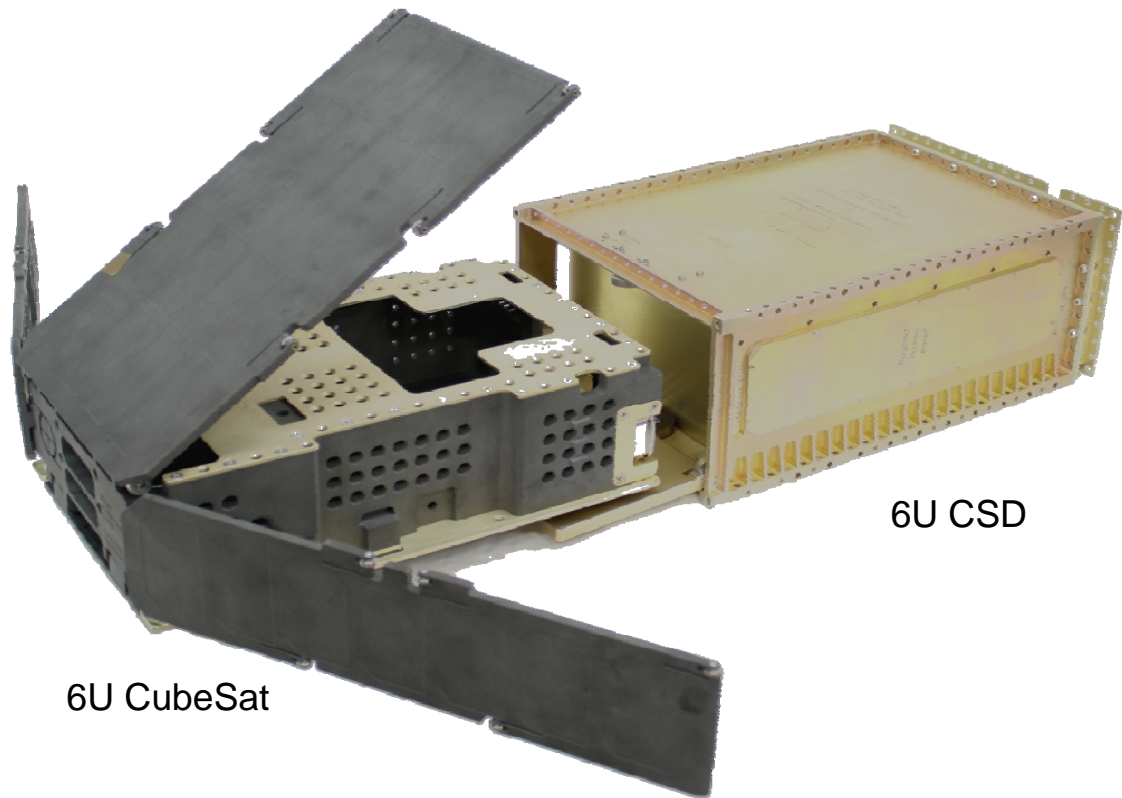
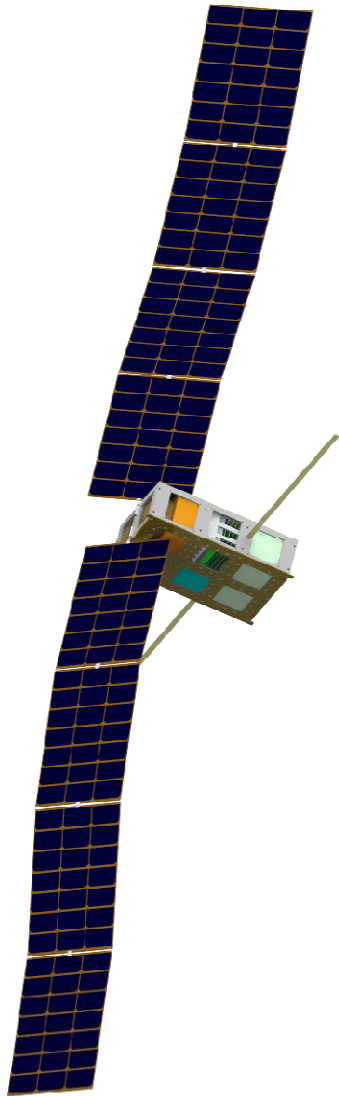




# Innovative Uses of the Canisterized Satellite Dispenser (CSD)

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# What is CSD?

- **A high performance Cubesat dispenser**
  - **Preloaded Payload Tabs** create a predictable load path to and from the payload.
  - **CSD Constrained Deployables** eliminate the payload's need for complex restraint mechanisms.
  - **Six Mountable Sides** increase integration options
  - **Motor Driven Initiator** creates a reliable and testable deployment mechanism that automatically resets without consumables.
  - **Separation Electrical Connector** allows communication and charging between payload and launch vehicle.
  - **P-Pod Compatible Mechanical Interface** ensures compatibility with existing Cubesats.
  - **Lowest External Volume** versus existing designs increases packaging density on launch vehicle.
  - **Largest Internal Volume** versus existing designs accommodates larger payloads.
  - **Safe/Arm Access on Front Door** ensures payload access at all times.

CANISTERIZED SATELLITE DISPENSER (CSD) DATA SHEET

Figure 1: 3U, 6U and 12U CSDs, 6U Shown with Access Panels Removed.

**FEATURES AND BENEFITS**

- Preloaded Payload Tabs create a predictable load path to and from the payload.
- CSD Constrained Deployables eliminate the payload's need for complex restraint mechanisms.
- Six Mountable Sides increase integration options and greatly reduce the need for adjoining
- Motor Driven automatic
- Robust Separation and launch
- Conductive Complete
- Manual P-Pod Full Length
- Lowest E-vehicle
- Largest Safe/Arm

The CSD is also compatible with existing Cubesats.

2002337 Rev A

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**PAYLOAD SPECIFICATION FOR 3U, 6U, 12U AND 27U**

This is a standalone specification intended for payload designers. Planetary Systems Corporation does not design or manufacture payloads but can recommend vendors.

**DESCRIPTION**

These payloads are designed to be fully contained within a Canisterized Satellite Dispenser (CSD, canister or dispenser) during launch. A CSD encapsulates the payload during launch and dispenses it on orbit. CSDs reduce risk to the primary payload and therefore maximize potential launch opportunity. They also ease restrictions on payload materials and components. This specification currently encompasses four payload sizes, 3U, 6U, 12U and 27U.

The payloads incorporate two tabs running the length of the ejection axis. The CSD will grip these tabs, providing a secure, modifiable, preloaded junction.

The payload may use the CSD to restrain deployables. The allowable contact zones are defined.

A payload can be built to this specification without knowledge of the specific dispenser within it will fly. Similarly, dispenser manufacturers will be ensured of compatibility with payloads that conform to this specification.

Figure 2: Payloads

**REVISION HISTORY**

Revision	Release Date	Created By	Reviewed By
A	06-Aug-2013	RH	WH

Changes from previous revision:

- Parameters: Changed EL, DC, Y.
- Common Requirements: Note 1, changed tab material from 6001-T6 to 7075-T7 and changed surface finish from chem-film to hard anodize. Added several more notes.
- Figure 5: Changed Tab fillets. Increased payload volume near tabs. Added missing dimensions.
- Recommended Test & Integration: Changed reference document.
- Added Predicting Design Limit Loads.
- Added Separation Electrical Connector Attachment.
- Added Tips and Considerations.
- Added Anticipated Improvements.

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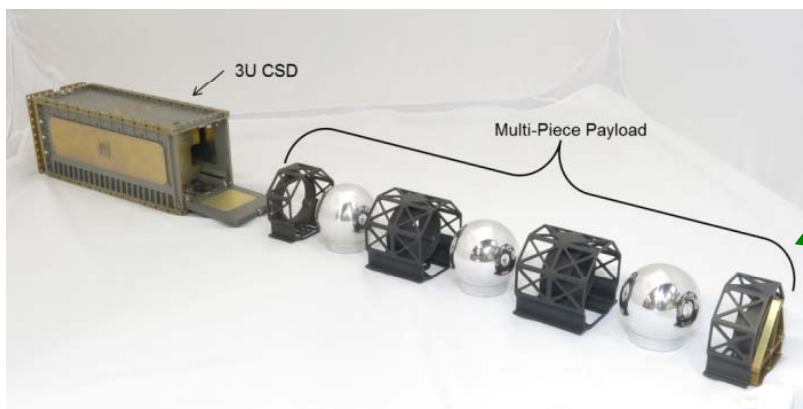
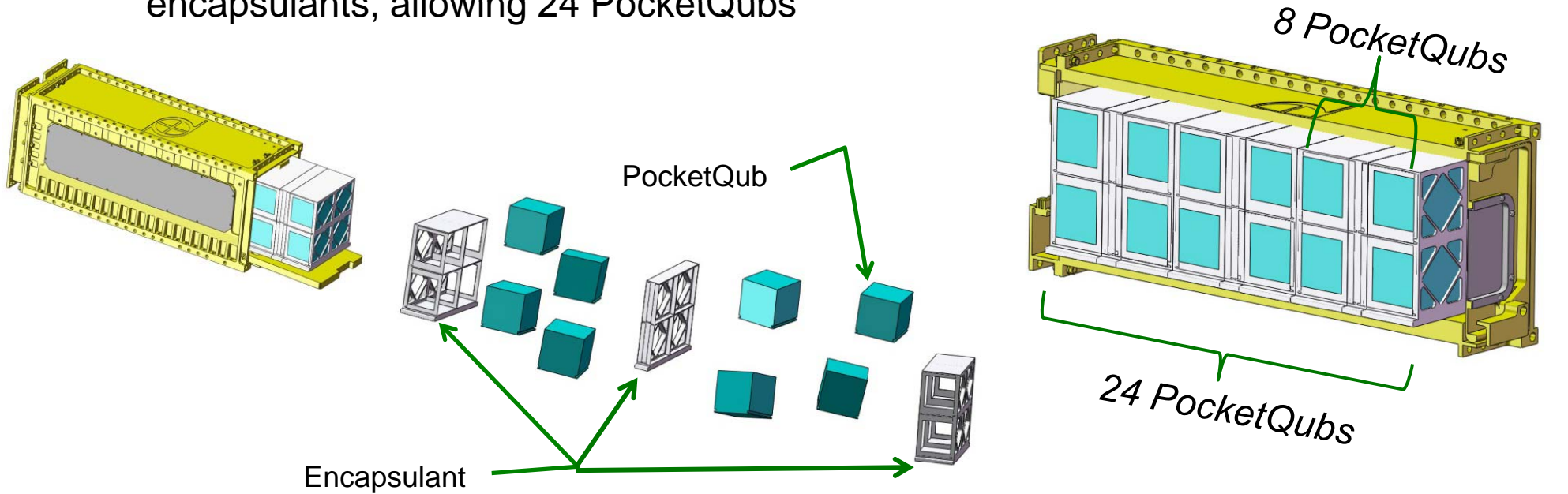
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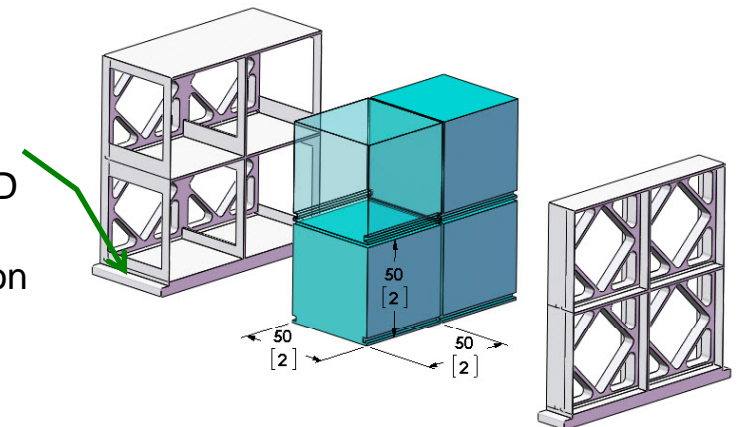
# Dispensing PocketQubs

- 3 part encapsulant holds 8 PocketQubs in a ~1U
  - The 3U CSD is 1 inch longer internally allowing the extra length of the encapsulants, allowing 24 PocketQubs



Tab: load path to CSD

Similar to encapsulation of POPACS spheres



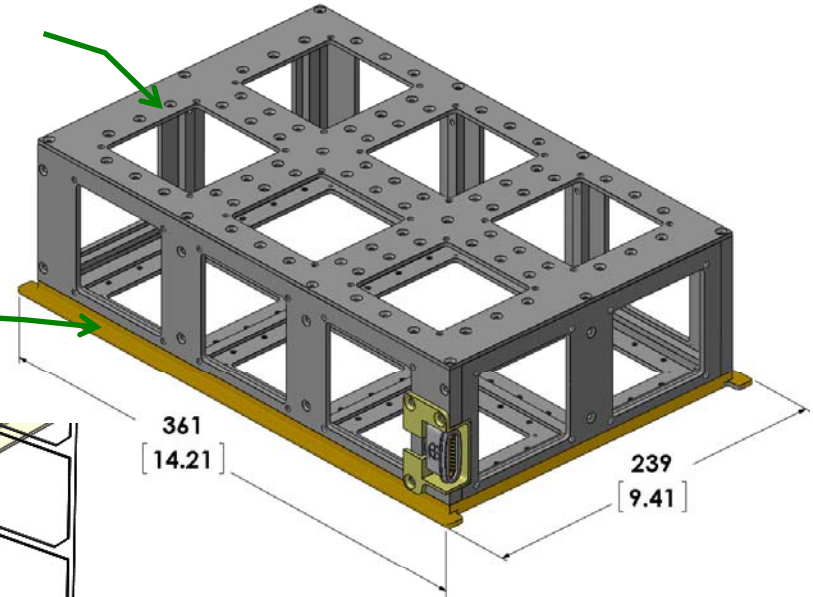


# 6U Structure

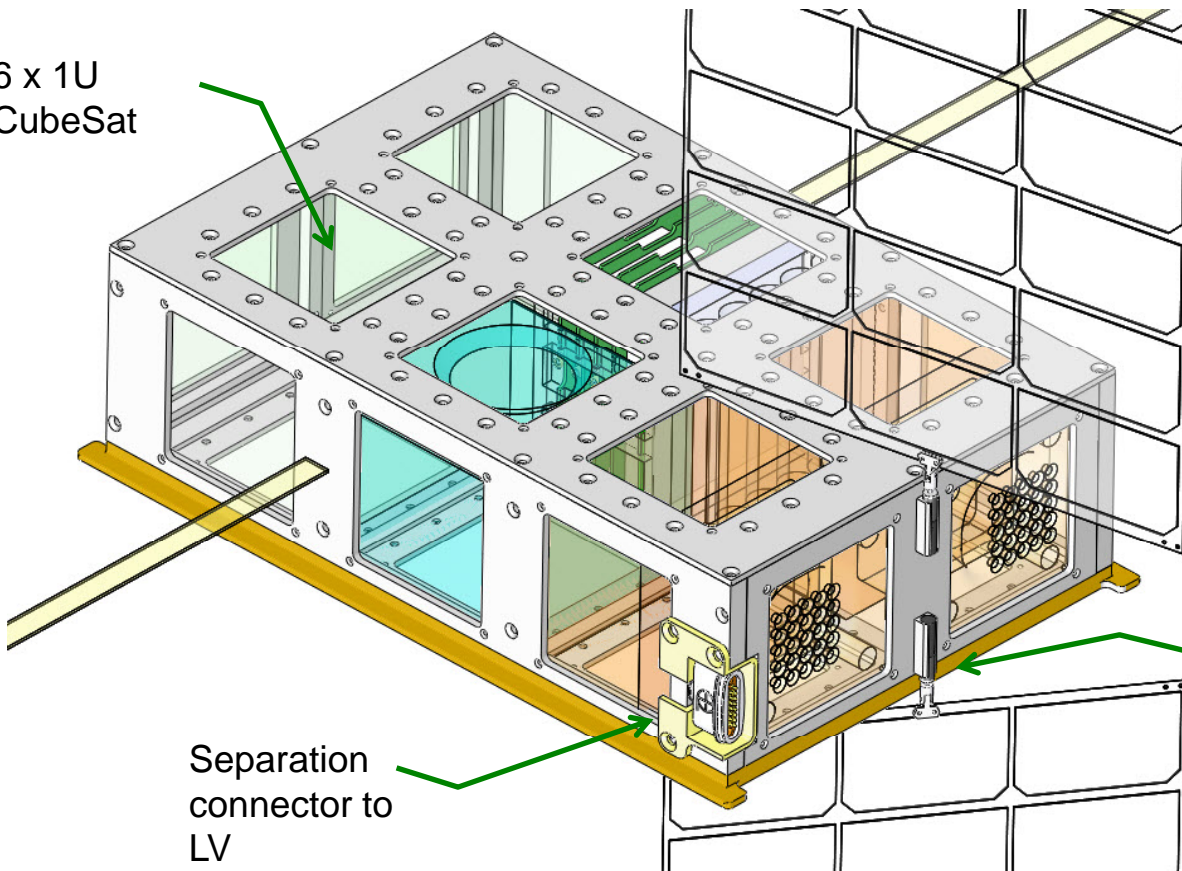
- Designed by Pumpkin, Inc.
  - Holds six standard CubeSats as subsystems in larger 6U CubeSat

Aluminum structure

Tab: load path to CSD



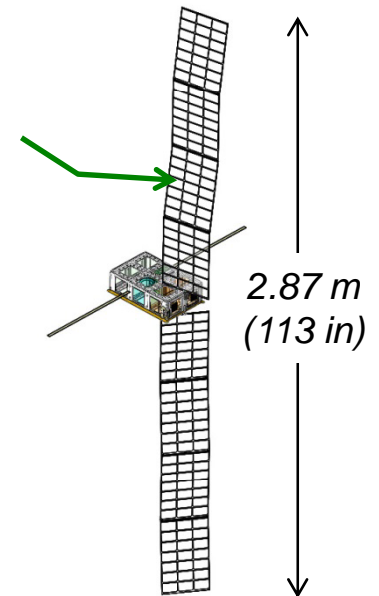
6 x 1U  
CubeSat



204 Watt PV  
panel can  
drive electric  
propulsion to  
the planets

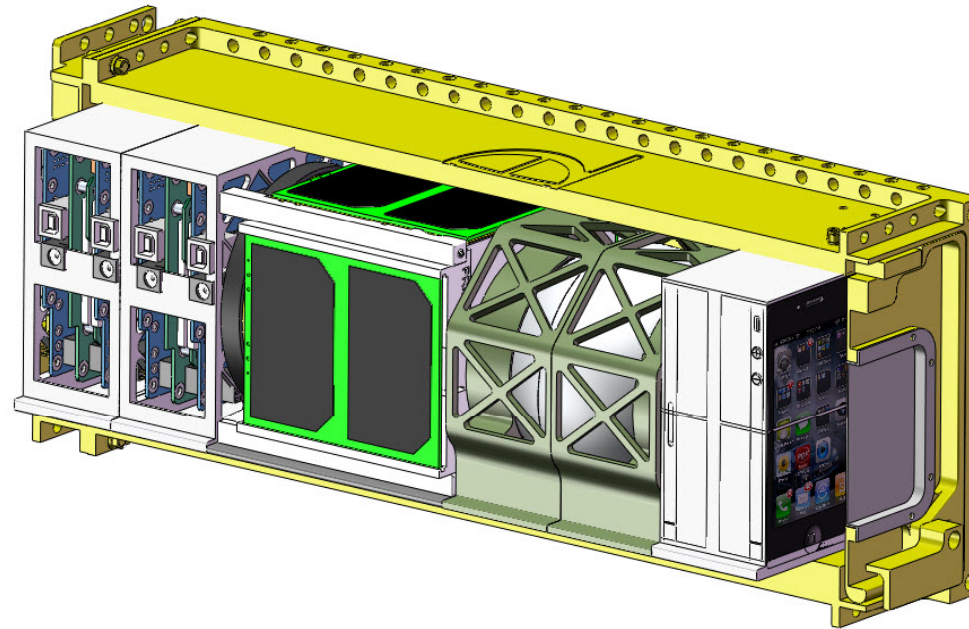
Motors drive PV  
panels

Separation  
connector to  
LV

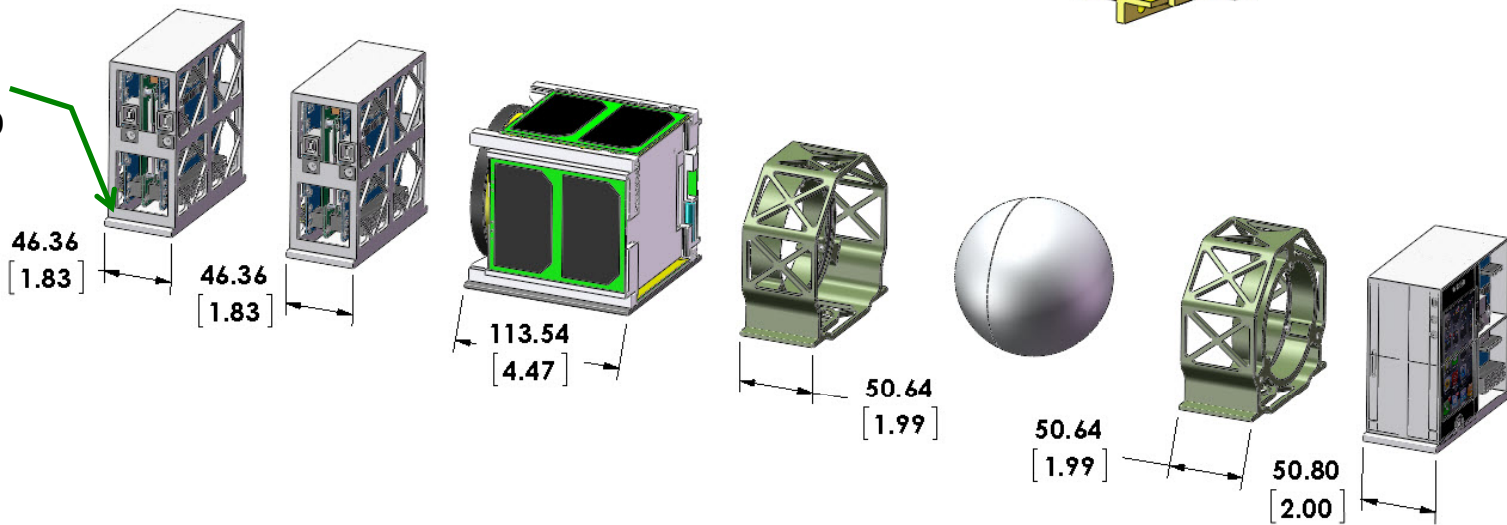


# Arbitrary Length Payloads

- 3U CSD constrains and dispenses 5 CubeSats
- Total length does not have to fill CSD

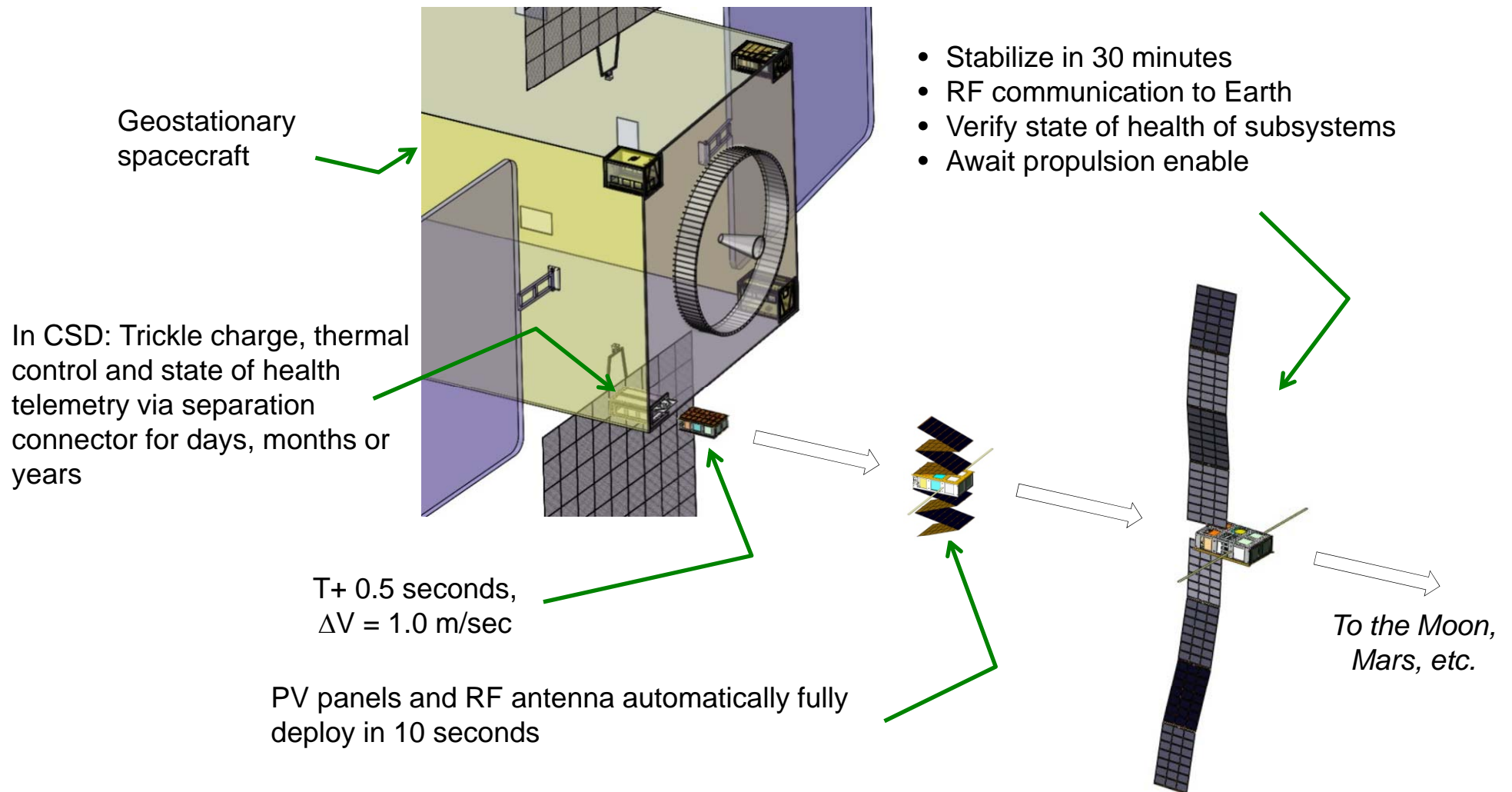


Tab: load path to CSD



# Dispensing Hosted Payloads from large spacecraft

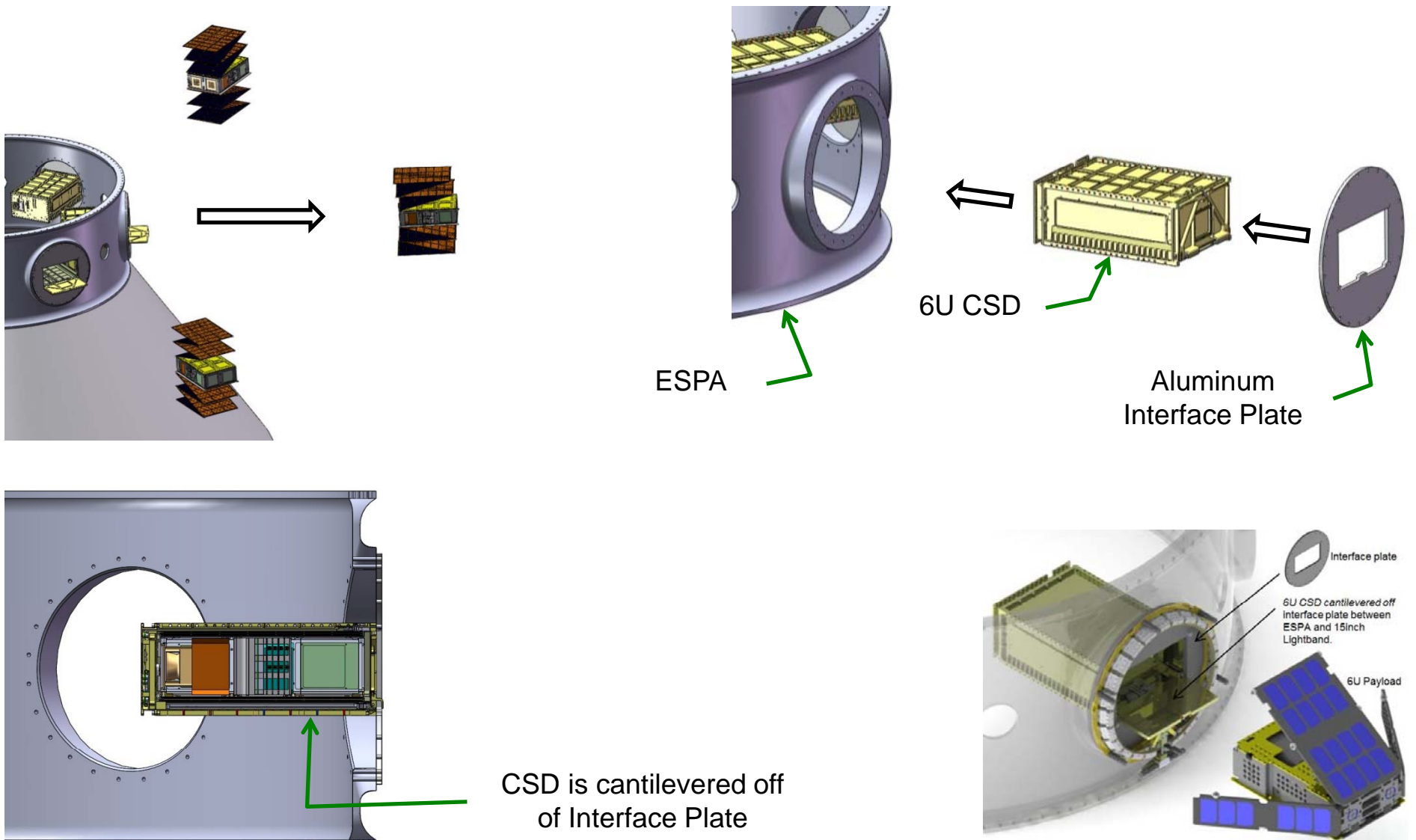
- Dispensing spacecraft from geostationary spacecraft allows electric propulsion to Moon, Mars etc.
  - Need 1.6 km/sec to Moon from Geostationary: about 1 kg of propellant at an Isp of 1,500 sec





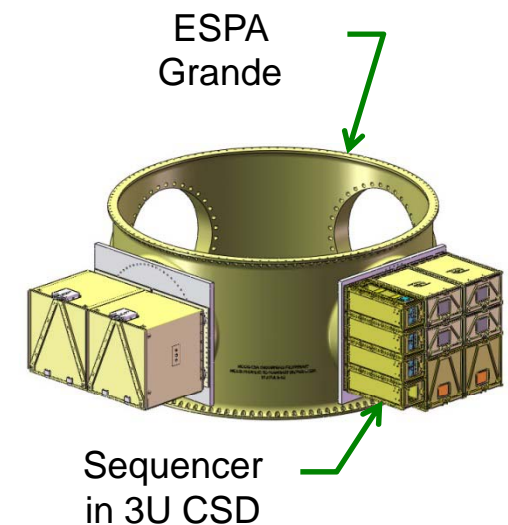
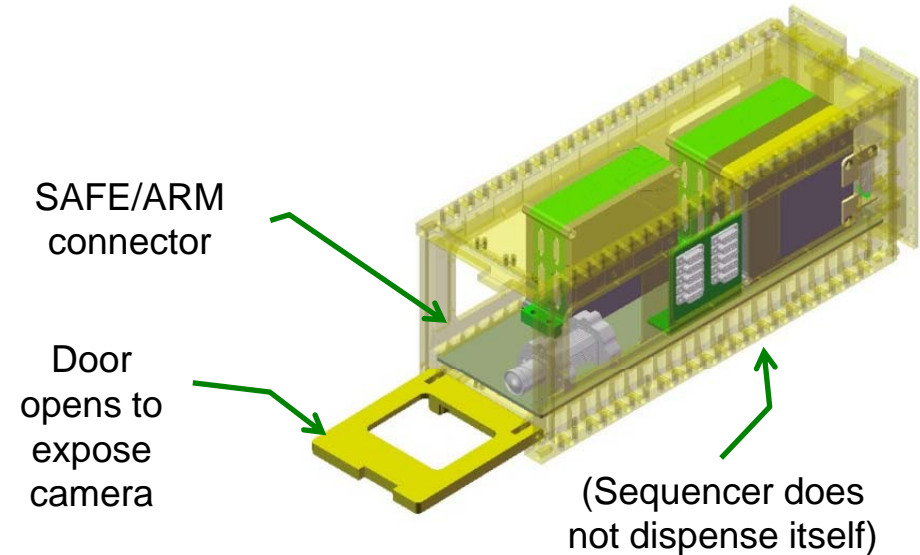
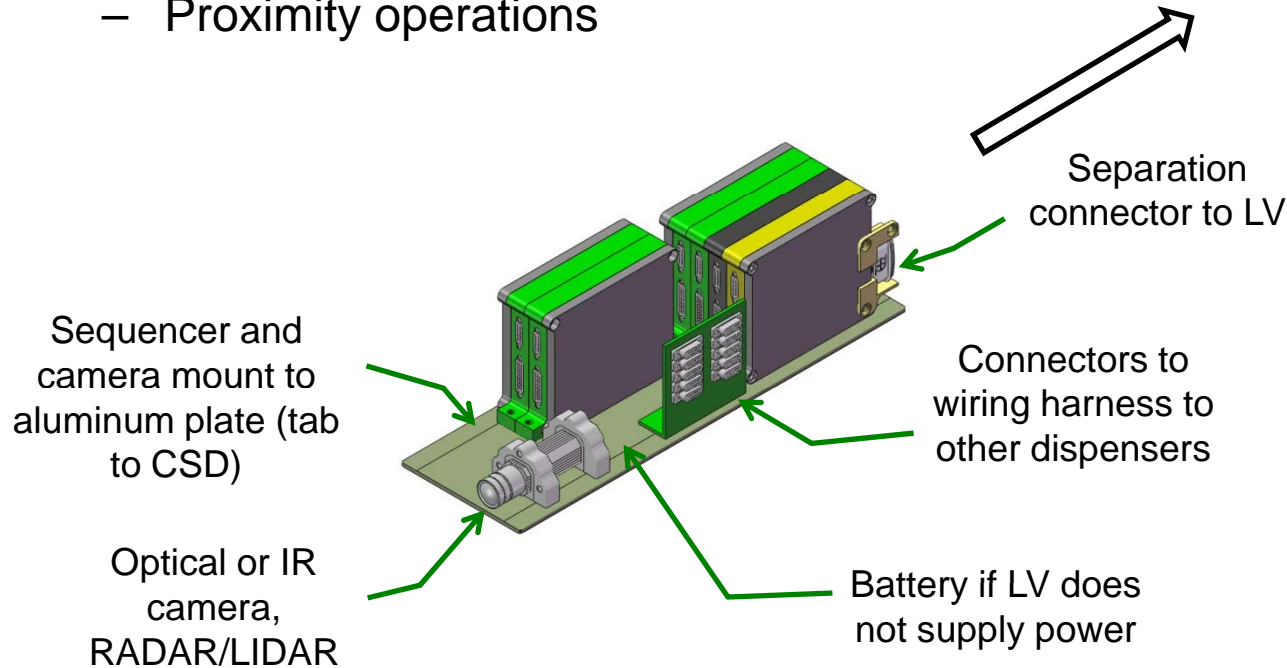
# Dispensing from the inside of ESPA

- A simple, flat Interface Plate allows rapid and robust integration to ESPA



# Sequencing Electronics and Camera in 3U CSD

- Sequencer (By Ecliptic) initiates the dispensers once launch vehicle (LV) enables
- Camera(s) records
  - Initial conditions of missions
    - Tumble rates and velocity
    - Shape of deployables
    - CubeSat constellation shape
  - Proximity operations







PocketCube Shop

PUMPKIN  
REAL TIME SOFTWARE



## References

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- **Staehe, Robert L. *Lunar Flashlight: Finding Lunar Volatiles Using CubeSats*, Third International Workshop on LunarCubes Palo Alto, California, 2013 November 13**