The Kentucky Space Consortium
2008 4th Quarter Update

5th Annual Developer’s Workshop
AIAA/USU Small Satellite Conference

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http://www.kentuckyspace.com

Logan, UT
8 August 2008
Outline

- Kentucky Space Enterprise
- Balloon-1 Mission
- KySat-1 CubeSat
- Status of KySat-1
Kentucky Space Enterprise

Mission Partners
Kentucky Space History

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Kentucky Space

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

**Pressure vs. Time**

- Pressure (PSI)
- Time (hours)

**CPU Temperature**

- Degrees Celsius
- Time (hours)
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-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 $\frac{1}{4} \lambda$ 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