CubeLab\textsuperscript{SM} Payload Developers Workshop

Affordable Access to Space for your ideas

July 11-15, 2011
Lexington, Kentucky

Kris Kimel
Kentucky Space

In collaboration with
NASA Kentucky
Space Grant and EPSCoR Programs
International Space Station

Image courtesy of NASA
First CubeSat Ejected into Sub-Orbital Space, March 2010

First Student Built Satellites to be Launched by NASA (ELaNa/Glory) March 2011

First Flight, Composite Super Loki, December 2007

Balloon-1, July 2008 (Background Image)

Garvey P-12A

New NanoRacks/CubeLab™ Standard on the ISS, July 2010
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Research on the ISS

• Control for a variable that wasn’t really possible before gravity
• Unique aspects of μG
  – Mass Transfer Dominated by Diffusion
  – No Sedimentation
  – Greatly Diminished Gravity Driven Convection
  – No Hydrostatic Pressure
  – Decreased Hydrodynamic Pressure

Image courtesy of NASA

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So how does this affect…

Some examples:

- **Plant Growth**
  - Water Distribution in Root Zones
  - Root & Stem Growth
  - Gravity Perception
  - Seed Exposure

- **Cell Biology**
  - No low-g genetic “memory”
  - Changes Observed in
    - Gene Expression
    - Virulence
    - Replication

- **Crystal Growth**
  - Improved Yield Suitable for Diffraction Analysis
  - Analysis Showed:
    - Increased Resolution
    - Decreased Mosaicity
    - Increased Crystal Volume

- **Materials Science**
  - MicroStructure Control
  - Reduced Wall Contact
  - Dendrite Growth
  - Directional Hardening
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Getting On Orbit

• **Nominal**
  – Attend and Petition Science Workgroup
  – Receive Approval
  – 18-36 Month Process to Get On Orbit
  – Certify Hardware for Flight Readiness
  – Schedule Operation Time
  – Develop Procedures for Operation
  – Support Real Time Operations
  – Collect Data

• **CubeLabSM**
  – Contact Kentucky Space
  – Negotiate Launch Process Date with Partner NanoRacks LLC
  – 6-12 Month Process to Get On Orbit
  – Work with KS Team in Kentucky to Certify For Flight
  – Collect Data
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CubeLab℠ Modules

- Low cost platform for micro-gravity research
- Repeatable Access
- Downmass Negotiable
- Based on the CubeSat and USB Standards

- ICD Available for Developers
- Currently Operating On Orbit
- Manifest Possibility on All Flights To and From Station
- Over 100kg Still Available in 2011

Image courtesy of NASA
CubeLab™ Process

• Work with KS Team in Kentucky
  – Proven Track Record
  – Successful Operations on the ISS
  – Other Successful Missions
• to…
  – Schedule Launch and Possible Return
  – Develop Flight Hardware
  – Ensure Hardware Meets Flight Criteria
  – Discuss Operations and Negotiate ISS Crew Time
  – Develop Procedures and Crew Training Material
  – Collect and Store Data
This unique 4+ day workshop will cover all aspects of designing, developing, integrating and operating science experiments aboard the International Space Station (ISS) using the existing NanoRacks R&D Platform and supporting CubeLab™ modules.
Topics Will Include:

- Overview of microgravity dynamics and research opportunities and the unique capabilities of the ISS.
- Experiment options, the NanoRacks R&D Platform and CubeLab℠ payload standards.
- Designing payloads for multiple launch vehicles and for operation aboard the ISS.
- Astronaut operations training and astronaut interaction with payloads.
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**July 11-15, 2011**
Lexington, Kentucky

**Registration Fee**

$1,450

Workshop brochures available through the general inquiries contact

**Contacts**

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[www.kentuckyspace.com](http://www.kentuckyspace.com)