U.S. NAVAL ACADEMY

DragonSat-1 Ready for Launch

10th Annual CubeSat Developer's Workshop

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Jin S. Kang, Ph.D.

Assistant Professor

Aerospace Engineering Department

Excellence Through Knowledge

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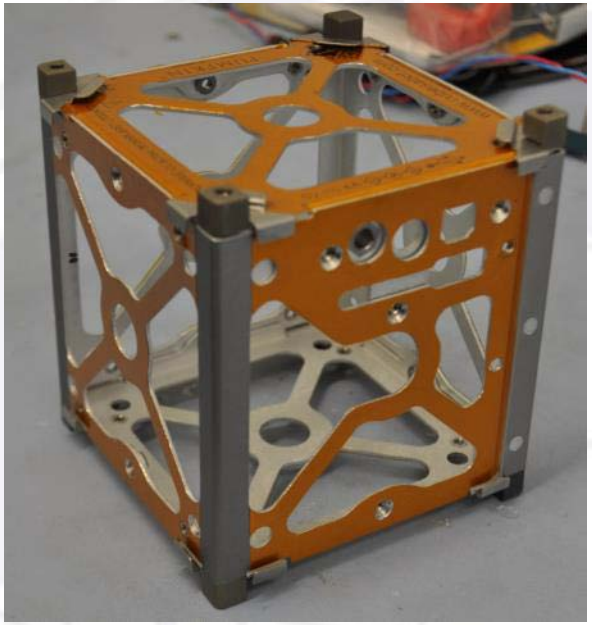

DragonSat-1 structure with
Kapton tape coating on outside

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Drexel / USNA

- DragonSat-1 is Drexel University's first satellite
  - Project started in 2009
  - Effort moved to USNA in 2012
- USNA has well established satellite program
  - DragonSat-1 is 7th satellite to launch
  - Three more satellites in development
  - Well equipped lab and ground station

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Mission Statement

The mission of DragonSat-1 is to take pictures of aurora (northern and southern lights) to observe the radiation dissipation intensity during the solar events, and to perform technology demonstration of boom deployment mechanism in space

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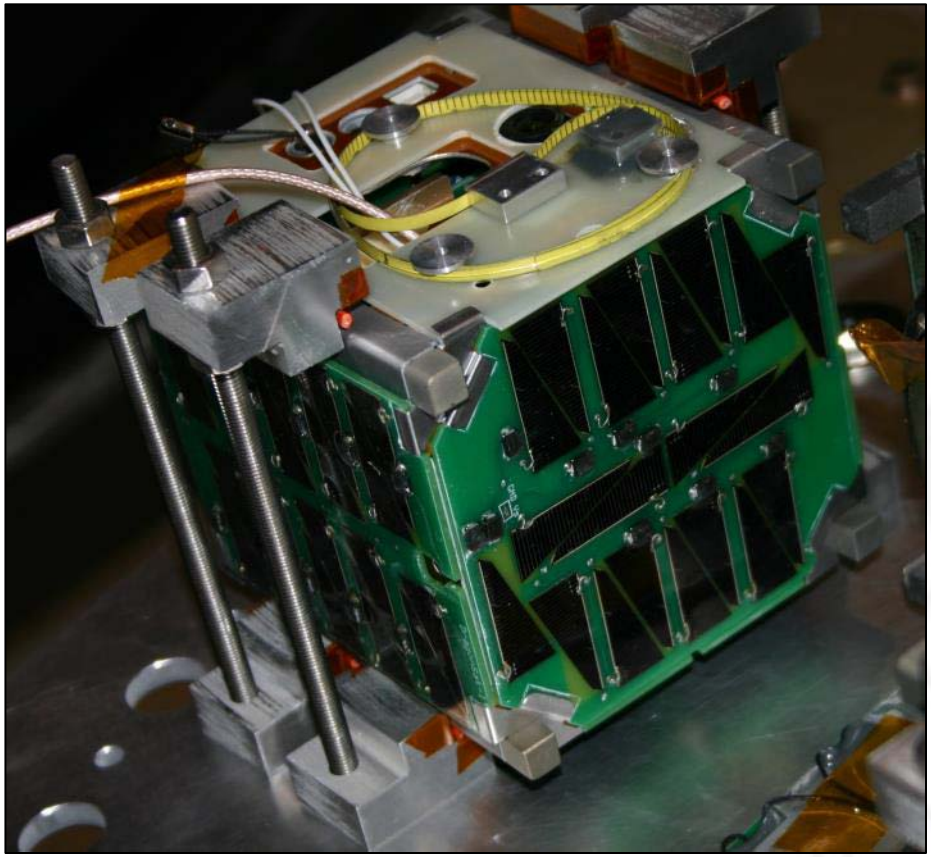
DragonSat-1



DragonSat-1 secured for thermal vacuum test

Subsystem	Feature
Structure	Pumpkin 1U
CPU	Pumpkin dsPIC33
Power	Clyde Space 1U
Comm	AstroDev Helium
Payload	Grav. grad. boom CMOS camera
Solar Panel	In-house (TASC cells)

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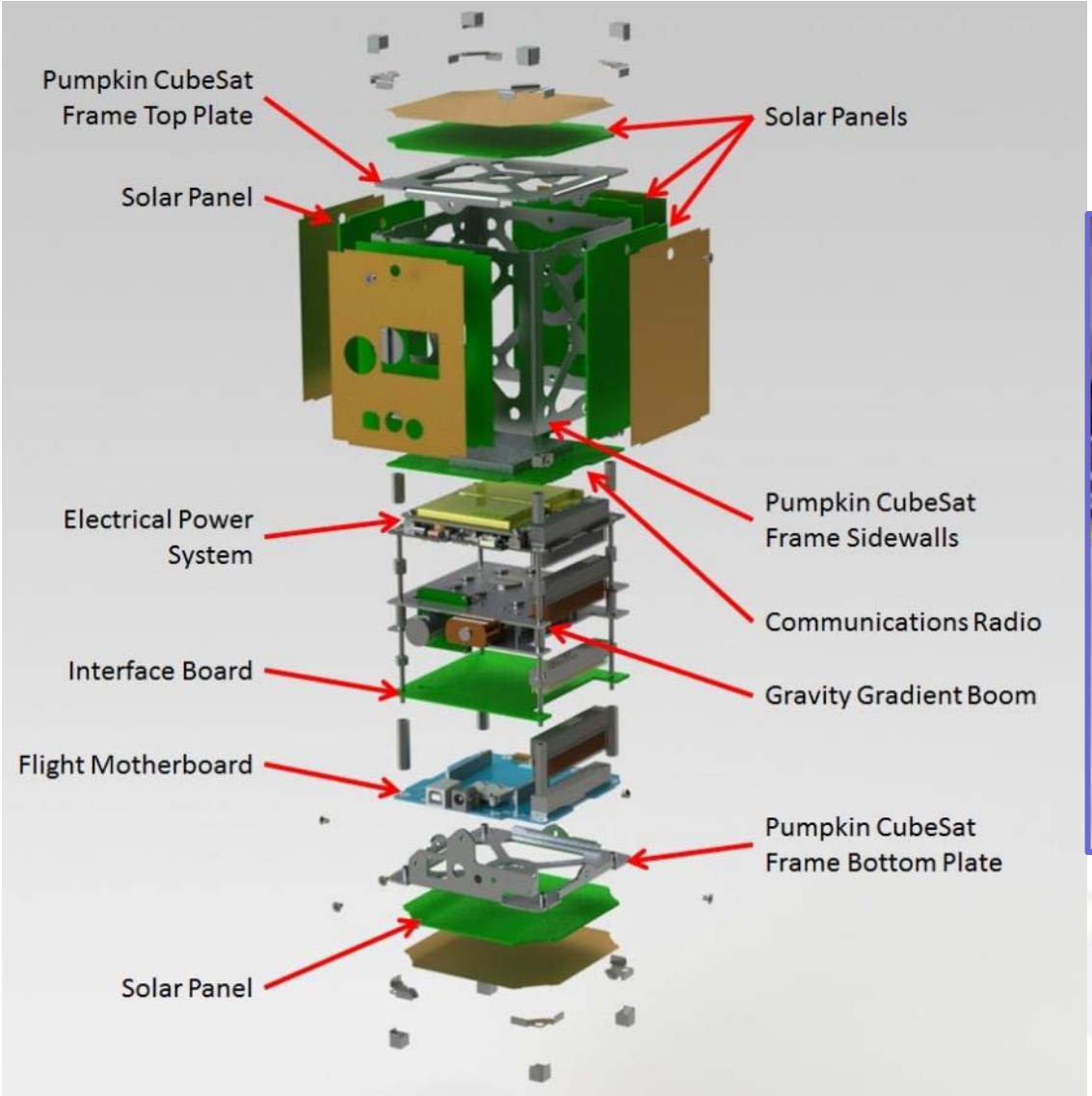
Exploded View



DragonSat-1 with panels off

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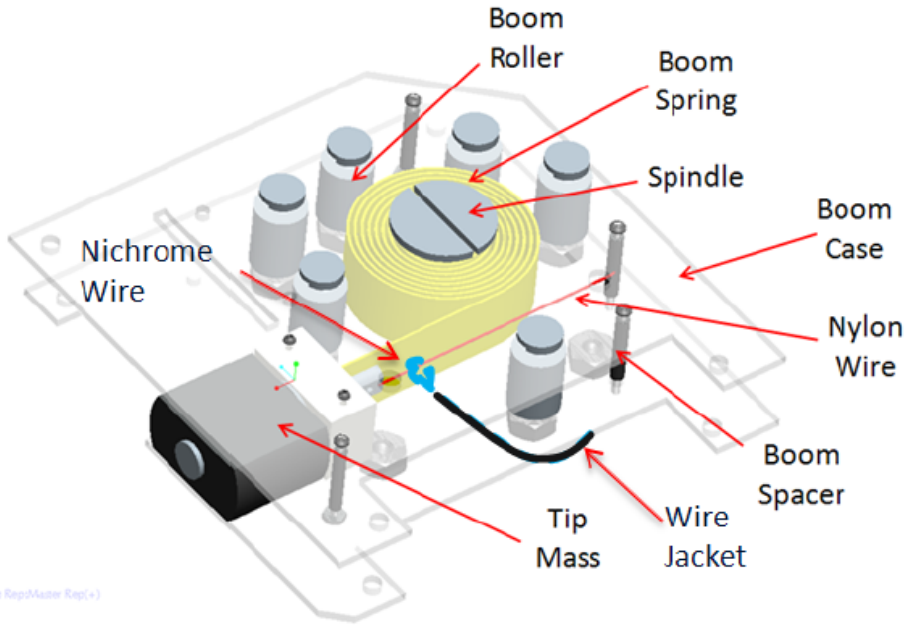
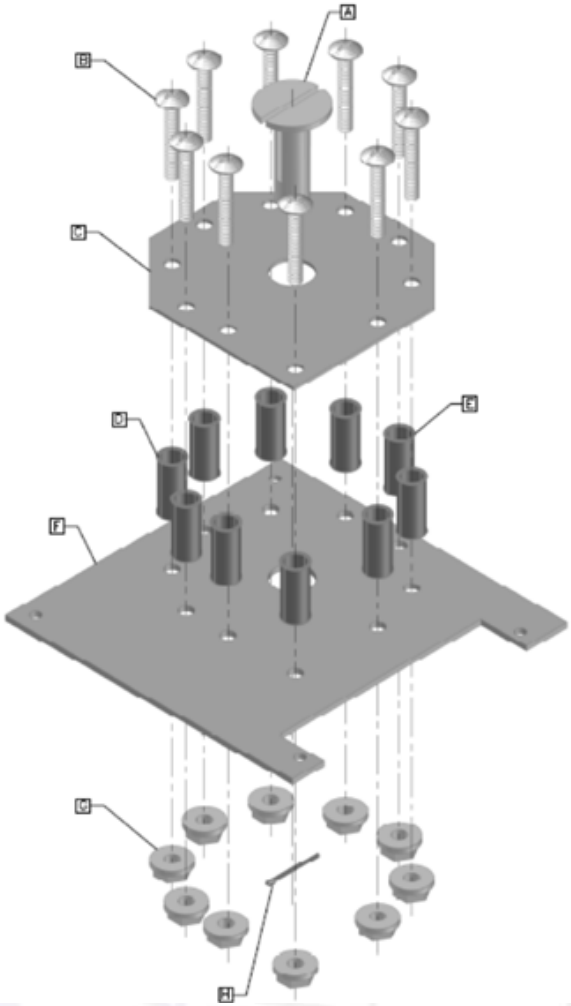
Gravity Gradient Boom – Original Design

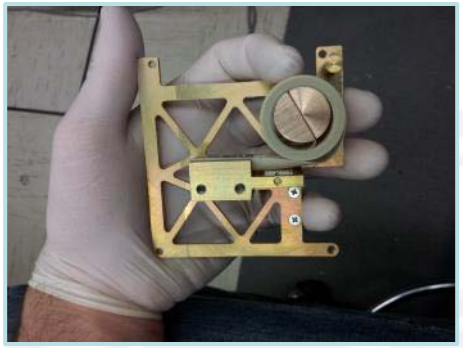




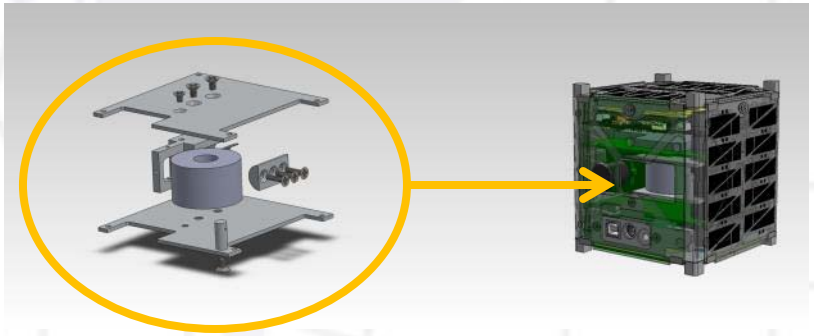
Microgravity Flight Test

Payload: Gravity Gradient Boom

- Quasi Bi-Stable Tape
  - Composite material
  - Extends linearly
  - Provided by AFRL
- Simple tip mass
  - 76 g
  - 1.5 m
- Held in place with nylon wire



G.G.B. structure



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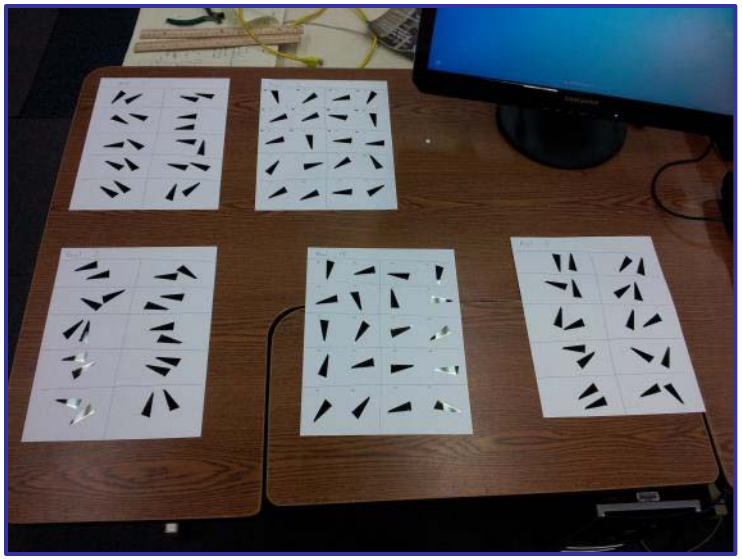
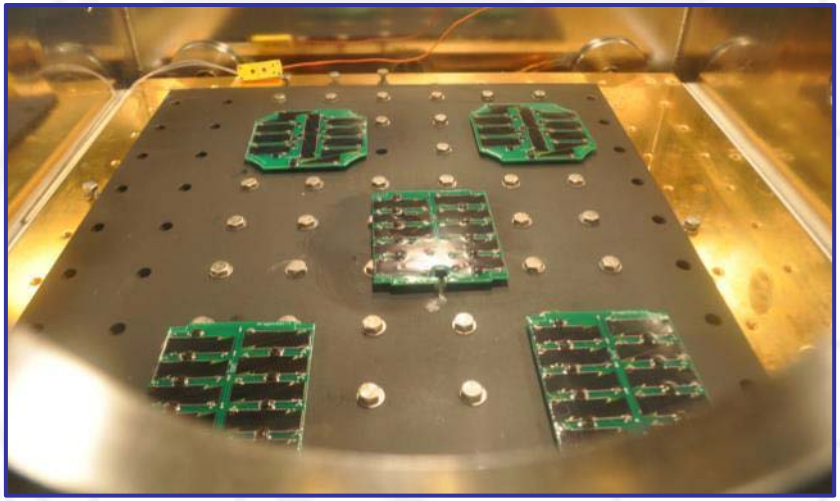
Solar Panel Fabrication





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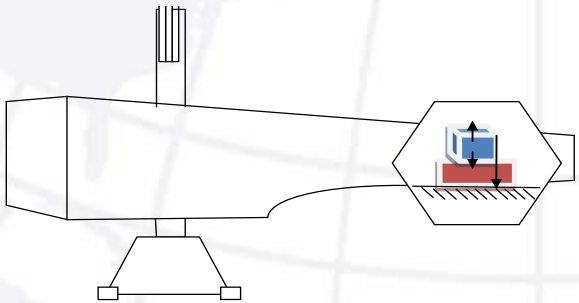
Testing 1: Combined-loads Test

- Combined axial acceleration and vibration loads (research purpose)
- Shaker table was integrated to centrifuge
- Tested at reduced NASA-GEVS levels
  - Reduced Grms
  - Same frequency profile

DragonSat-1 installed inside gondola

NASTAR Center centrifuge



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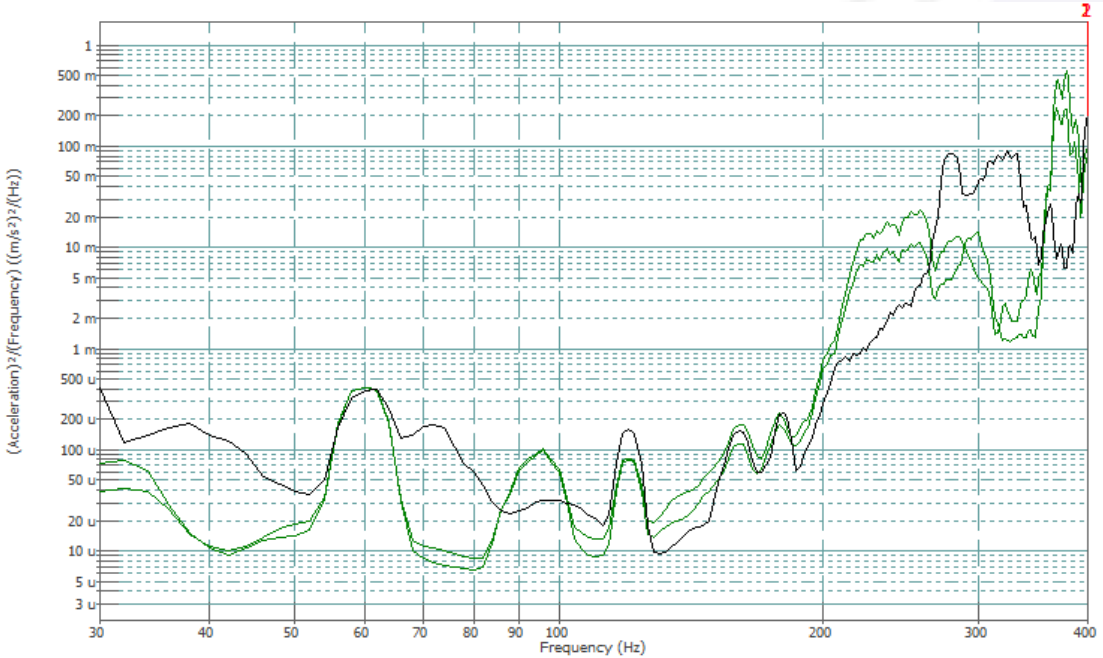
Result

- Noticed behavior not identified through ground testing
  - Shift in response frequency
  - “Settling” of components



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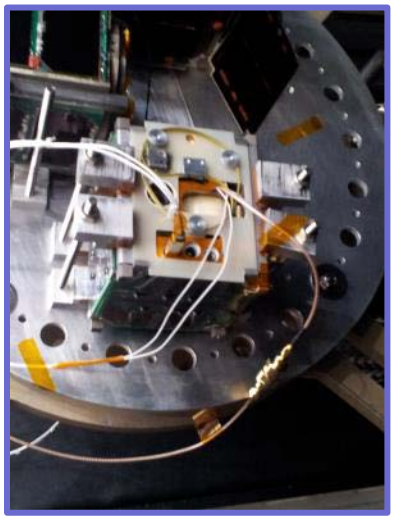
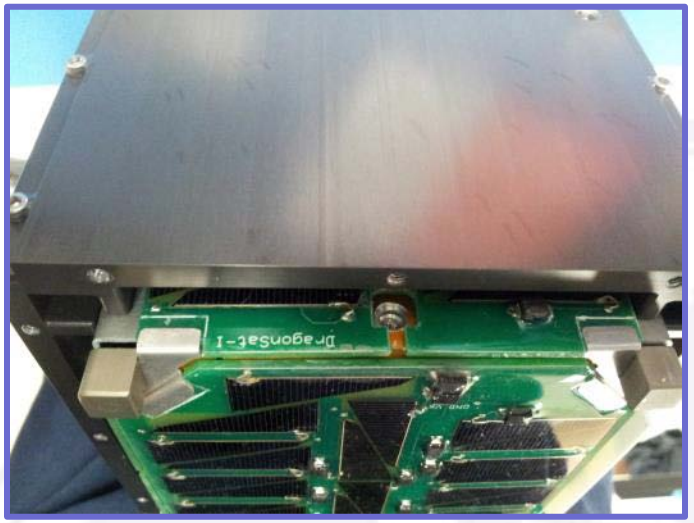
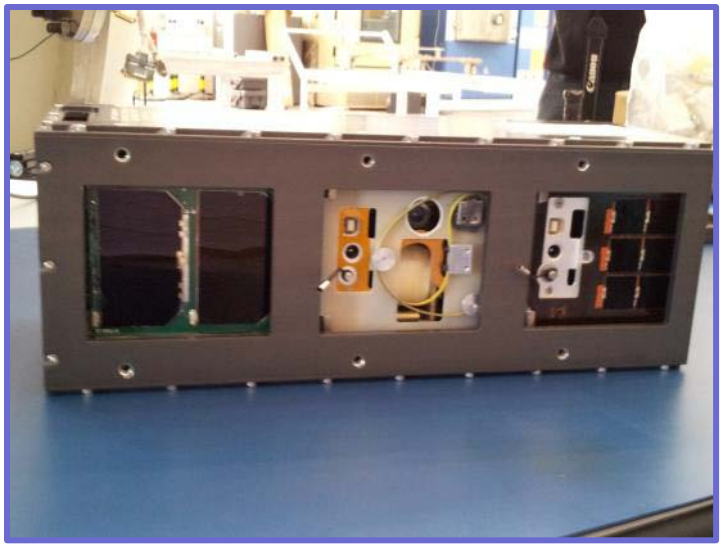
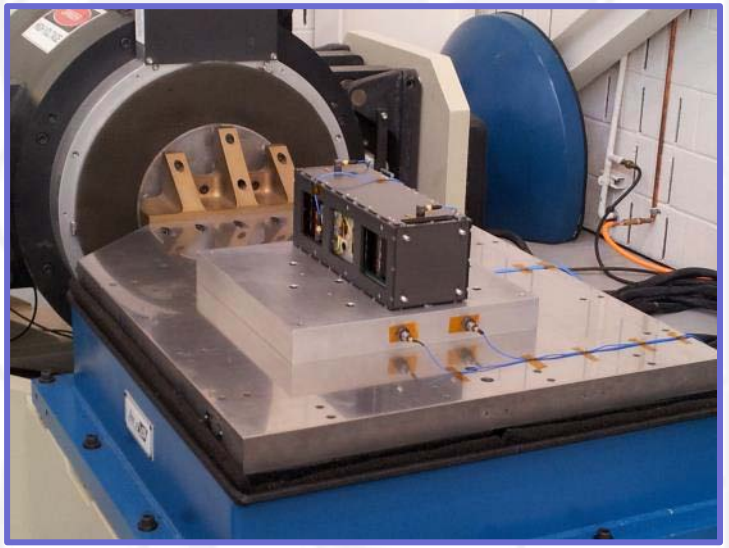
Environment Testing









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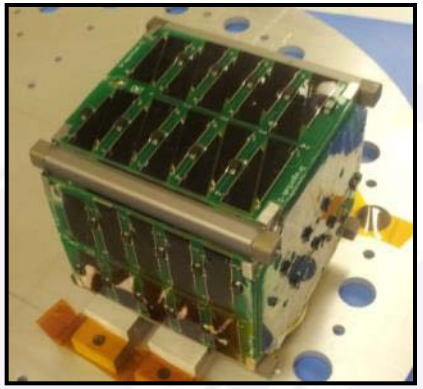
Some Interesting Lessons

- Still adapting, but positive changes
  - NOAA licensing
  - IARU/FCC frequency coordination
- Travelling
  - Airport security – not that bad
  - Regional jets – small overhead
  - Faster seating – worth money
- Documentation



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Future Application

- Planned launch: Q4 of 2013
  - NASA Wallops Flight Facility
  - 500 km circular orbit
  - Together with many other CubeSats → anticipating "interesting" early operation phase
- Future application
  - Established "standard" satellite bus
  - Baseline current design to serve as common bus for future missions
    - Two more launches coming up

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Questions? kang@usna.edu