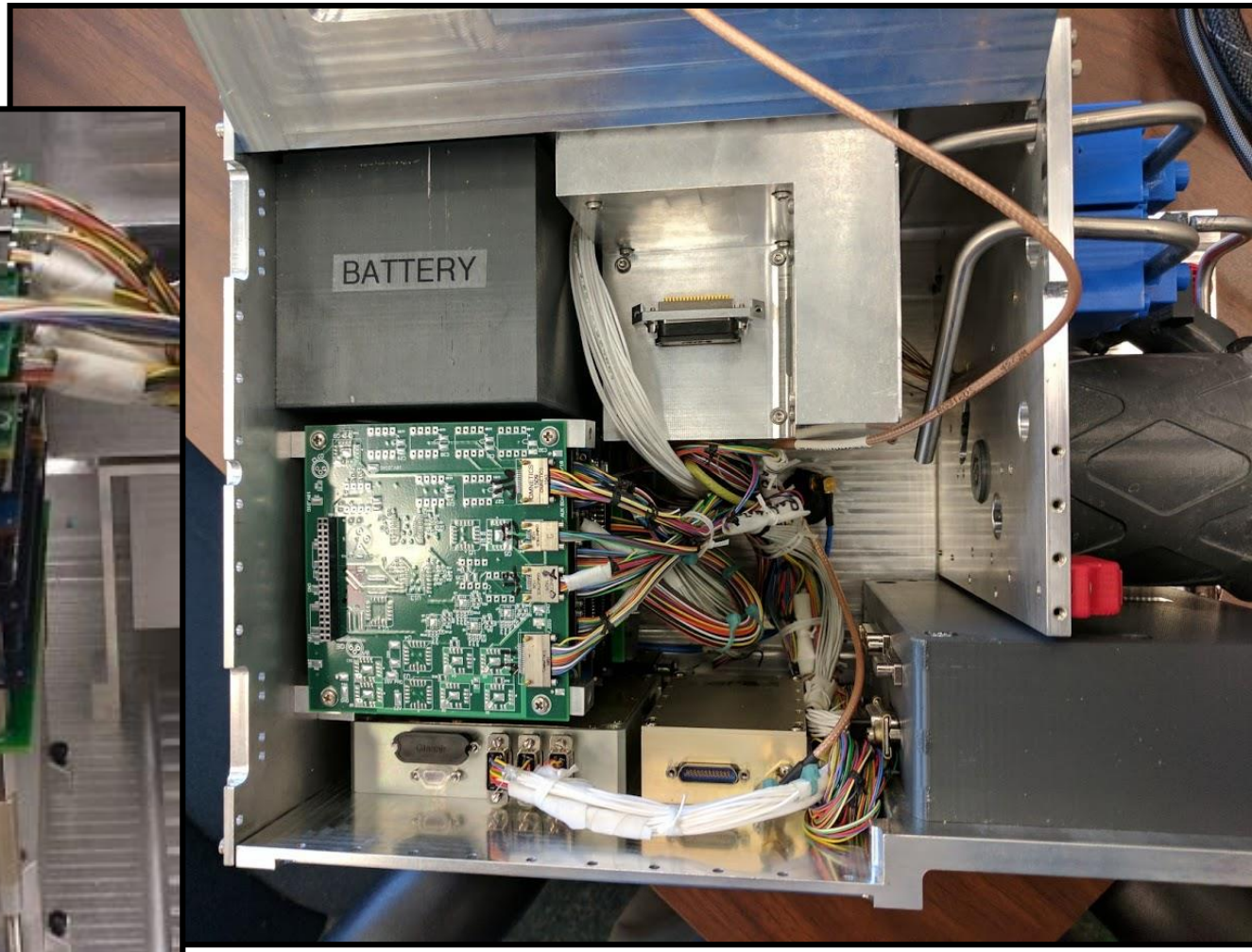
Demonstrate iodine as a viable propellant



Busek Hall effect Thruster, BHT-200

iSAT Mass Model



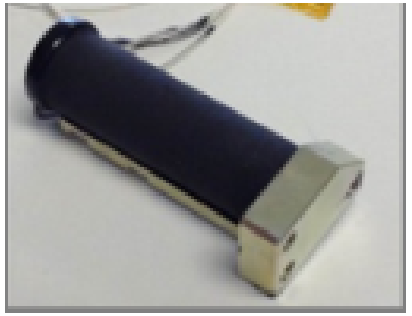


GN&C Hardware

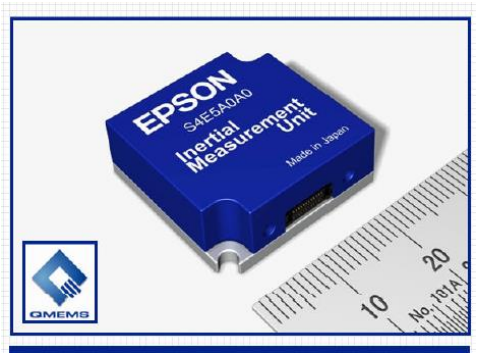
GPS:
Spacequest GPS-12

Magnetometer:
Honeywell
HMR2300

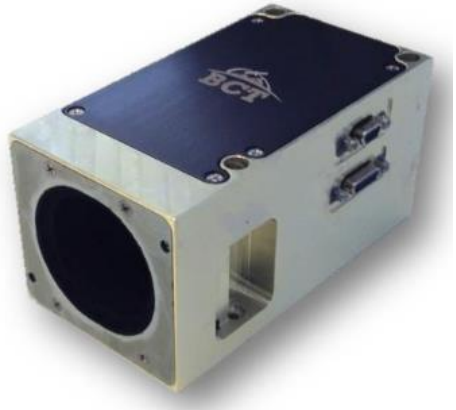
Sun Sensor:
Sinclair SS-411



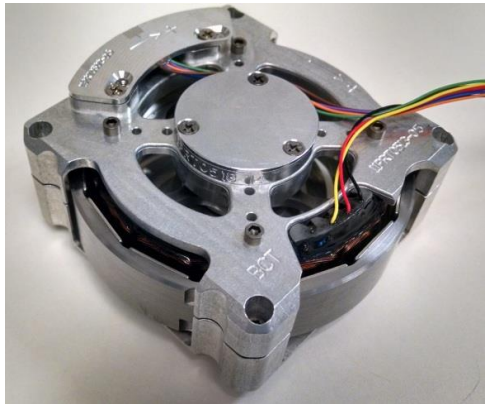
Torque Rods (3):
Blue Canyon



IMU: Epson M-G362

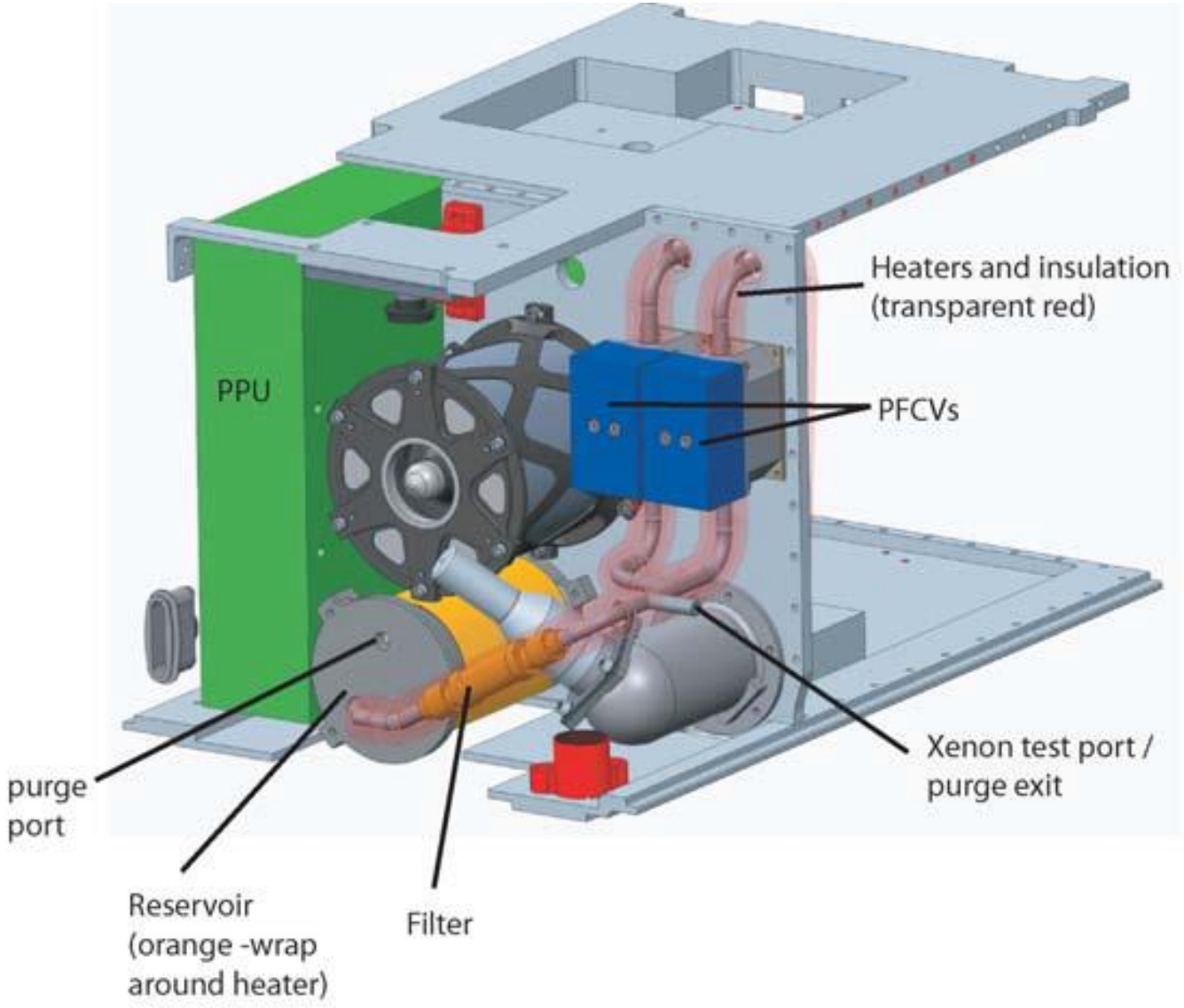


Star Tracker: Blue Canyon NST



Reaction Wheels (3):
Blue Canyon RWp100

Propulsion Feed System

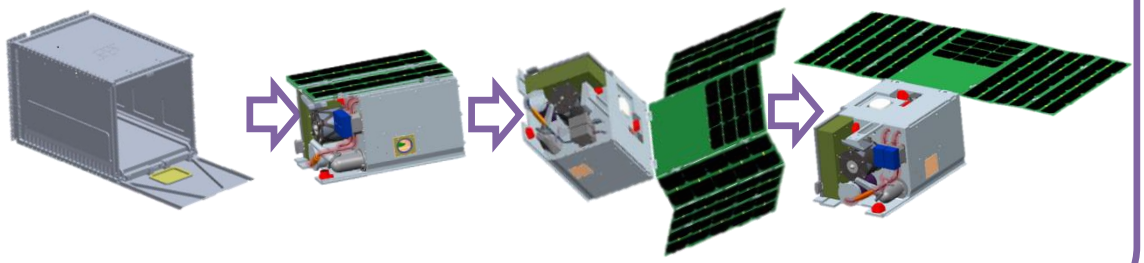


Baseline Mission Con Ops

LAUNCH

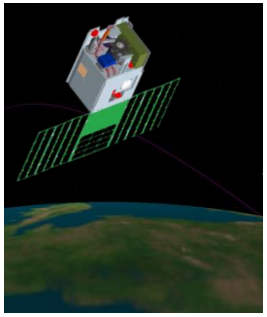
- Ride-share launch opportunity
- Most likely to sun-synch orbit

DEPLOY



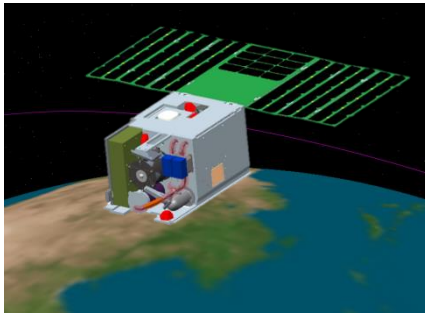
- Deployable solar arrays for power production

CHECK OUT



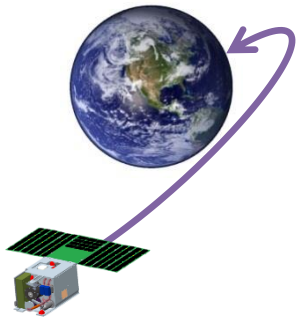
- Evaluate tip-off moments
- Arrest initial rotation

OPERATIONS



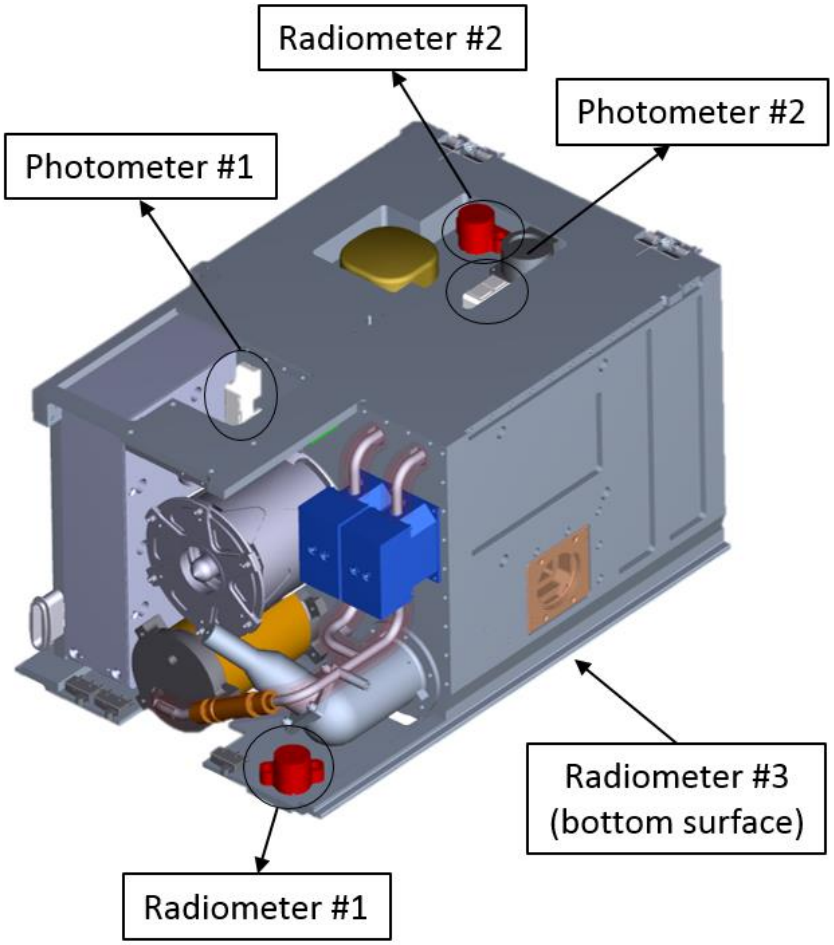
- Lower to deorbit altitude and perform science operations

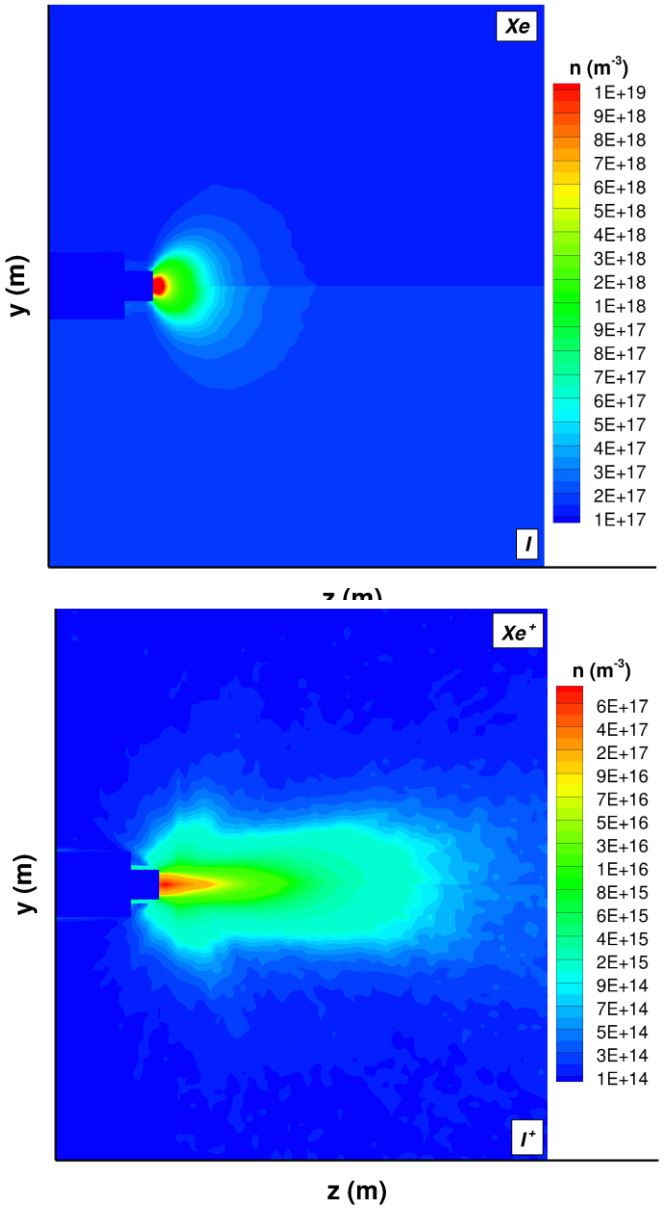
DEORBIT



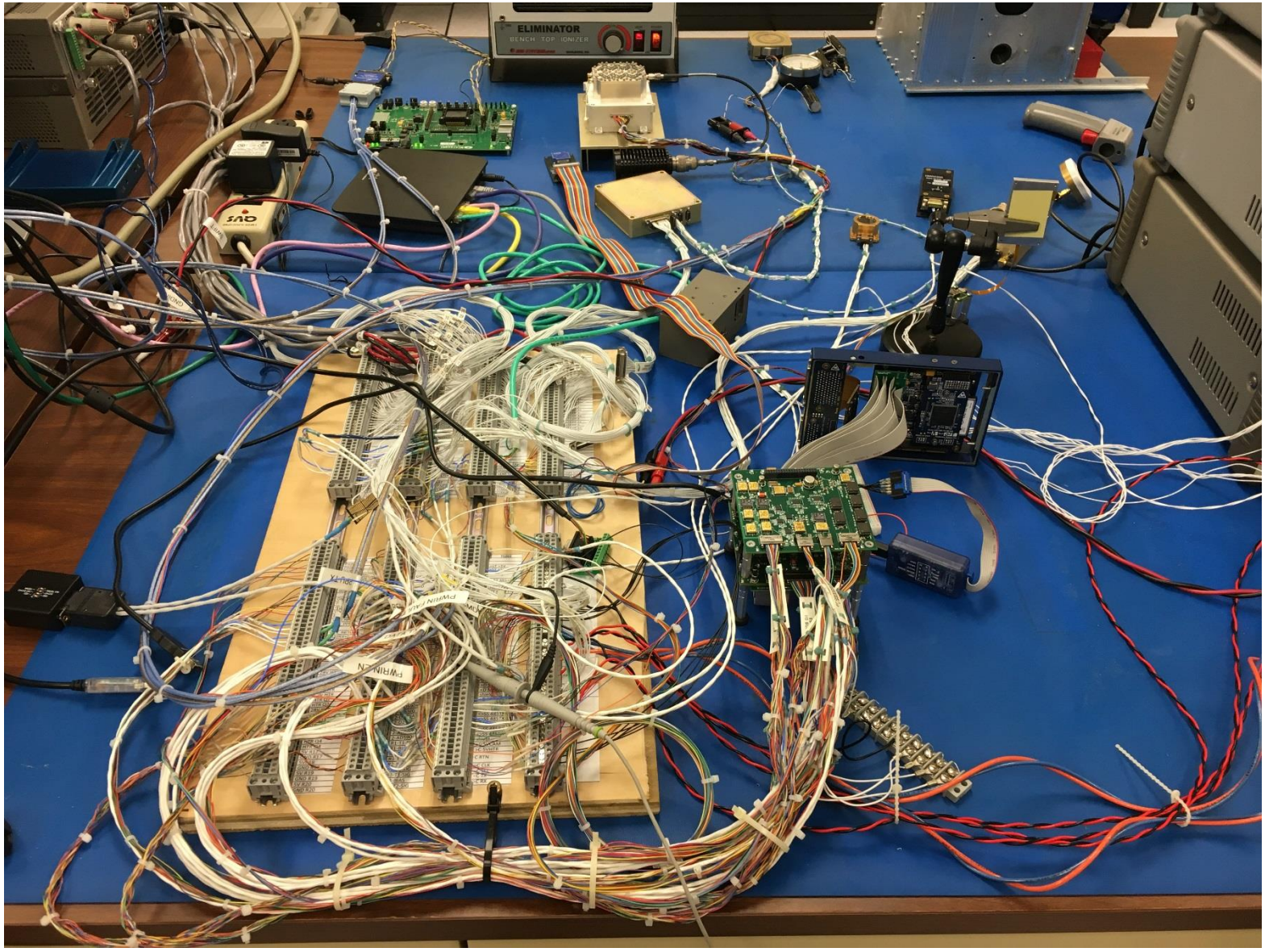
- Natural drag interaction will result in deorbit after perigee is lowered

Iodine Characterization

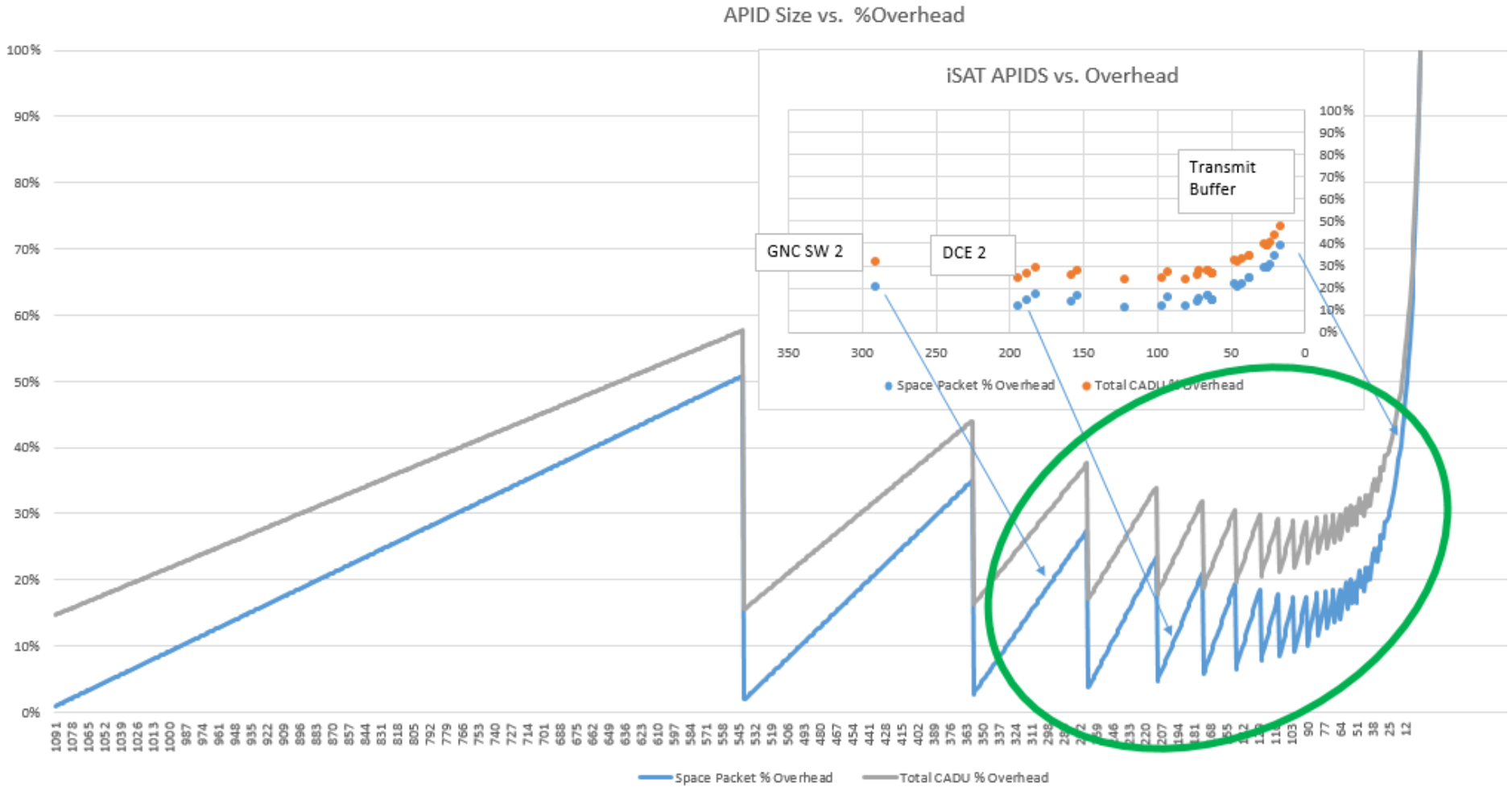




Avionics Test Bed

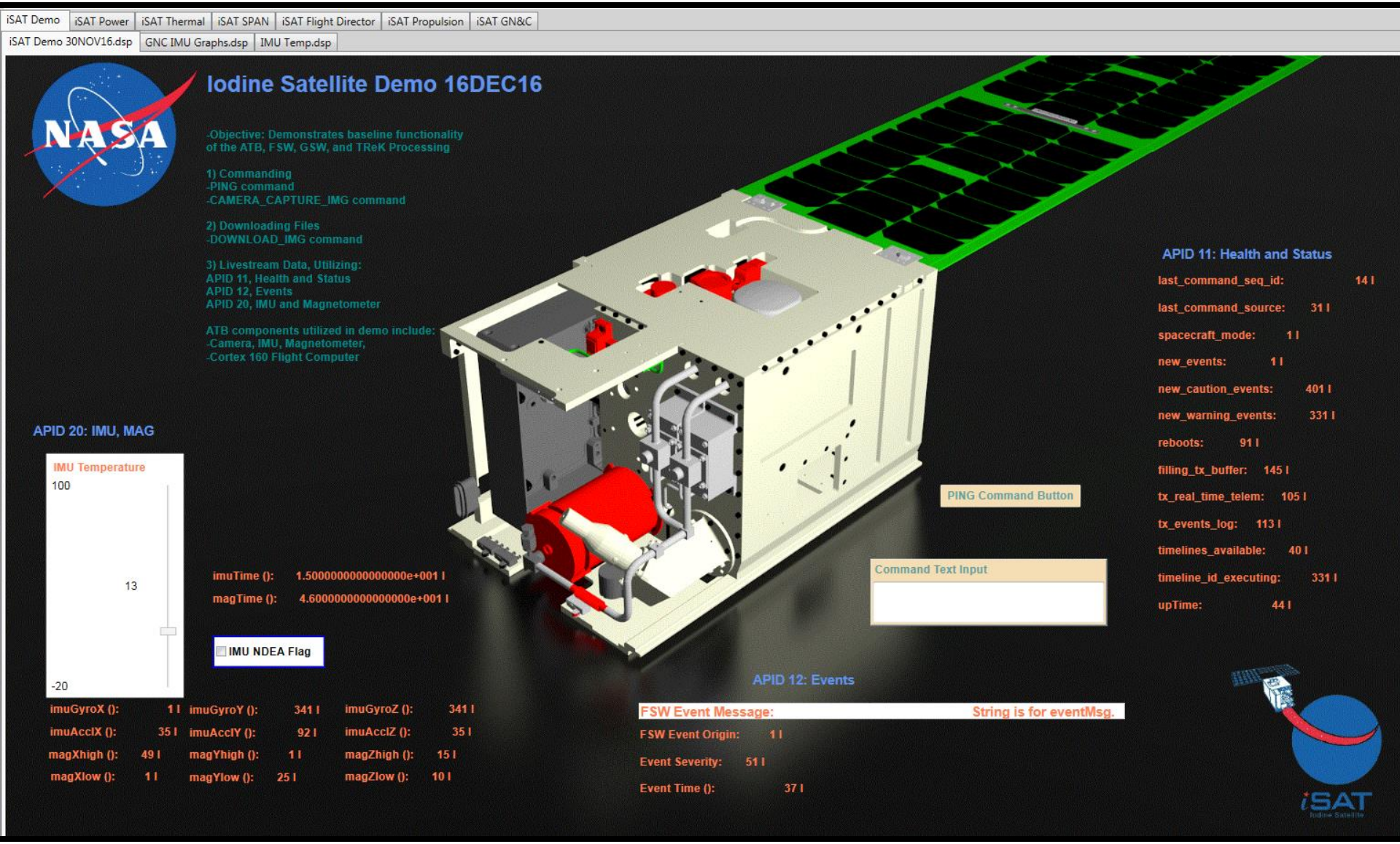


Command and Data Handling

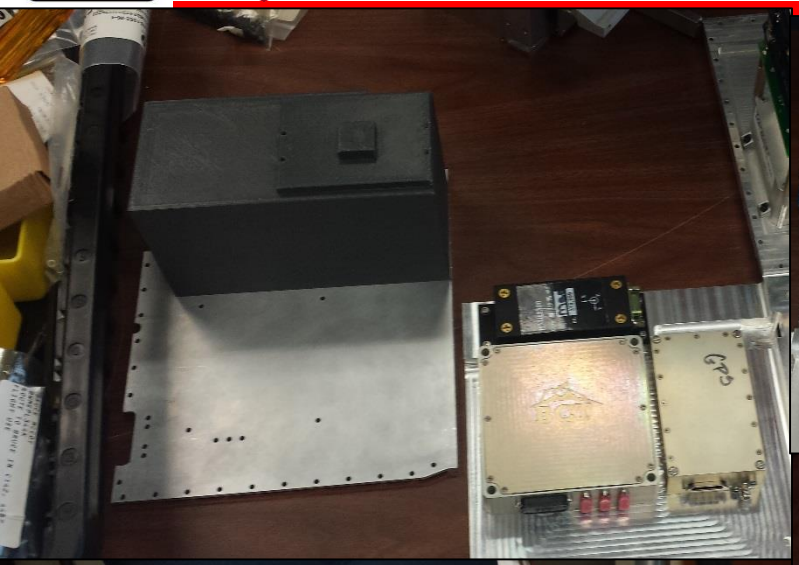


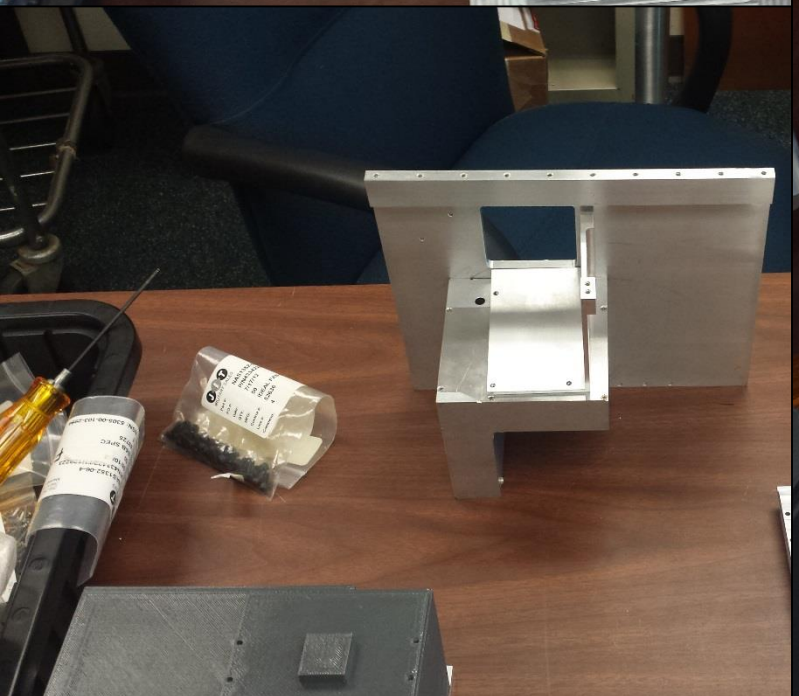
EPC Display

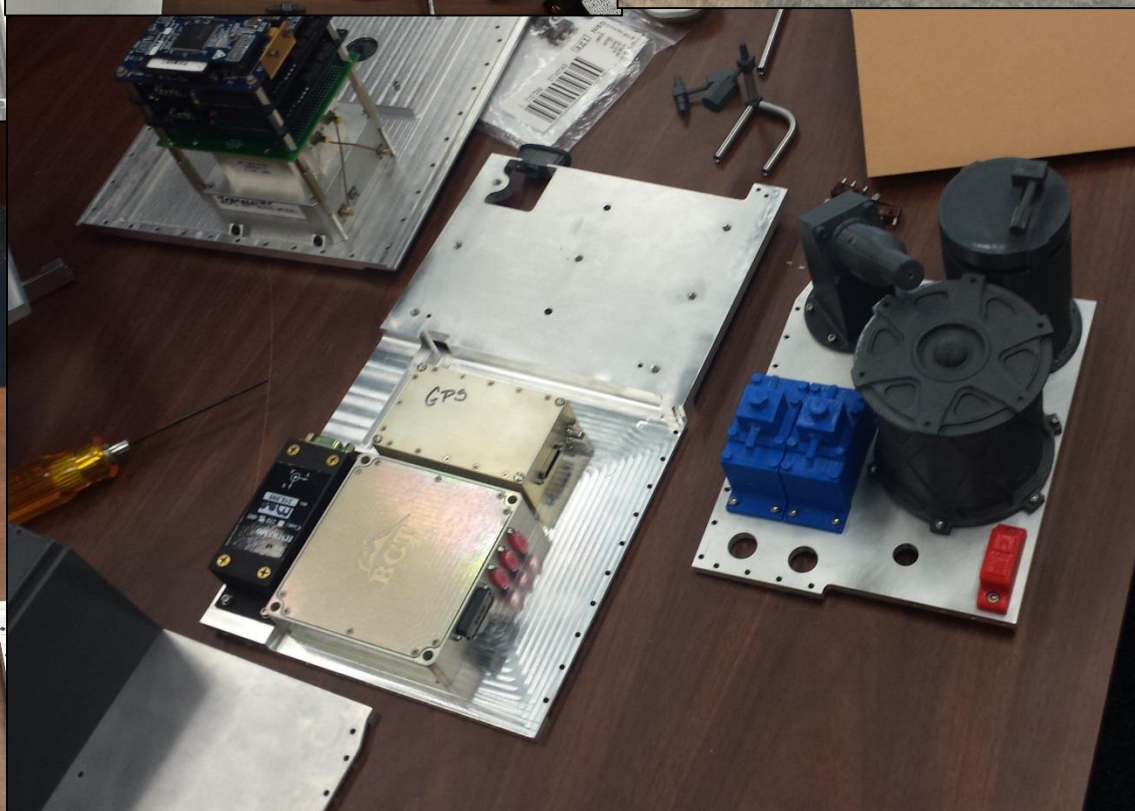
(Canned Data Screen Capture—Demo used live ATB Data)



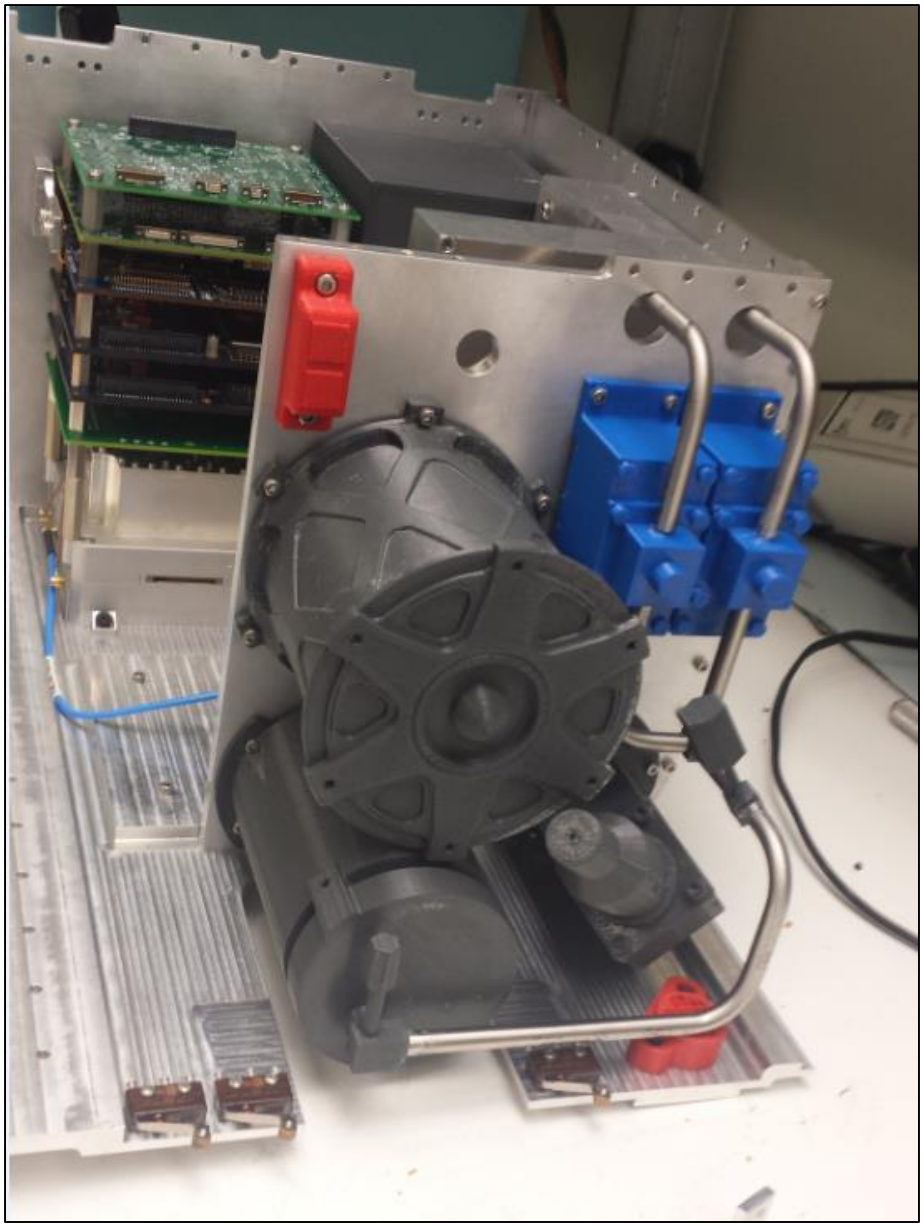
Mass Model Under Construction

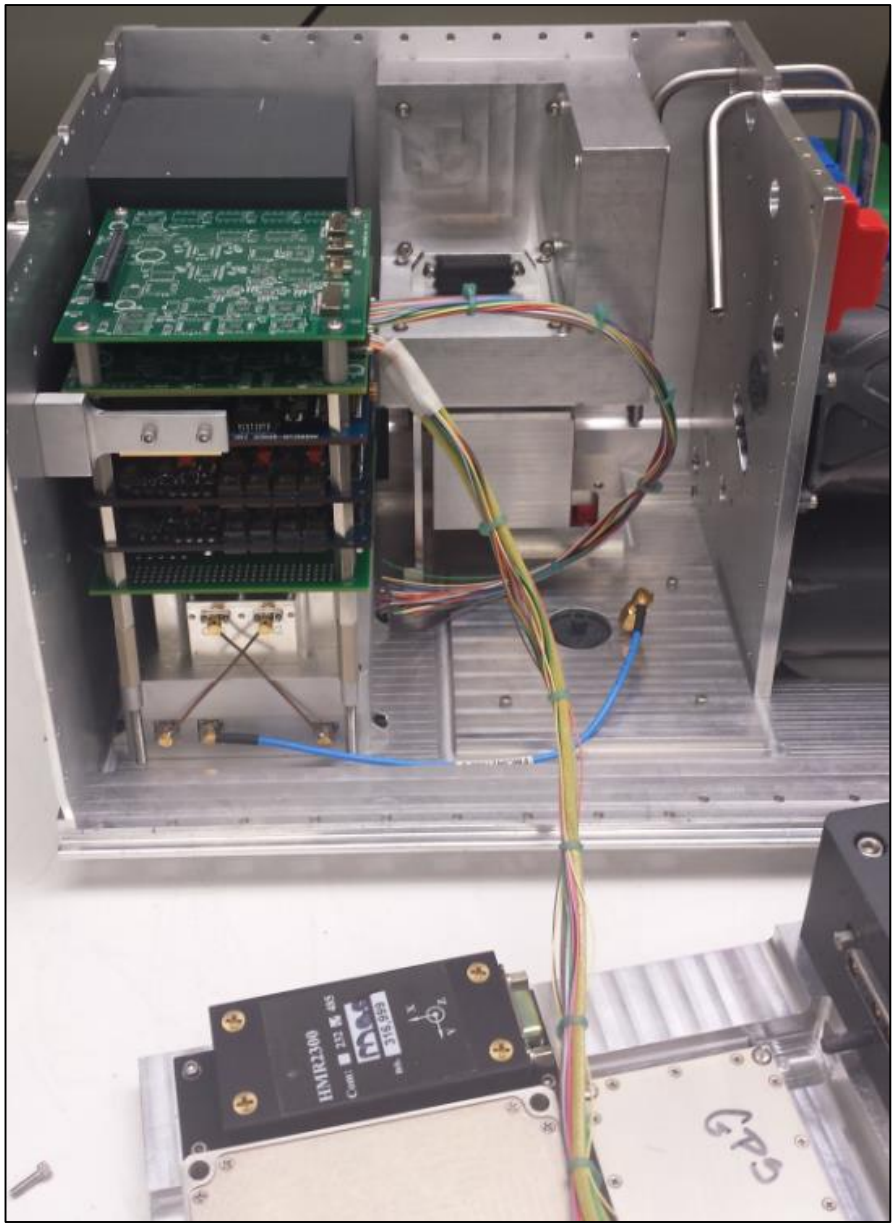




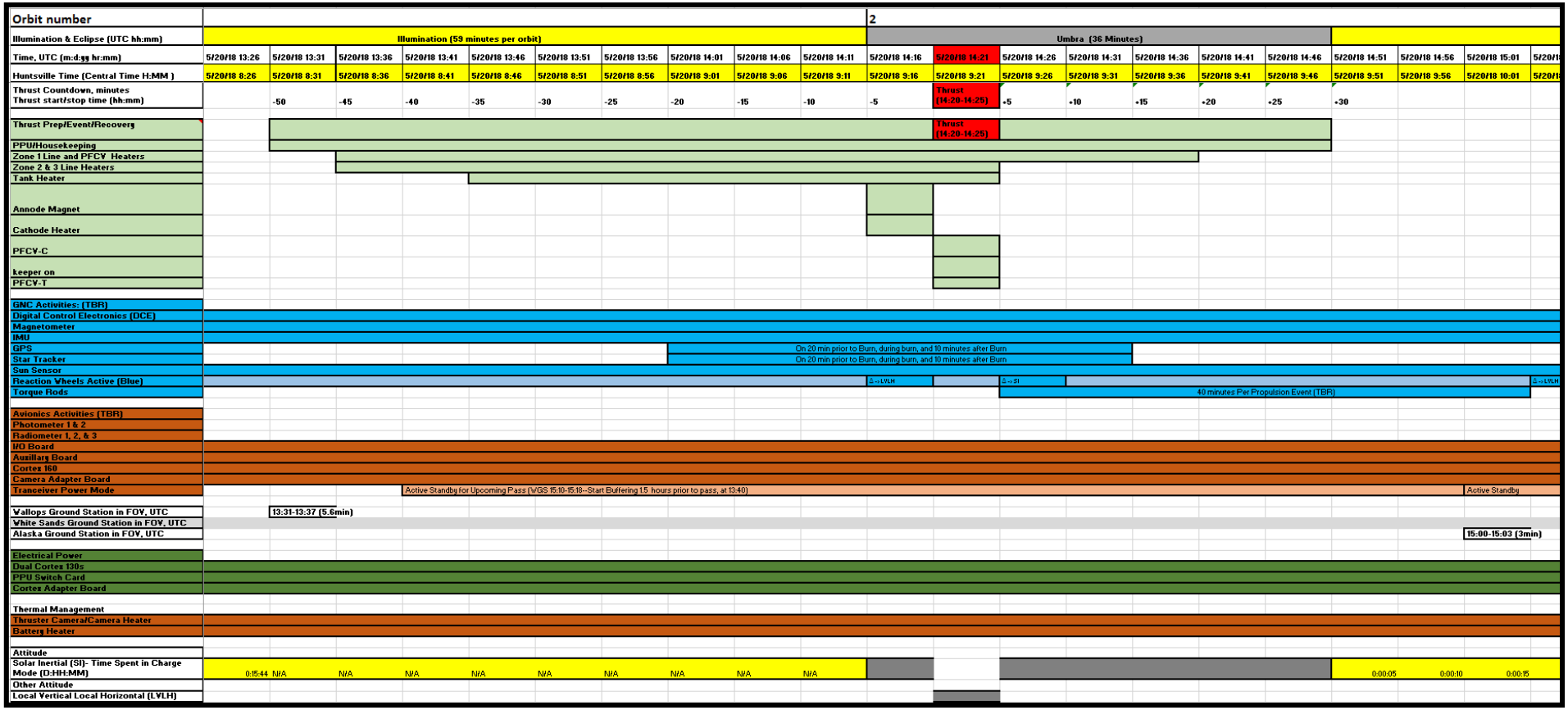


Mass Model Under Construction



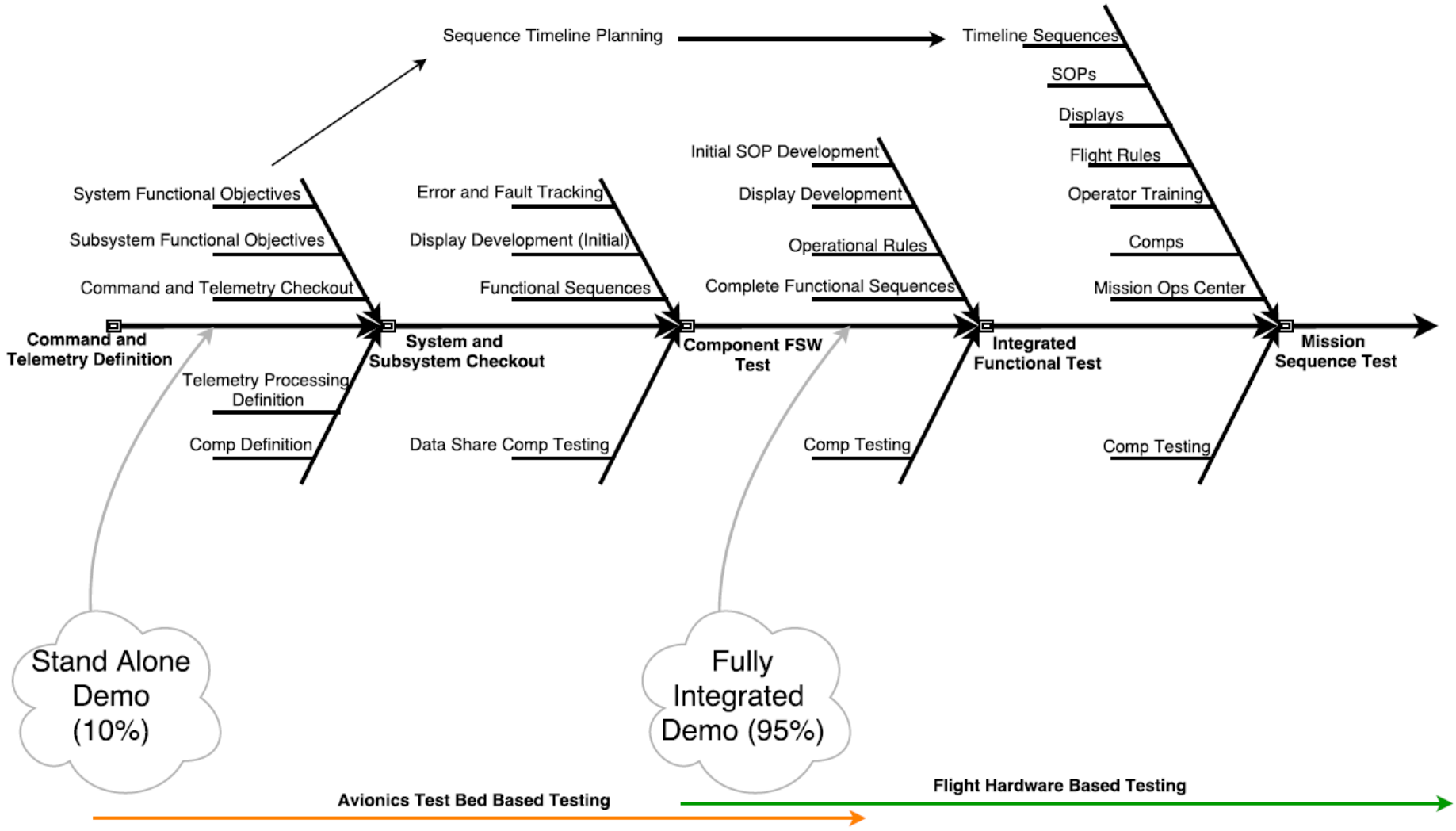


Day in the Life



Way Ahead

Operations Integrated Schedule



Summary and Acknowledgements

- Special thanks to:
  - NASA and NASA's iSAT Team
  - The Army Space Professional Development Office
  - Busek

References

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