CUBESAT
California Polytechnic State University

CubeSat Standard Updates

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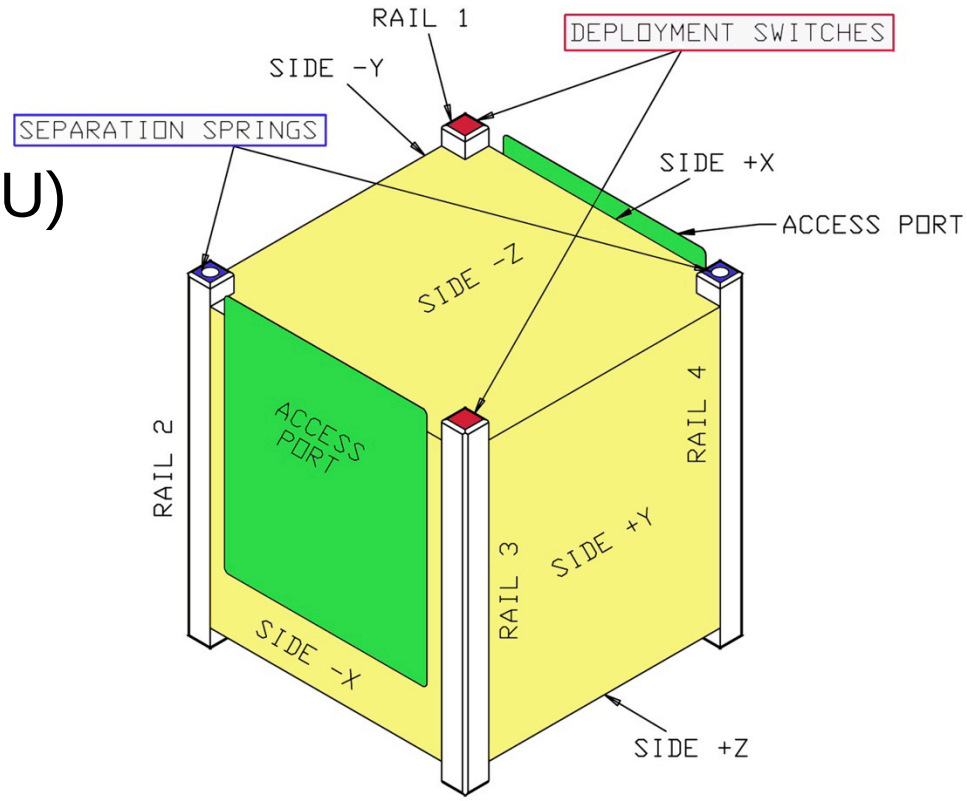
CubeSat Developers' Workshop

Agenda

- The CubeSat Standard
- CDS Rev. 12 to Rev. 13 Changes
- The 6U CubeSat Design Standard
- 6U CDS vs. 3U CDS
- CubeSat Launch Opportunities

The CubeSat Standard

- Shape and size (10 cm cube = 1 Unit, or 1U)
- Mass (up to 1.33 kg per 1U)
- Interface to P-POD
  - Rails
  - Access ports
- Materials and tolerances
- Operations
  - Deployables
  - Communication
- Different configurations possible (1U, 1.5U….)



1U CubeSat Form Factor

CDS Rev. 12 to Rev. 13 Changes

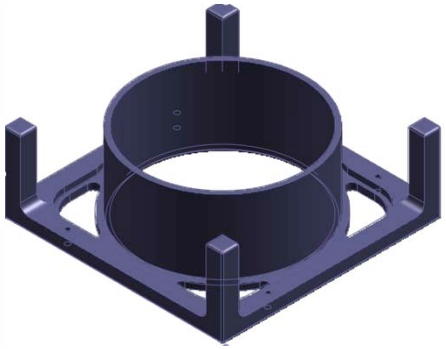
- Allowable Mass
- 3U+ CubeSat Form Factor
- Magnetic Requirements
- Propulsion Capabilities
- CubeSat Separation Springs
- ODAR and NOAA
- Rev. 13 Provisional Period

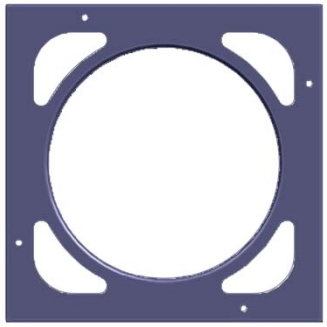
Allowable Mass

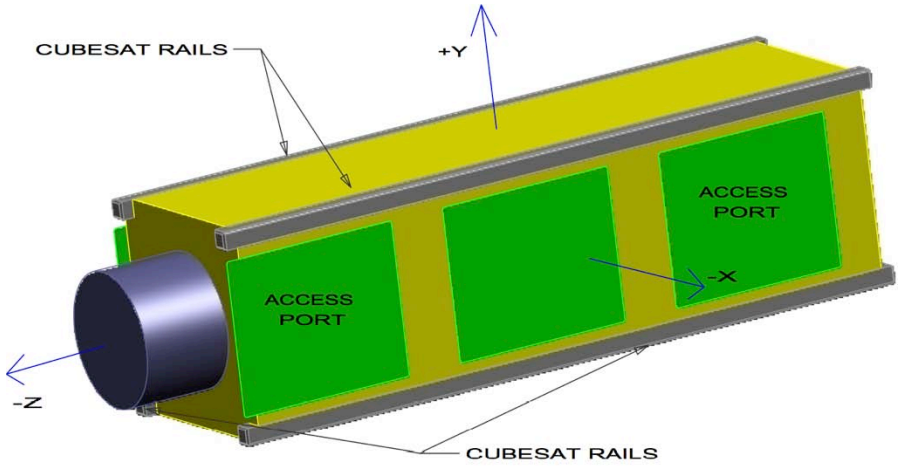
- Mass limit for CubeSats baselined at 1.33 Kg per 1U payload volume (Total of 4Kg per P-POD)
  - All current launch opportunities can accommodate this mass
- P-POD is capable of deploying heavier payloads, however this mass capability is evaluated on a mission to mission basis

3U+ Form Factor

- The P-POD has been modified to make use of volume internal to the Main Spring
  - NASA AMES helped with development of this extra volume
- This additional volume can be made use of by the new 3U+ form factor
- The 3U+ Design Standard will be detailed in the CDS Rev. 13







Magnetic Requirements

- CubeSats are now required to limit the strength of passive magnets
- The magnetic requirements are currently being investigated
  - This requirement flowed down from LV's
- Helps ensure separation of multiple CubeSats post P-POD deployment

Propulsion Capabilities

- Cal Poly is facilitating the incorporation of propulsion systems for the CubeSat community
  - Emphasis will be placed on safety and inhibit structure working with the Launch Vehicle, Primary Payload, and Range Safety stakeholders
- Propulsion systems will be evaluated on a case by case basis
  - Even though this effort is ongoing, CubeSat propulsion systems may limit available launch opportunities

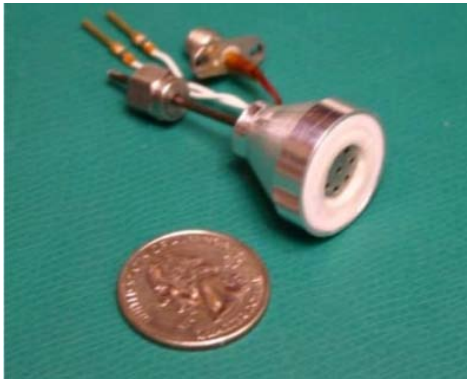
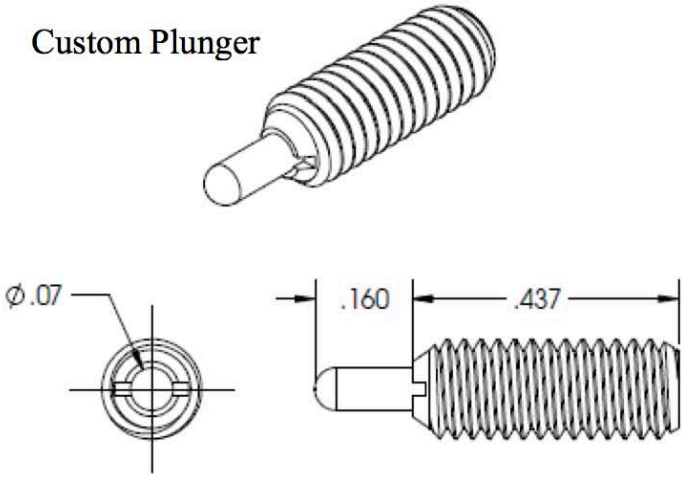
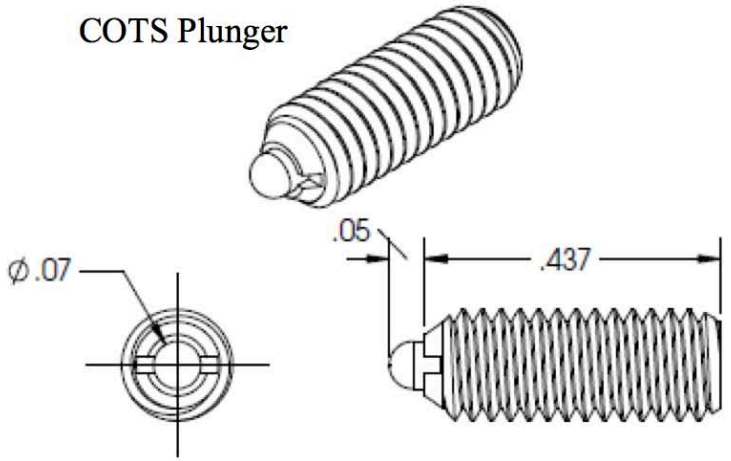


Photo Courtesy of: Penn State, MRIT: Miniature Ratio-Frequency Ion Thruster

CubeSat Separation Springs

- Custom separation spring developed
  - A drop in replacement
- Improves CubeSat to CubeSat separation velocities
- Not necessary for 3U form factors
- Available for purchase from Cal Poly





ODAR and NOAA

- ODAR: **O**rbital **D**ebris **A**ssessment **R**eport
  - The ODAR is used to determine orbital lifetime, collision, and re-entry probabilities
  - NPR 8715.6 – NASA Requirements to Limit Orbital Debris
  - NASA DAS Users Guide identifies how to satisfy these requirements

- NOAA: **N**ational **O**ceanic and **A**tmospheric **A**dministration
  - NOAA Licenses imagers for commercial satellites
  - Easy to use one-pager initial contact form
  - After initial contact, NOAA evaluates if a license is required or not

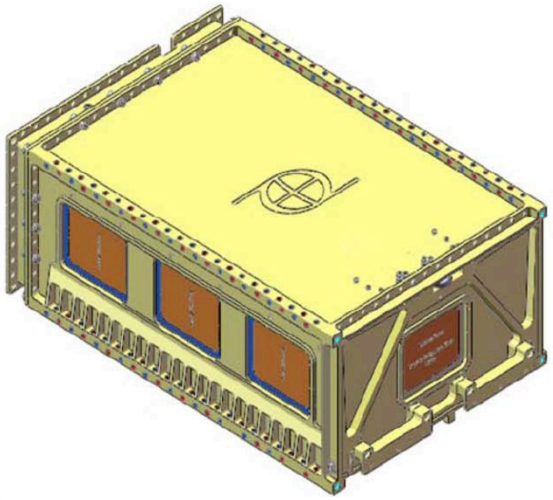
- CDS will provide guidelines to CubeSat developers on how to work with the ODAR and NOAA

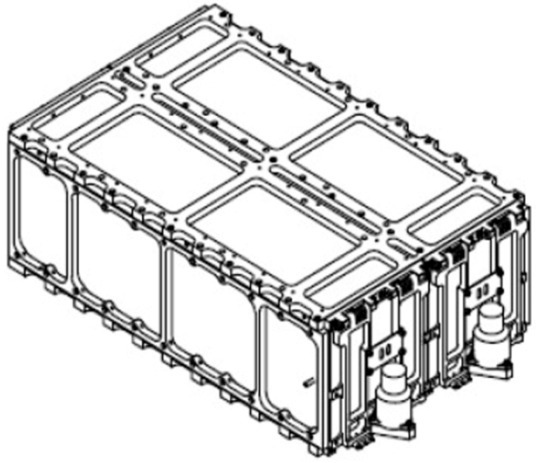
Rev. 13 Provisional Period

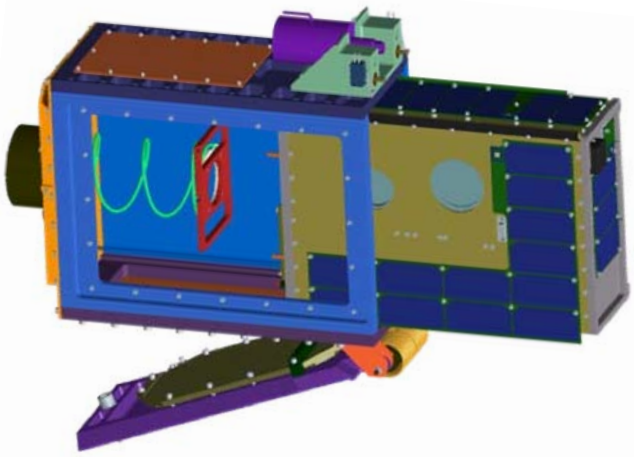
- Cal Poly will release a “Provisional” version of the CDS Rev. 13 to the CubeSat community in a few weeks
- The “Provisional” CDS will be open for community feedback before the official CDS Rev. 13 Release
- The “Provisional” period will be effective for 2-4 Months

6U CubeSat Design Standard (1)

- Double wide 3U = 6U
- The 6U community is growing, and a number of 6U dispensers are emerging
- To preserve and facilitate success of the 6U community, a 6U Design Standard needs to be developed



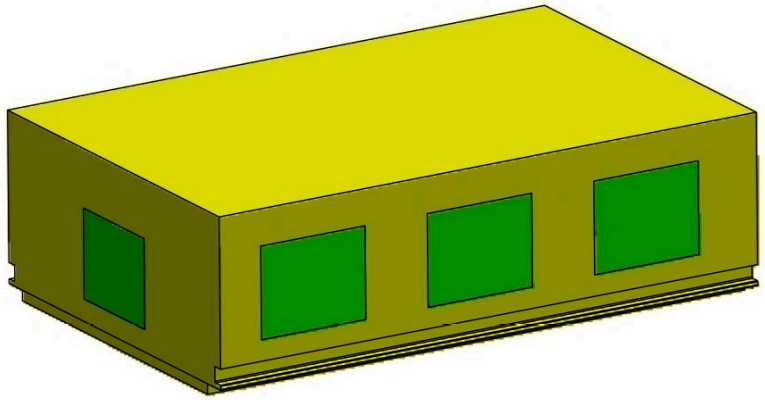




Photos Courtesy of: PSC, NASA AMES, NASA Wallops

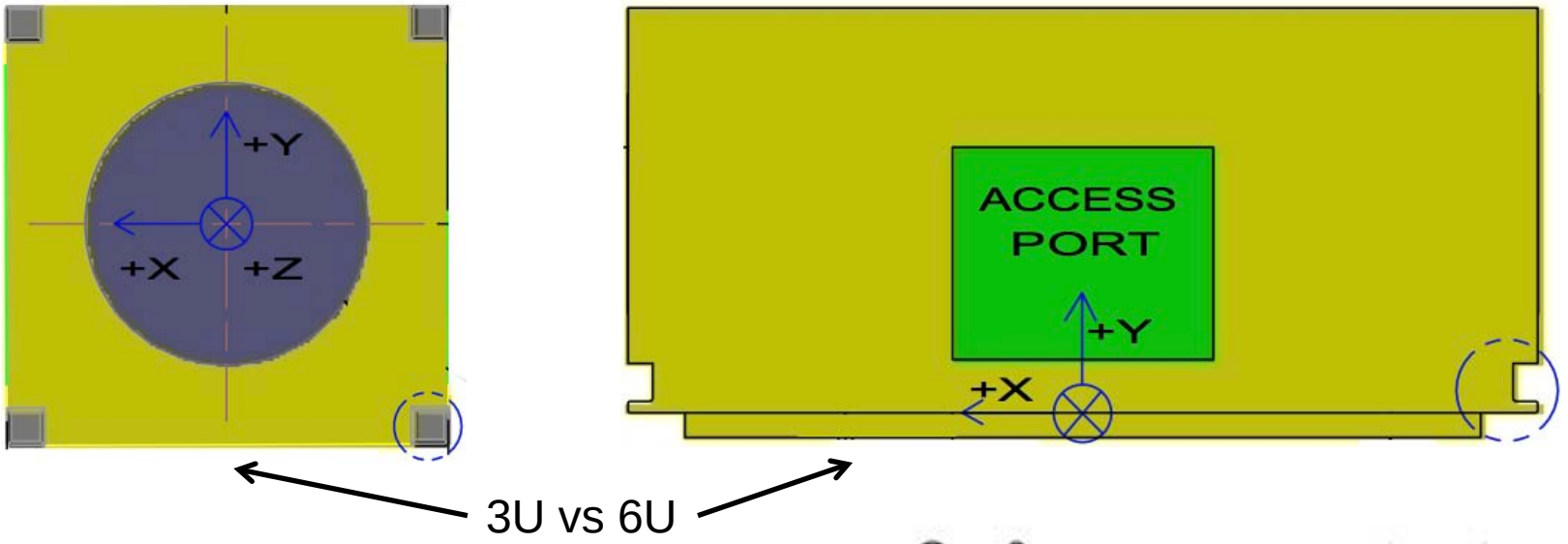
6U CubeSat Design Standard (2)

- The 6U CDS will be hosted by Cal Poly
- Cal Poly will release a “Beta” version of the 6U CDS to the CubeSat community in a few weeks
  - The “Beta” 6U CDS will be open for community feedback before initial release
  - The “Beta” period will be effective for 2-4 Months



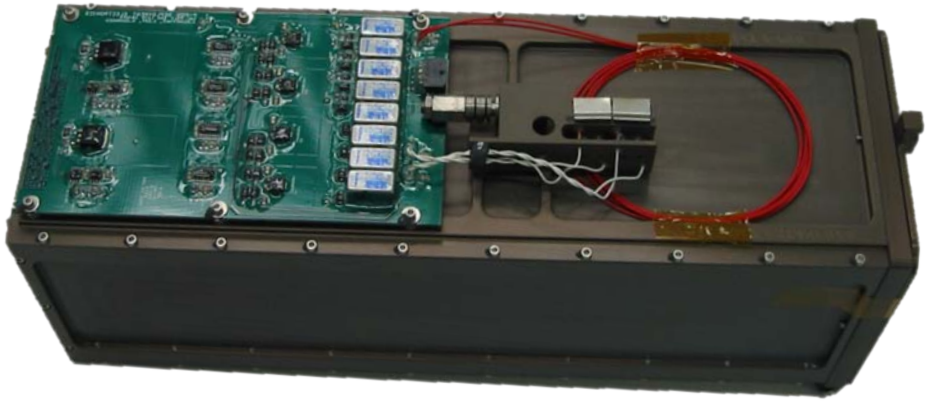
6U vs 3U

- Larger size
- PSC Dispenser utilizes optional hold down tabs
- Different access requirements
- Larger allowable mass



CubeSat Launch Opportunities

- This year marks the 10th anniversary of the first CubeSat in space!
  - 12 Launches, 39 Cal Poly P-PODs, 70 CubeSats
  - 4 Launches in queue for 2013!
  - More to come from LEO to Interplanetary in 2014-15!
- NASA, DoD, Commercial, and International launches available
  - Please contact us for details



Questions?

- Contact Information

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