CubeLabs and Access to Space Aboard the ISS

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CubeSat Workshop April 20, 2011
International Space Station

- Ten Year Process Nearing Completion
- Lifetime extended beyond 2016
- National Lab Designation
Kentucky Space Missions

New NanoRacks/CubeLab Standard on the ISS, July 2010

First CubeSats Ejected into Sub-Orbital Space, March 2010

First Student Satellites Launched by NASA (ELaNa/Glory) March 4, 2011

First Flight, Composite Super Loki, December 2007

High Altitude Balloon-1 (Background Image)

Garvey P-12A

First Flight, Composite Super Loki, December 2007
ISS as National Laboratory

- National Lab Designation in 2005
- Initiatives and BAAs targeting diverse users
- “Lean” payload integration process
  - Limits on types of payloads
  - Requirements based testing
  - Ship and Shoot
  - 20 month process to a 6 months
NanoRacks Platform and CubeLabs

- Facilitate research aboard the ISS
- NanoRacks Platform interface between ISS and CubeLab Experiments
Leverage Standards

- **CubeSat Standard**
  - Well defined form-factor
  - Familiar to academia and industry

- **USB**
  - Plug-and-play standard
  - USB Mass Storage Class

- **EXPRESS Rack Locker**
CubeLabs

- Designed as an accessible standard platform
- Low-cost entry to ISS
- Repeatable Access
- Down-mass options
- ICD familiar to CubeLab developers
- Form-factor accommodated by all current launch vehicles (Progress, Soyuz, HTV, ATV, DragonLab, Shuttle)
CubeLab Form-Factor

- Various Form-Factors:
  - 1U: 10cm x 10cm x 10cm
  - 2U: 10cm x 10cm x 20cm
  - And so on up to 4U
CubeLab Experiments

- Plant Growth Experiments
- Microbial Growth
- Chemical Reactions
- Nano-crystal Growth
- Microelectronic Mechanical Systems (MEMS)
- Space Radiation Environment
- Attitude Determination and Control
- ???
Development and Delivery
Launch STS-131 (NR-1, CL-1&2)
Road to ISS for a CubeLab

CubeLab development follows two tracks on its way to the ISS:

- **Integration**
  - Manifesting
  - Engineering and technical data submission
  - Qualification testing
  - Safety reviews
  - “On-dock” delivery

- **Operations**
  - Planning models
  - Required activities
  - Procedure development
  - On-Board training
  - Real-time operations
  - Data dissemination
  - Payload return
CubeLab ICD

http://ssl.engineering.uky.edu/cubelab/documents
Phases of Operations

- Increment Planning (pre-Ops)
- Real-time Operations
Status

- Two NanoRacks Platforms are currently installed and operating.
- EXPRESS Rack 4 in the JEM.
- CubeLabs have flown on STS-131, STS-132, HTV-2, STS-133.
- Manifesting CubeLabs on ATV, HTV, Progress, Soyuz, and DragaonLab
Nominal Operation

NanoRack-1

NanoRack-2

Astronaut Shannon Walker (USA)
Thank You

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http://nanoracks.com
http://ssl.engineering.uky.edu
http://www.kentuckyspace.com