The Kentucky Space Consortium
2008 4th Quarter Update

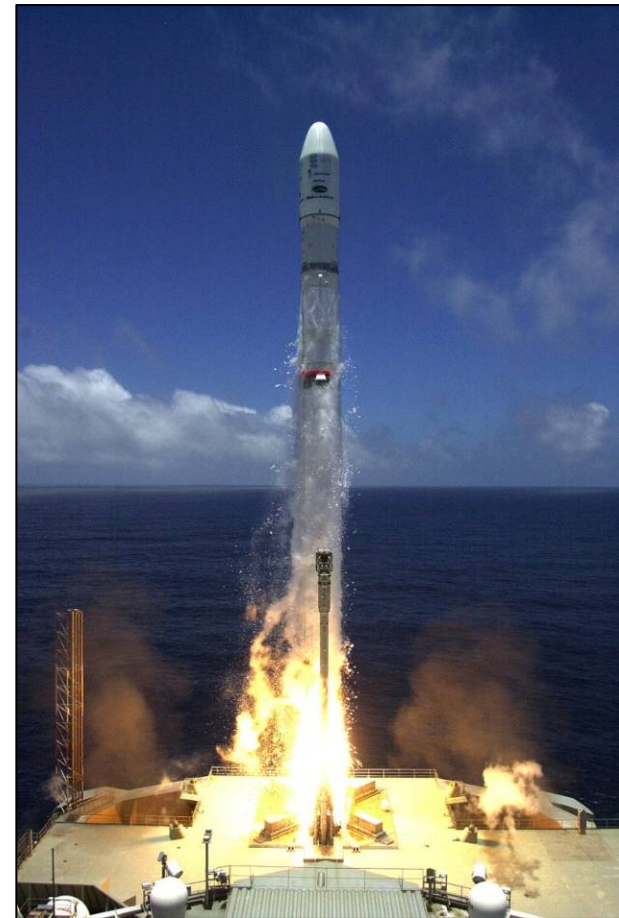5th Annual Developer's Workshop
AIAA/USU Small Satellite Conference
Logan, UT
8 August 2008

Tyler J. Doering
http://www.kentuckyspace.com

Outline

- Kentucky Space Enterprise

- Balloon-1 Mission

- KySat-1 CubeSat
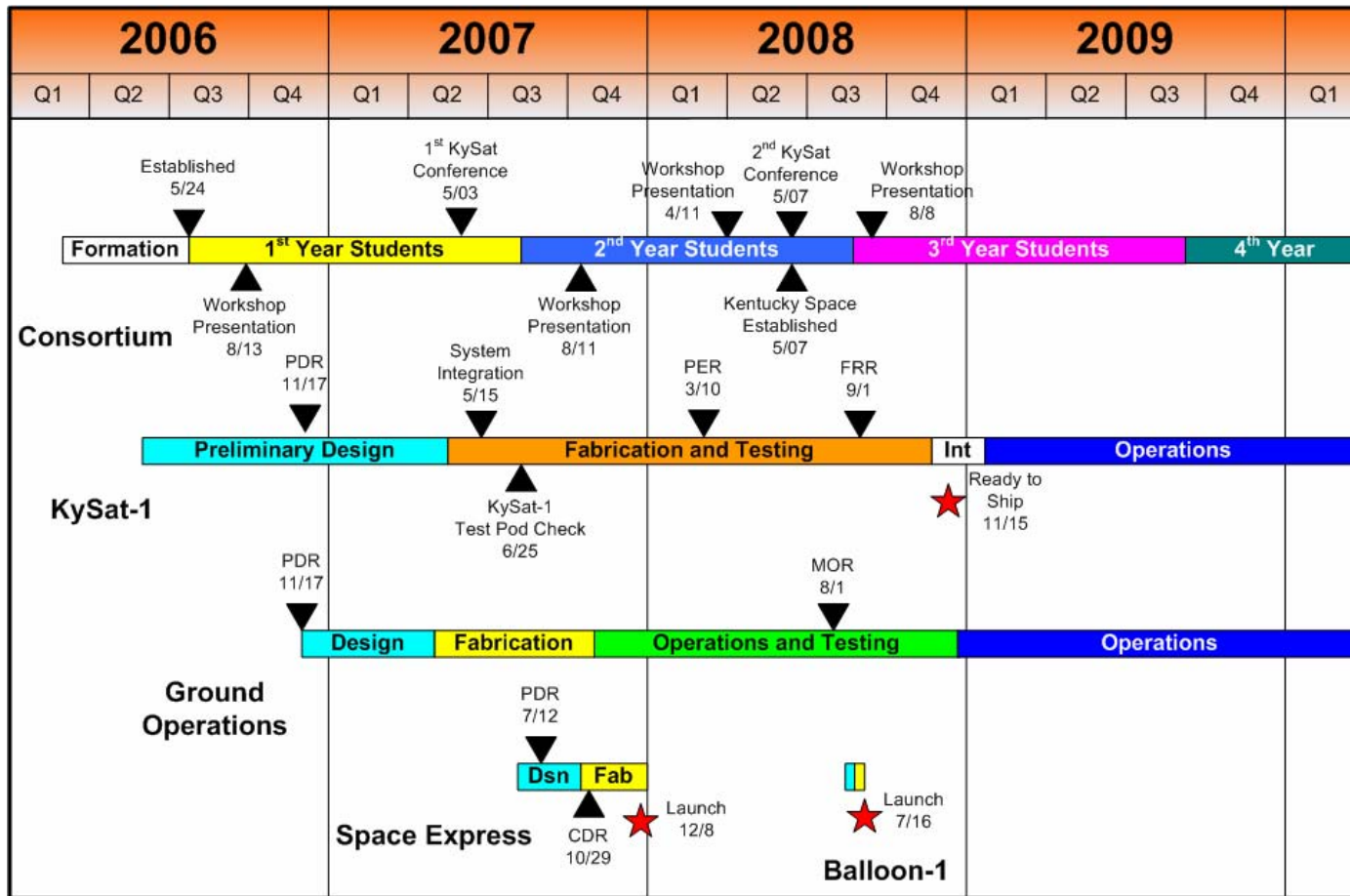
- Status of KySat-1

Kentucky Space Enterprise
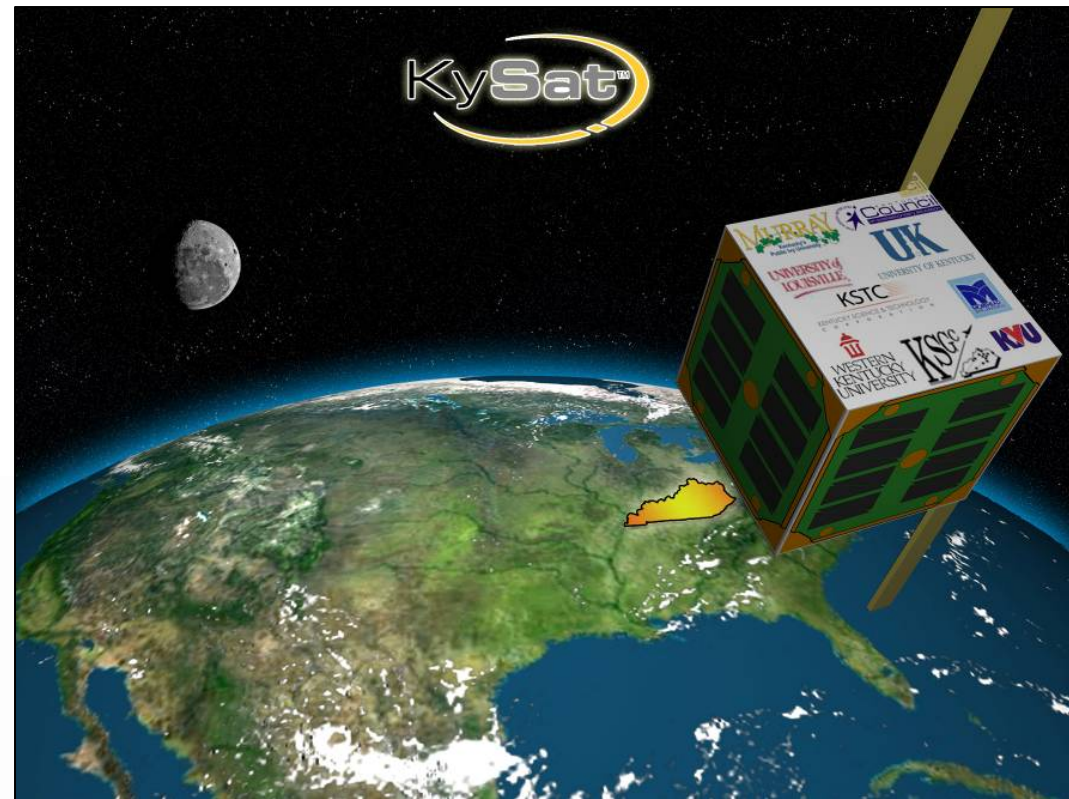

Mission Partners

Kentucky Space History

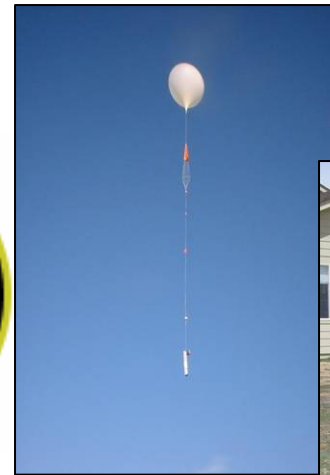# Kentucky Space

- Near-Space
- Sub-Orbital
- Orbital
- Deep Space

Kentucky Space

- ## Near-Space

- Sub-Orbital
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- Deep Space

Kentucky Space

- Near-Space

Sub-Orbital

- Orbital
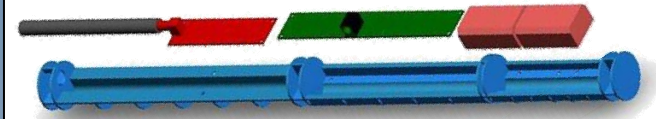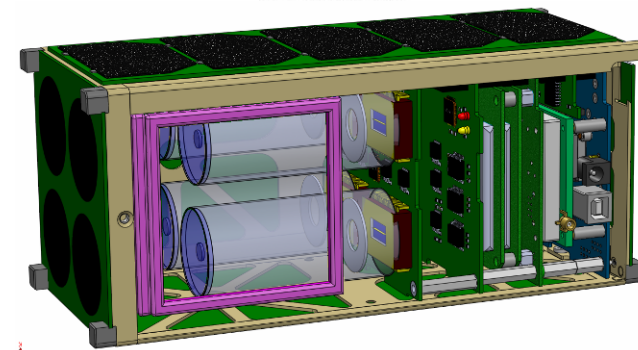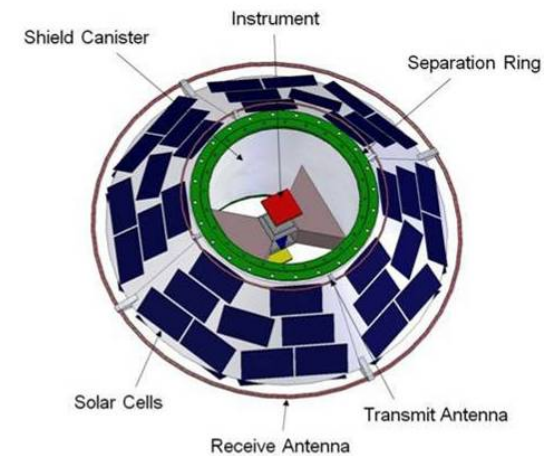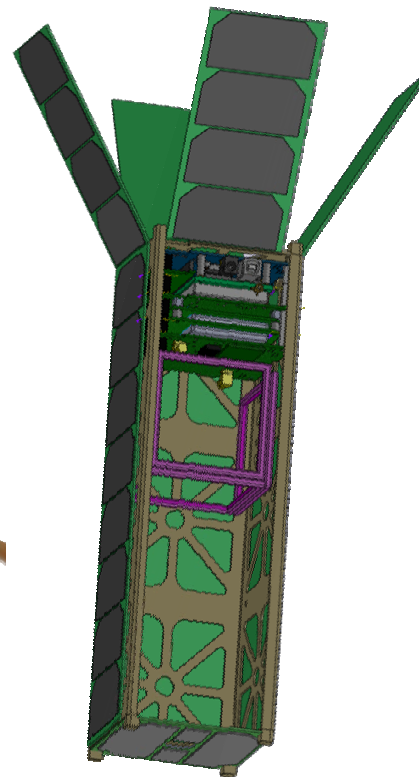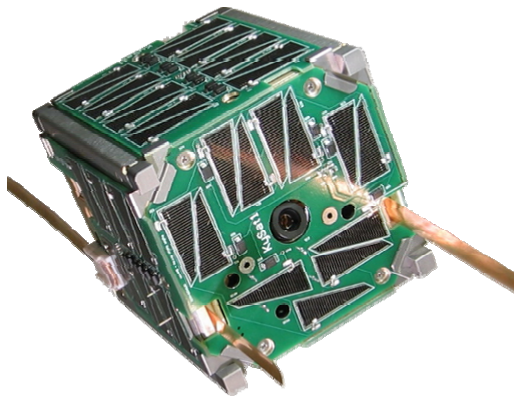- Deep Space

Kentucky Space

- Near-Space
- Sub-Orbital

Orbital

Shield Canister — Instrument — Separation Ring
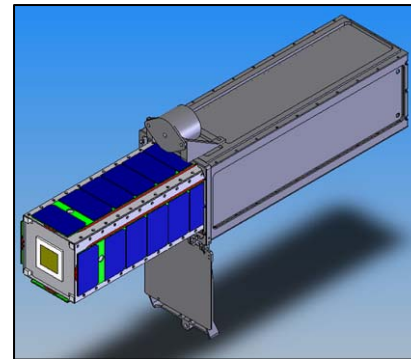Solar Cells — Receive Antenna — Transmit Antenna

- Deep Space

Kentucky Space

- Near-Space
- Sub-Orbital
- Orbital

Deep Space

Balloon-1 Mission Goals

- Learn to Build, Launch and Track Balloons
- Test Technologies for Future Missions
- Perform Scientific Measurements versus Altitude of Characteristics of the Stratosphere
  - Temperature Gradient
  - Air pressure Gradient
  - Earth magnetic Field Strength
- Gather High Resolution Images
- Training the New Kentucky Space Design Build Team Students on Relevant Technologies and Design Processes
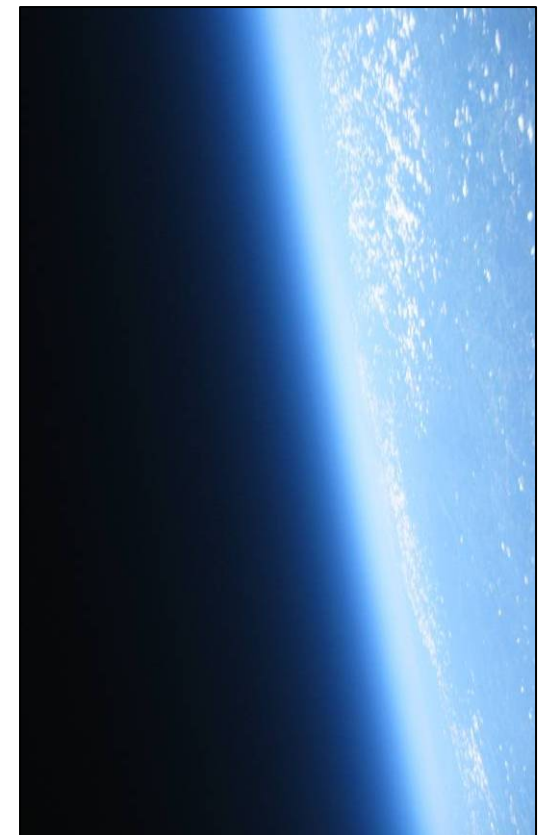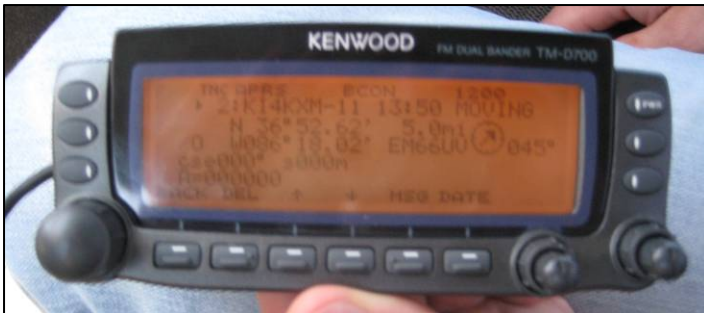
National Guard Support
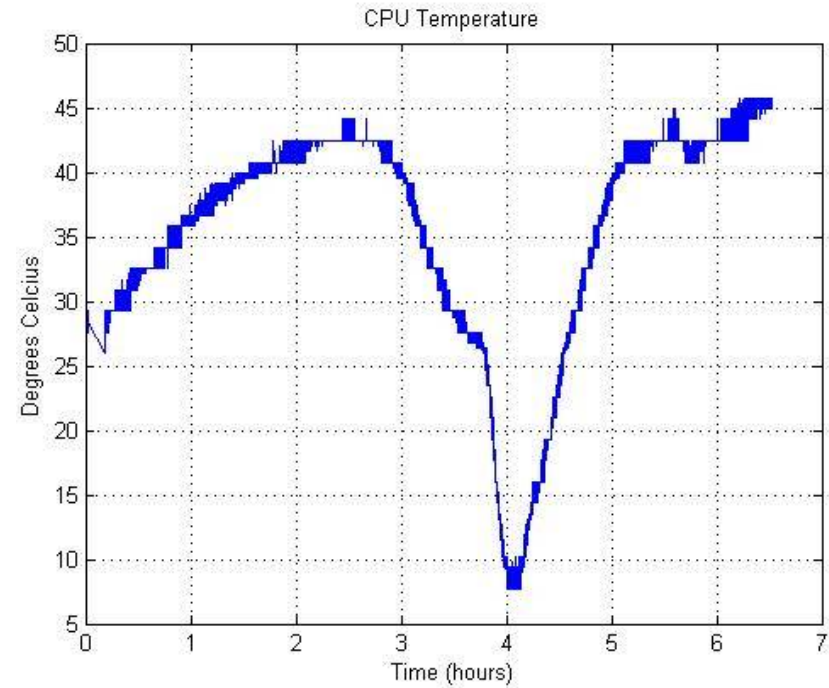
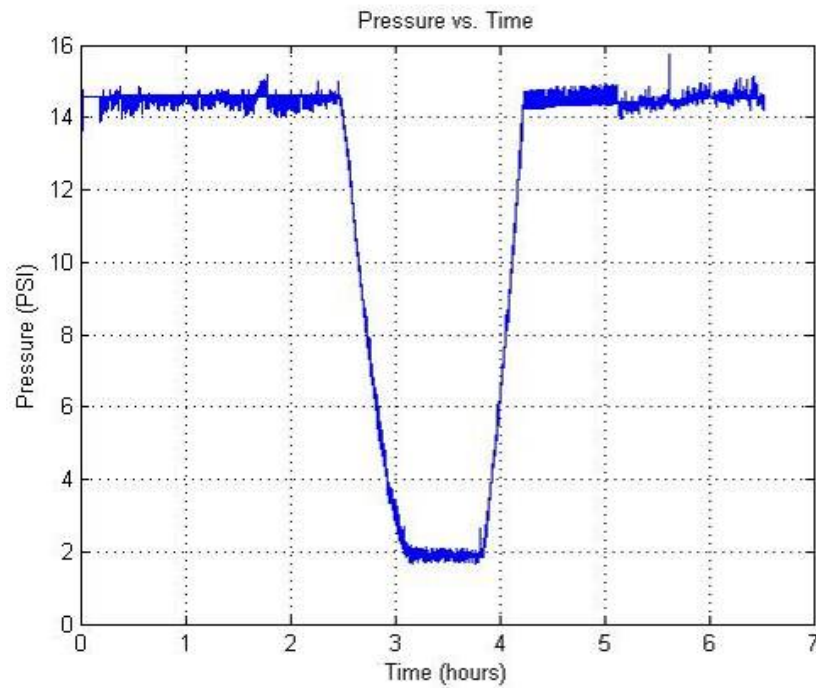# PearlSats Outreach

The Flight String

The Launch

The Chase and Recovery

Flight Data

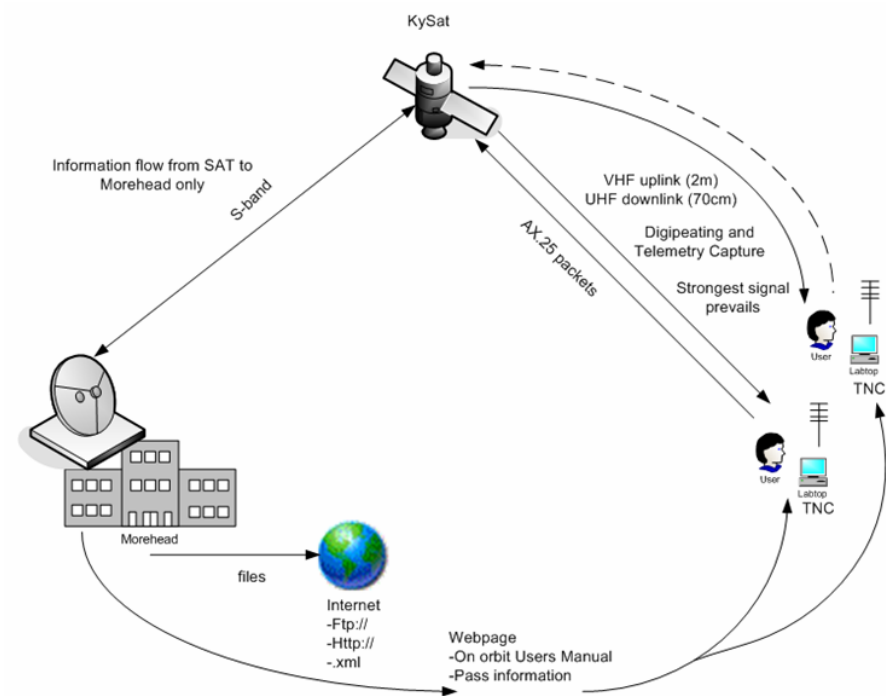# Balloon-1 Mission Takeaways

- Great Training Mission For Newer Students
- Relatively Low Cost/Risk
- Quick Mission Life Cycles
- Flight Testing Hardware/Software
- Public Outreach
- Systems Engineering Approach
  - Design Process
  - Mitigating Risk with Design
 - Creating/Updating/Archiving Schedules

KySat-1 ConOps

- Basic Communication
  - Capabilities
    - Audio Playback
    - Photo Capture
    - Morse Code Telemetry
  - Actions initiated automatically or radio keypad
  - No computer required for "playground station"
- Advanced Communication
  - Capabilities
    - Upload data
    - Download data
    - Digipeating
    - APRS
 - Transactions archived on server
  - Additional hardware required

KySat

Information flow from SAT to Morehead only

S-band

AX.25 packets

VHF uplink (2m)
UHF downlink (70cm)

Digipeating and Telemetry Capture

Strongest signal prevails

User

Labtop
TNC

User

Labtop
TNC

Morehead

files

Internet
-Ftp://
-Http://
-.xml

Webpage
-On orbit Users Manual
-Pass information

KySat-1 CubeSat

- KySat Solar Cells Arrays
- Pumpkin Frame
- Pumpkin FM430
- KySat System Support Module
- Clyde Space EPS
- StenSat UHF/VHF Radio
- KySat Payload Interface Module
- Payload
 - Microhard S-Band Radio
  - Imaging Payload
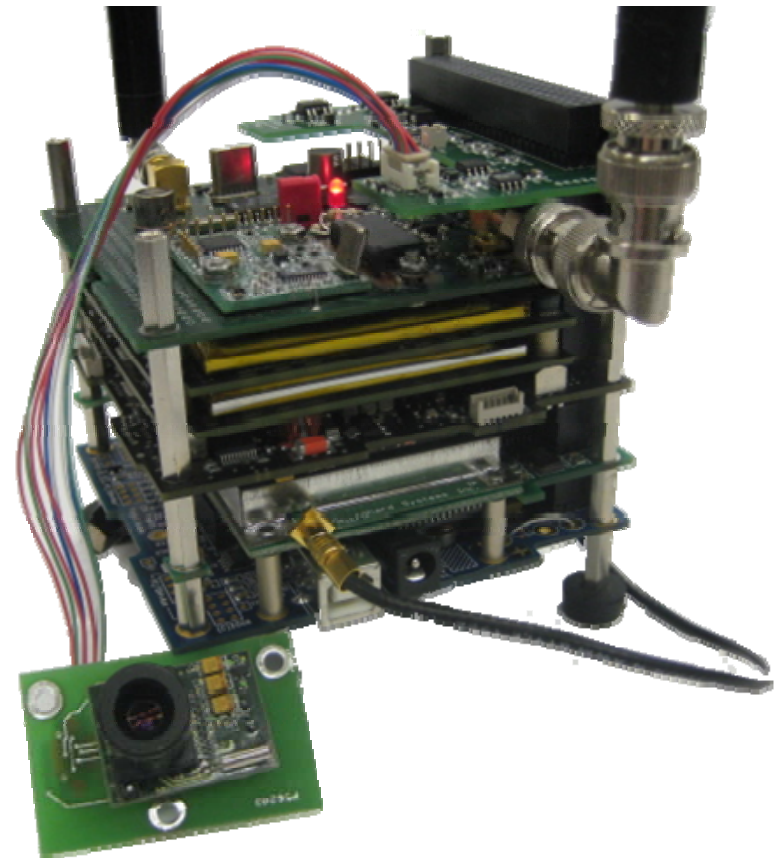
Status of KySat-1

- Engineering Model Complete
  - Flight Software Testing and Integration
  - Hardware Stack Completed
  - Mechanical Integration
  - Hardware Conformal Coating
- Testing of Engineering Model
  - Impulse Hammer Testing
  - Antenna Matching and Tuning
  - Hardware Bake Out and Thermal Cycling
- Facilities Established
 - TVAC Chamber Operational
  - Shaker Operational
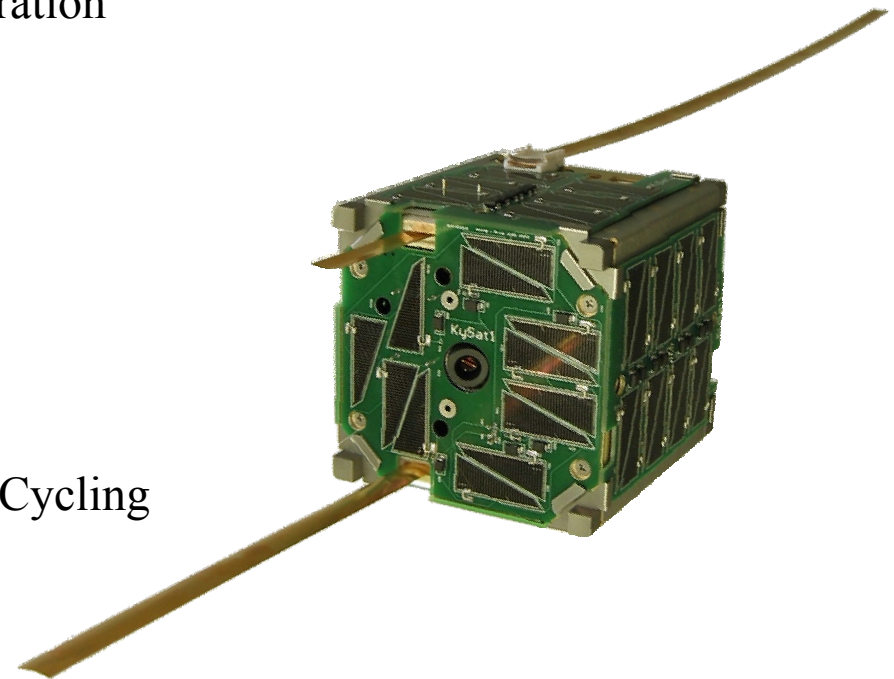
Impulse Hammer Test

- Used to Determine Natural Frequencies
- Performed with and without Test POD
- Natural Frequencies Found Currently being Investigated
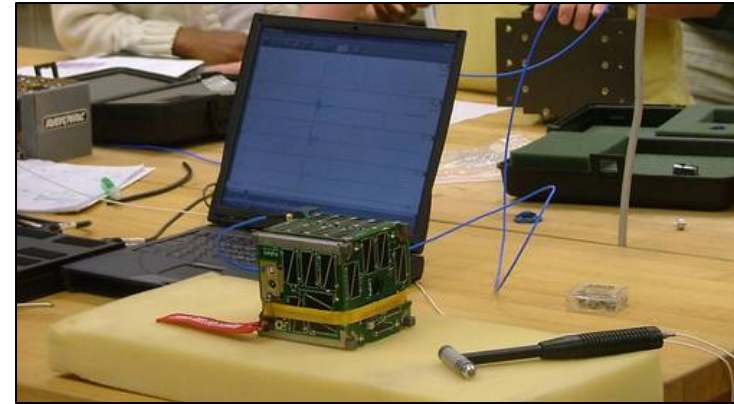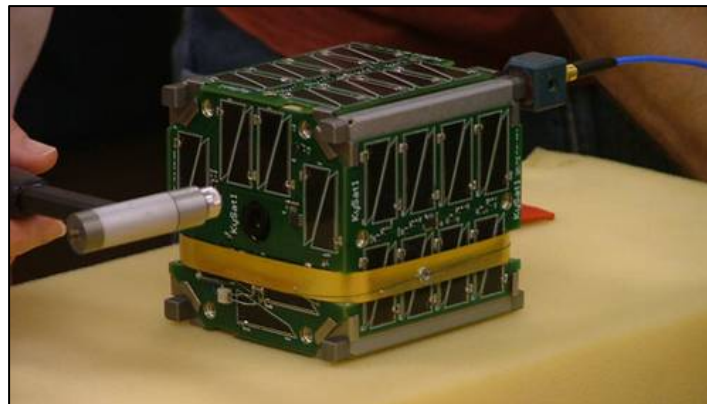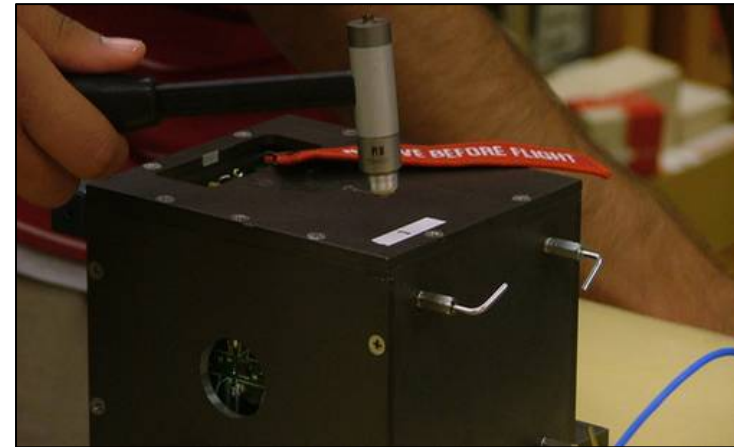
Antenna Tuning/Matching

- Deployable ¼ λ Monopole Antennas
- VHF Antenna Hardest to Match
    - Likely do to Small Ground Plane
- UHF Required No Matching
- S-Band Length to Width Ratio Became Strong Factor
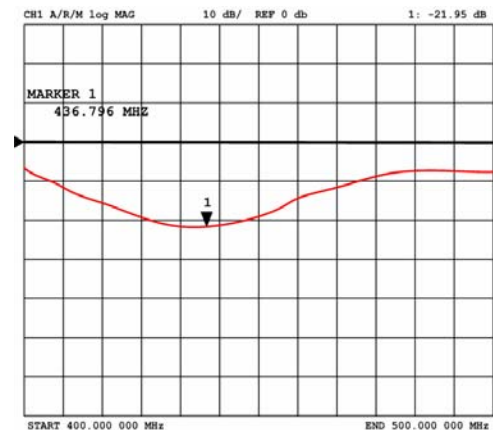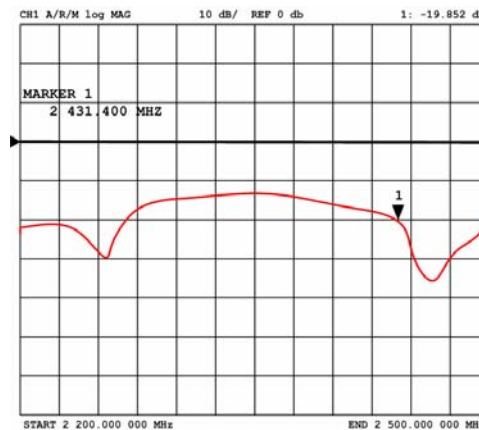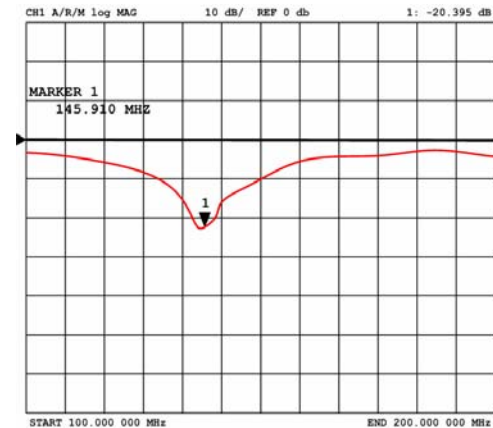
Hardware Bake Out

- Bake Out of all Components to Meet Out Gassing Standards

- Thermal Cycling Individual Hardware Components

- Conformal Coating Being Applied from External Contractor

http://www.kentuckyspace.com/online
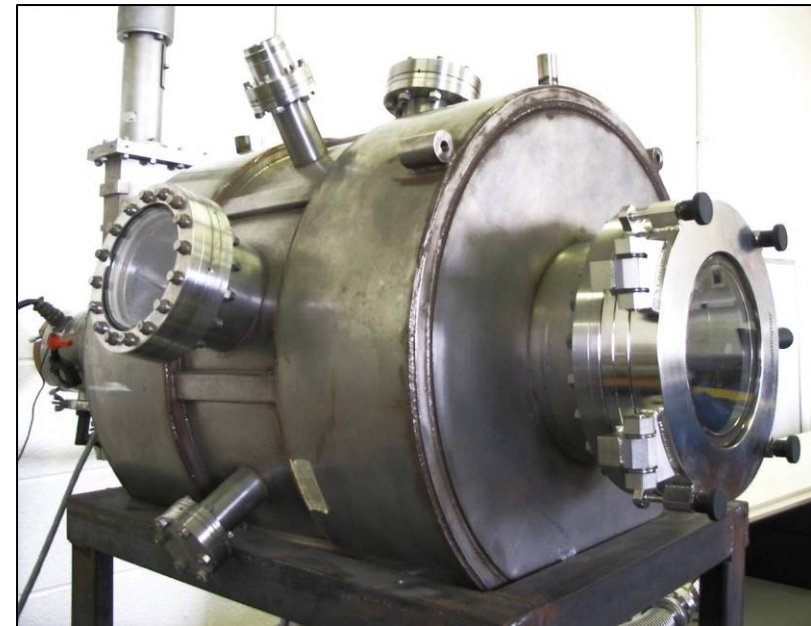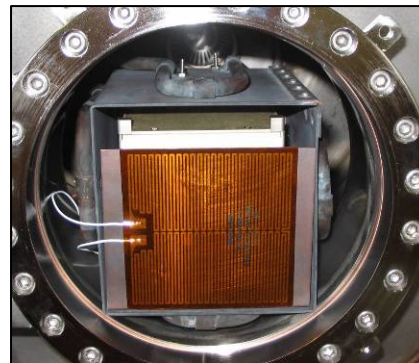
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