# Innovative Uses of the Canisterized Satellite Dispenser (CSD)

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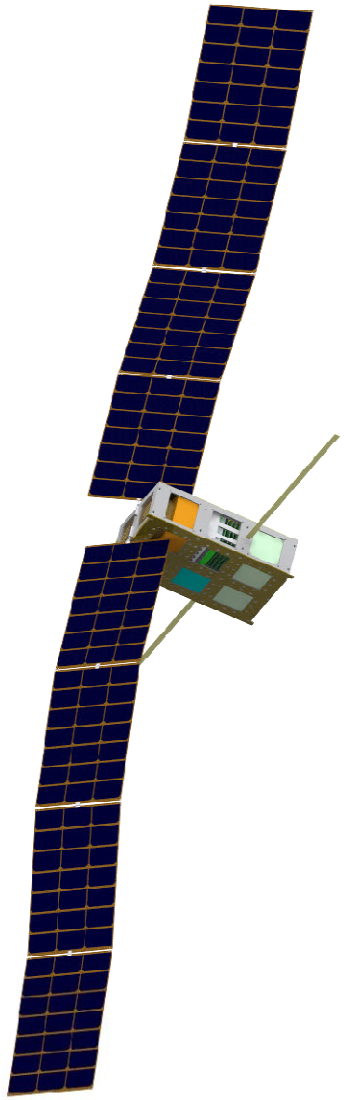
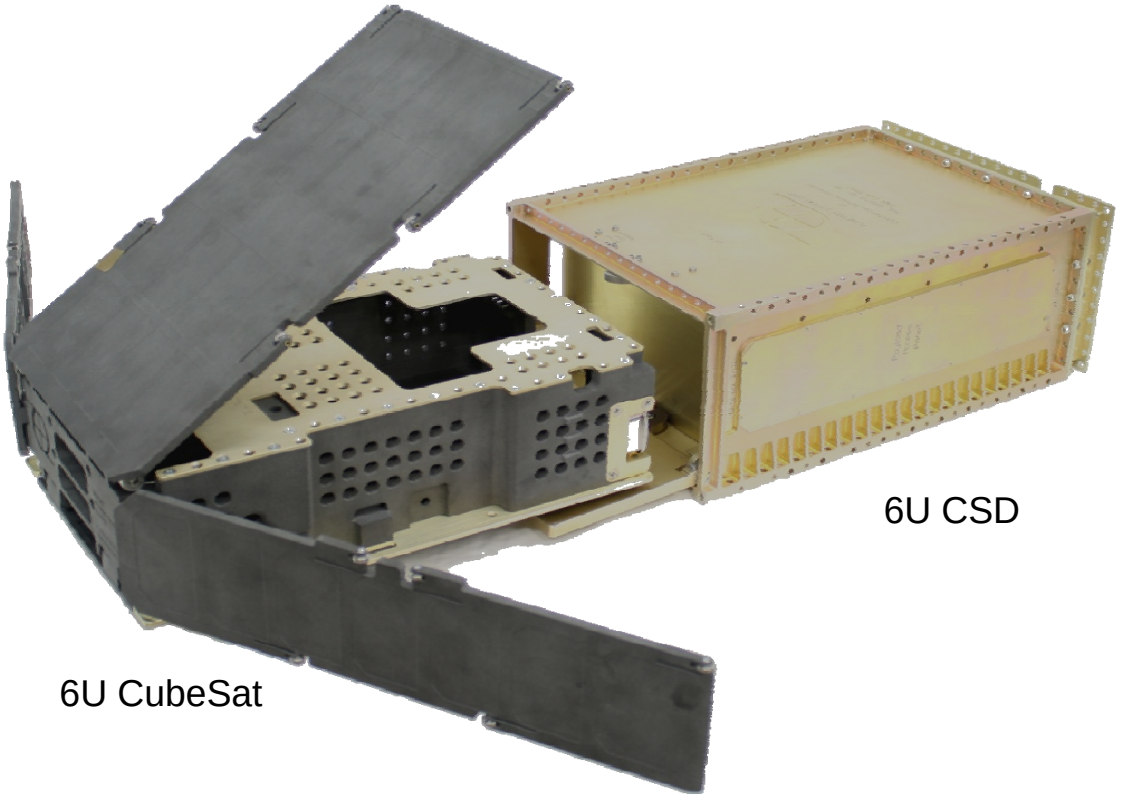


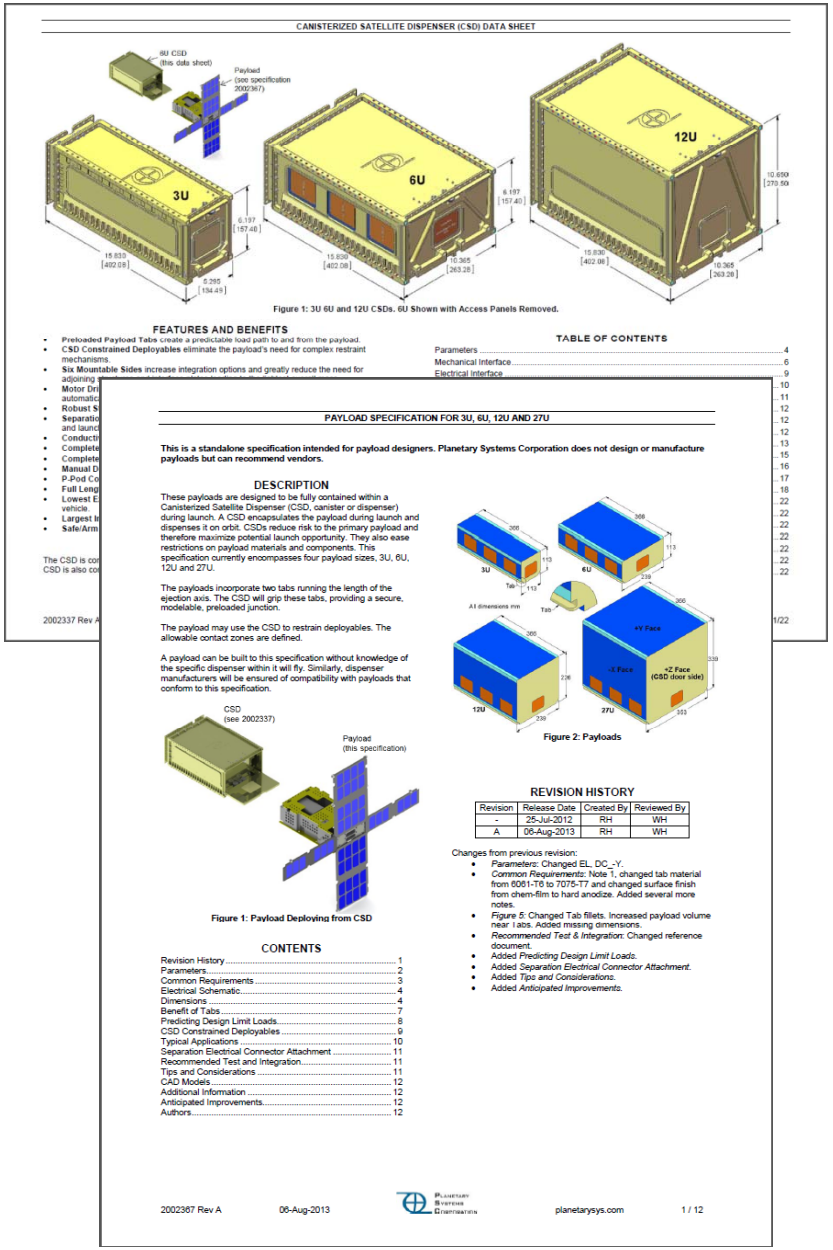


6U CSD

6U CubeSat

# 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

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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

Figure 1: Payload Deploying from CSD

Figure 2: Payloads

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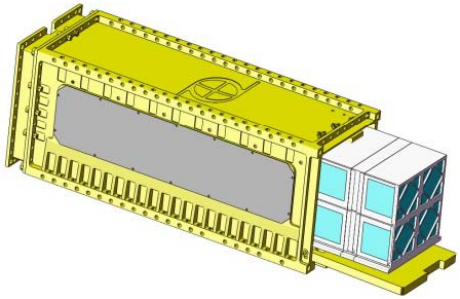
REVISION HISTORY

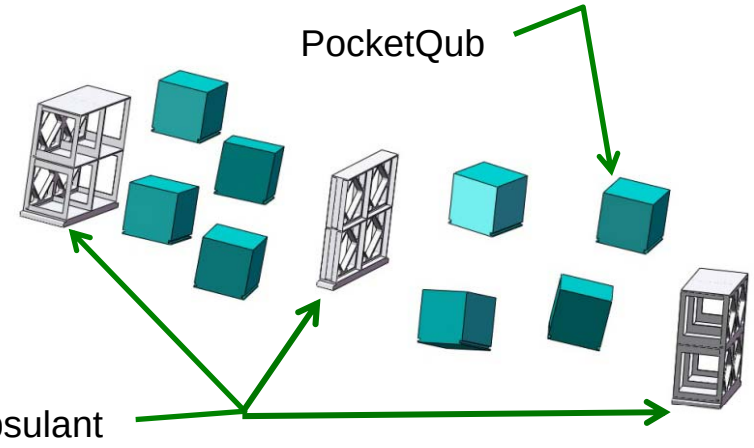
| Revision | Release Date | Created By | Reviewed By |
|---|---|---|---|
| - | 25-Jul-2012 | RH | WH |
| A | 06-Aug-2013 | RH | WH |

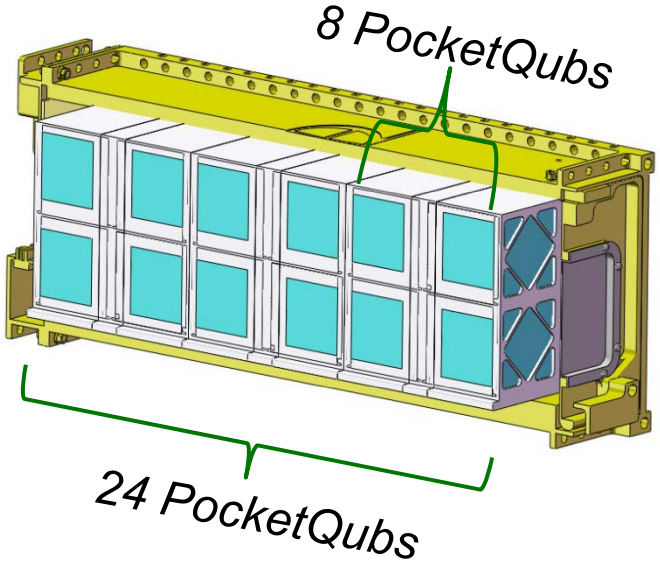
2002367 Rev A 06-Aug-2013 planetarysys.com 1 / 12

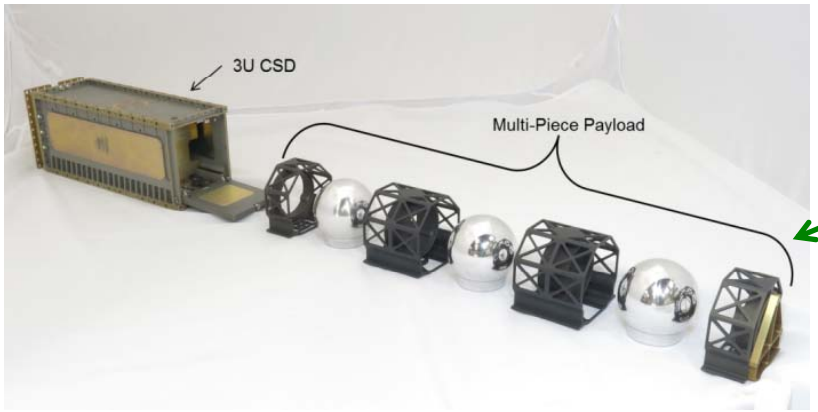
# Dispensing PocketQubs

- 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



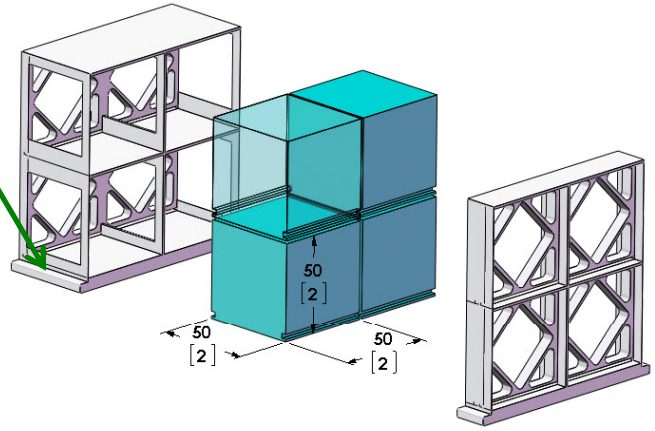


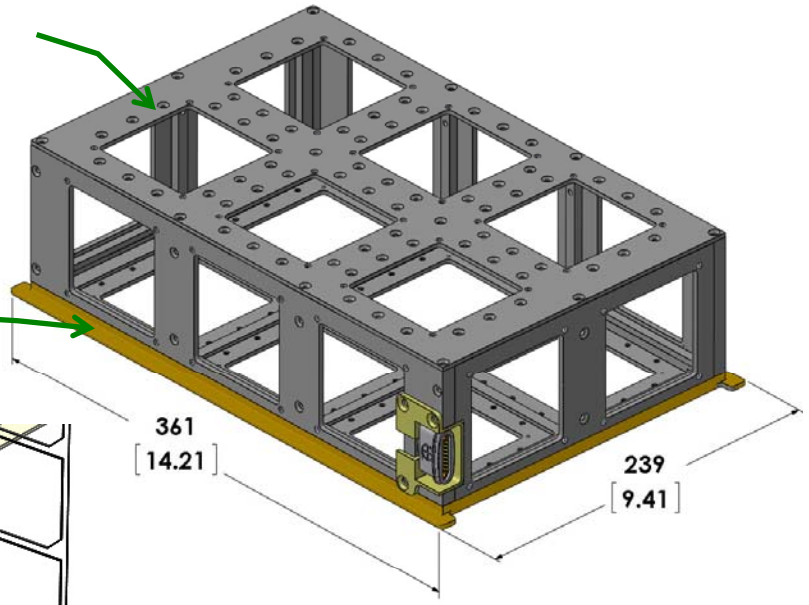

Similar to encapsulation of POPACS spheres

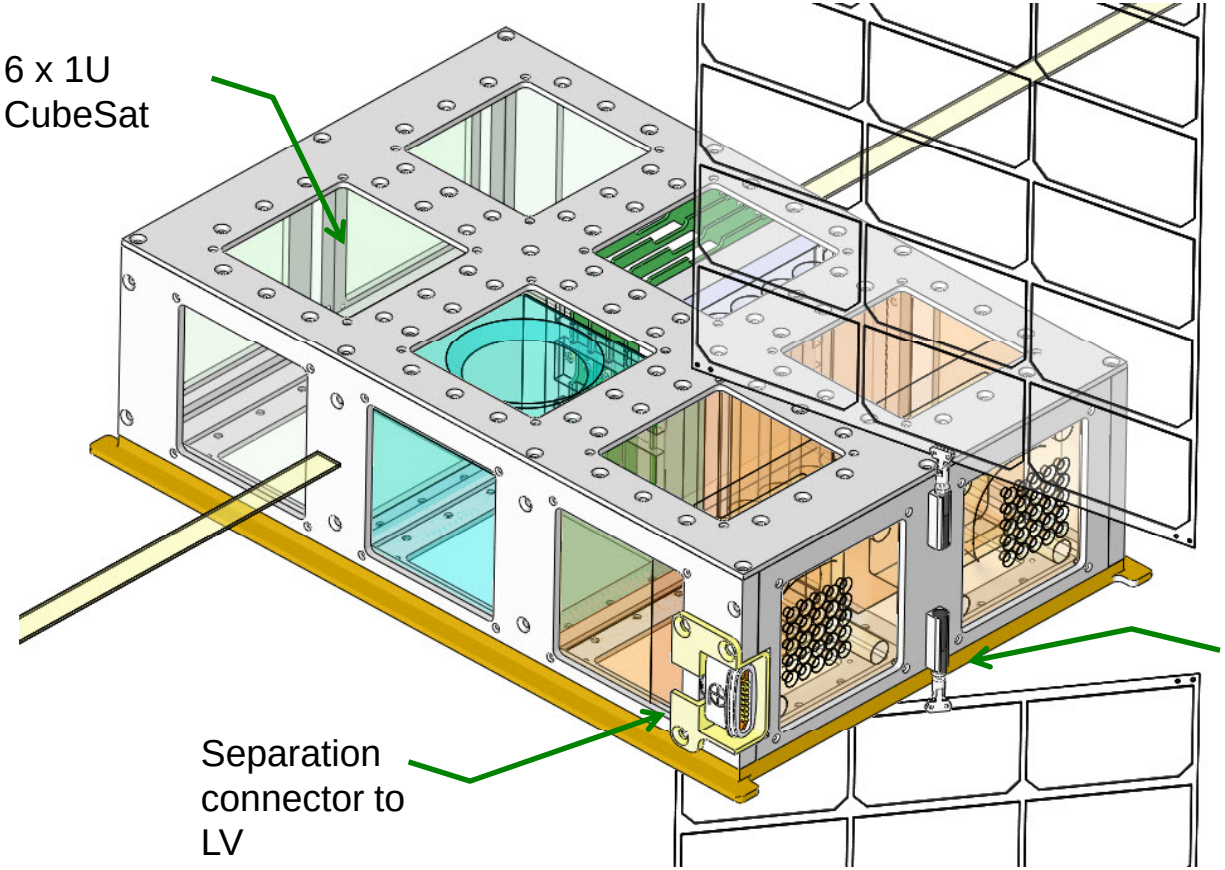
Tab: load path to CSD



# 6U Structure

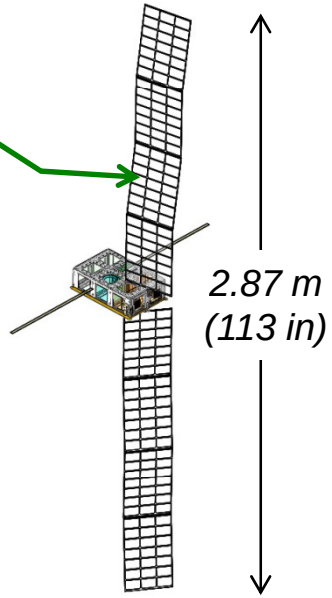
- Designed by Pumpkin, Inc.
  - Holds six standard CubeSats as subsystems in larger 6U CubeSat



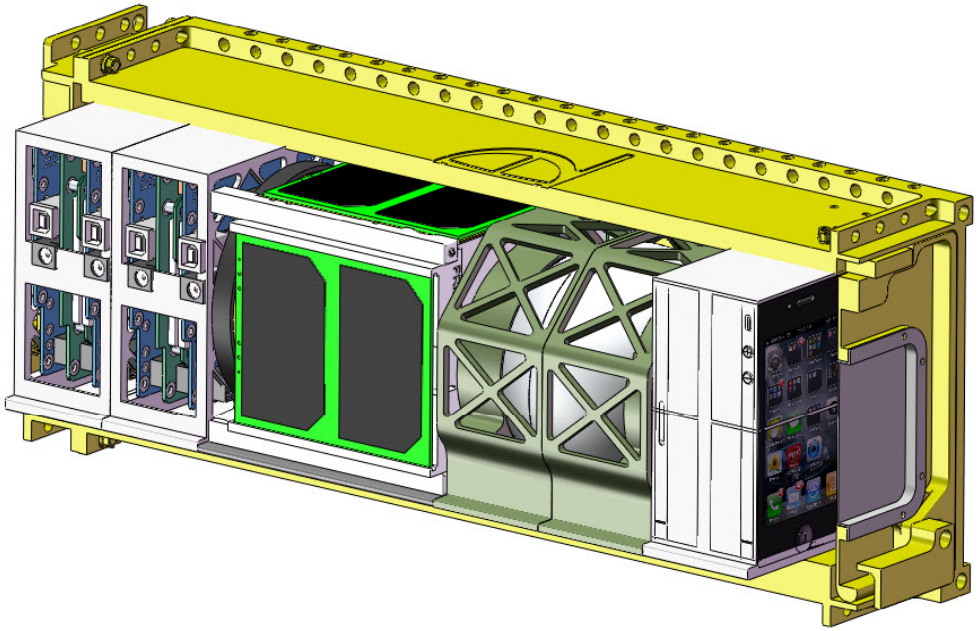

204 Watt PV panel can drive electric propulsion to the planets

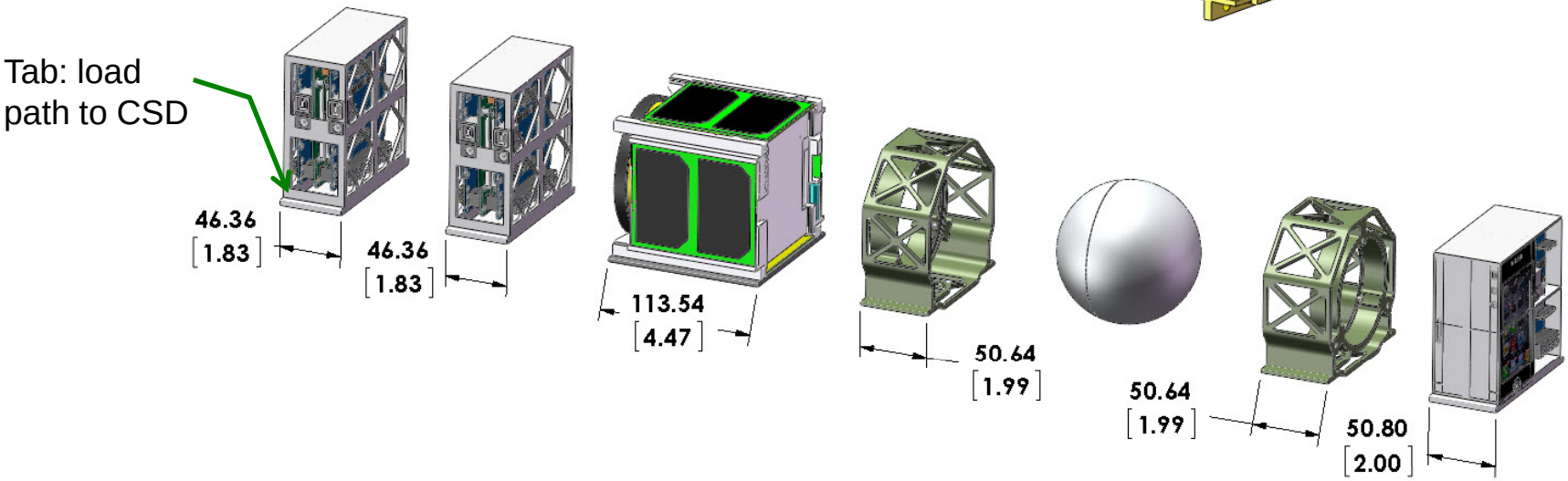
Motors drive PV panels



# Arbitrary Length Payloads

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

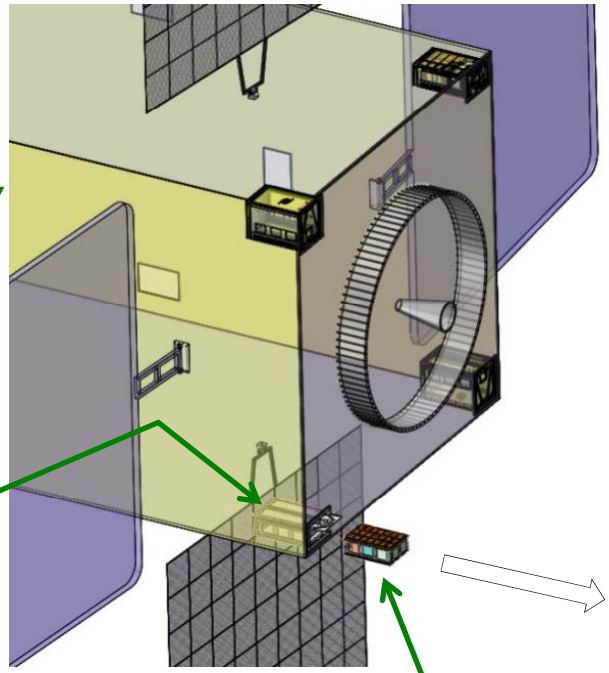




# Dispensing Hosted Payloads from large spacecraft

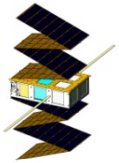
- Dispensing spacecraft from geostationary spacecraft allows electric propulsion to Moon, Mars etc.
  - Need 1.6 km/sec to Moon from Geostationary: about 1 kg of propellant at an Isp of 1,500 sec

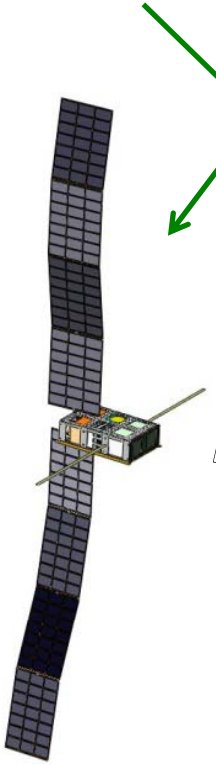
Geostationary spacecraft



- Stabilize in 30 minutes
- RF communication to Earth
- Verify state of health of subsystems
- Await propulsion enable

In CSD: Trickle charge, thermal control and state of health telemetry via separation connector for days, months or years





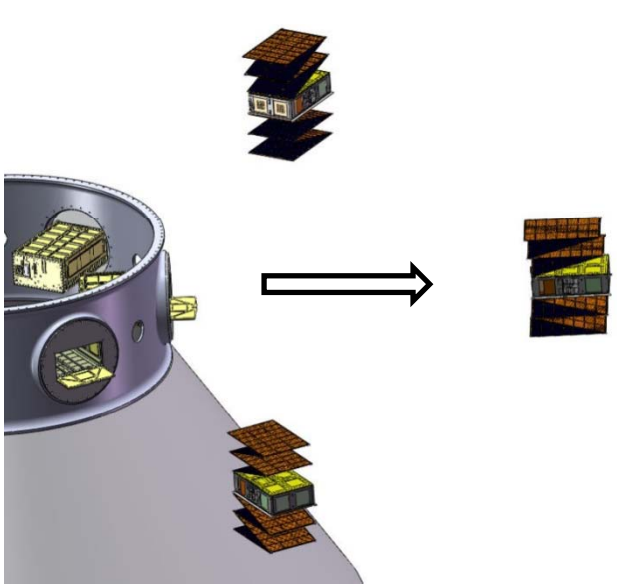
T+ 0.5 seconds,
$\Delta V$ = 1.0 m/sec

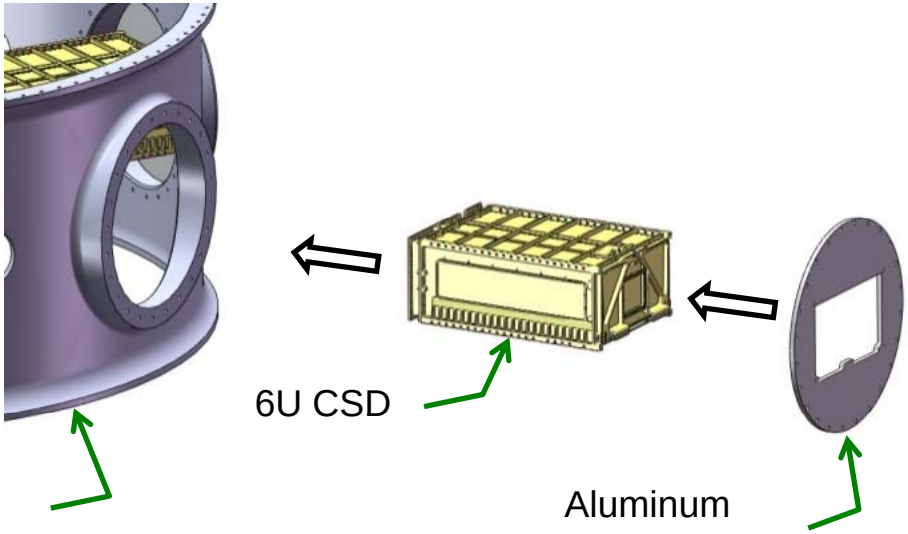
*To the Moon, Mars, etc.*

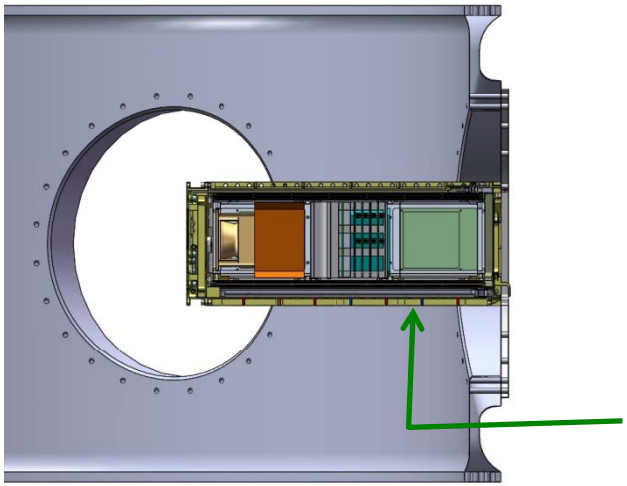
PV panels and RF antenna automatically fully deploy in 10 seconds

# Dispensing from the inside of ESPA

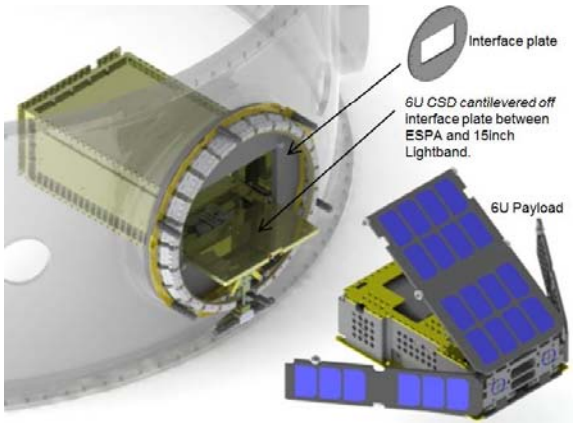
- A simple, flat Interface Plate allows rapid and robust integration to ESPA





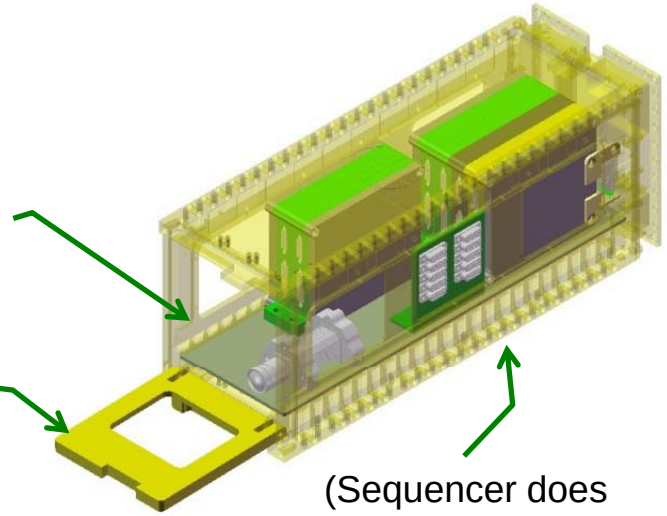



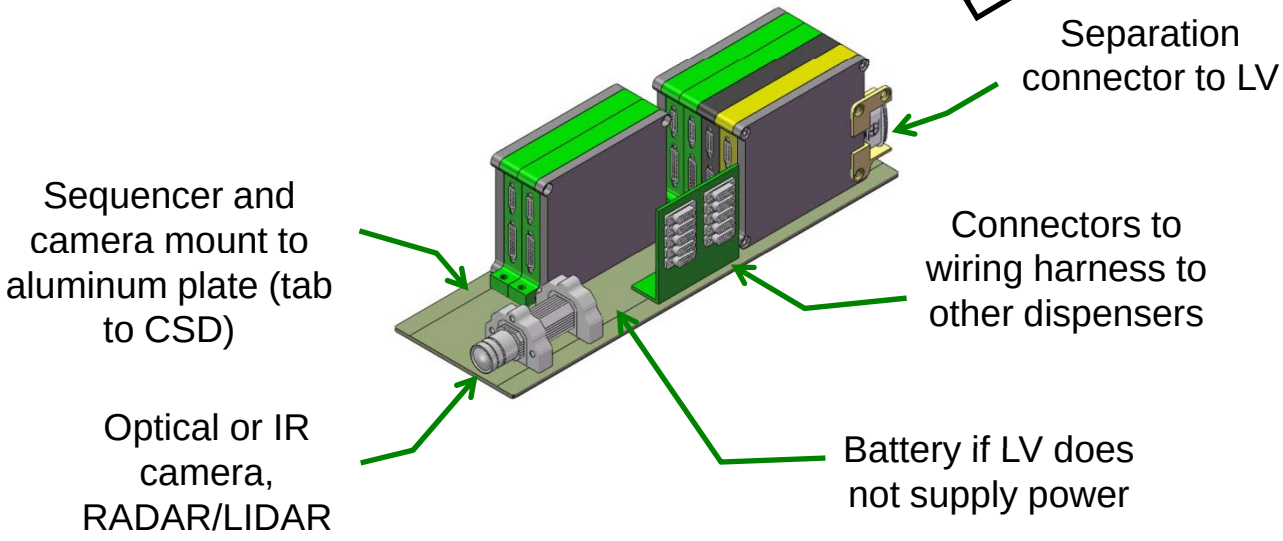
CSD is cantilevered off of Interface Plate

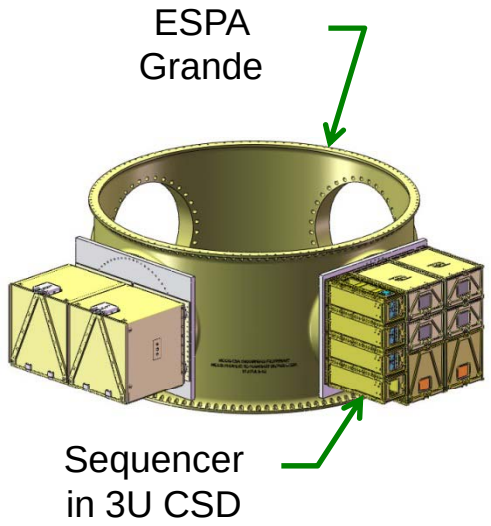


# Sequencing Electronics and Camera in 3U CSD

- 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



# References


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