Jet Propulsion Laboratory
California Institute of Technology

# Near Earth Asteroid Scout Mission Update

**Les Johnson, Joe Matus, Matt Pruitt**
NASA George C. Marshall Space Flight Center

**Anne Marinan, Calina Seybold, Julie Castillo-Rogez, Gregory Lantoine, Ted Sweetser**
NASA Jet Propulsion Laboratory, California Institute of Technology

# Near Earth Asteroid Scout Mission Overview

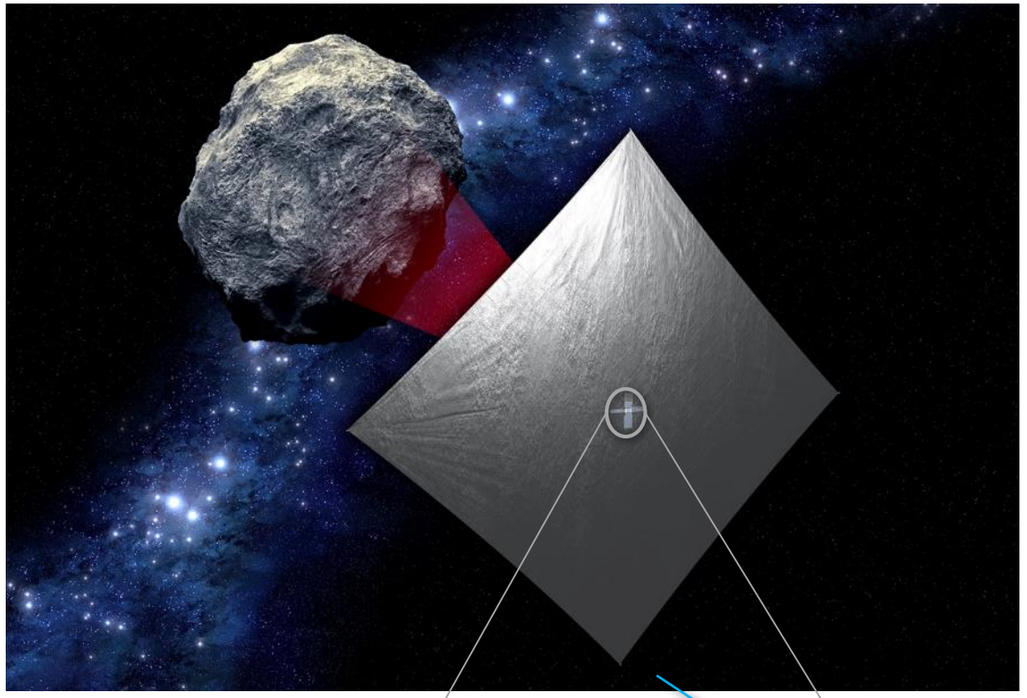
**The Near Earth Asteroid Scout Will**

- Image/characterize a NEA during a slow flyby (~m/s)
- Demonstrate deployment and navigation using a solar sail

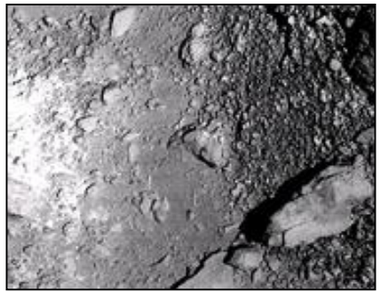
**Key Spacecraft & Mission Parameters**

- 6U CubeSat
- ~86 $m^2$ solar sail propulsion system
- Manifested for launch on the Space Launch System Artemis 1, in 2021
- 1 AU maximum distance from Earth

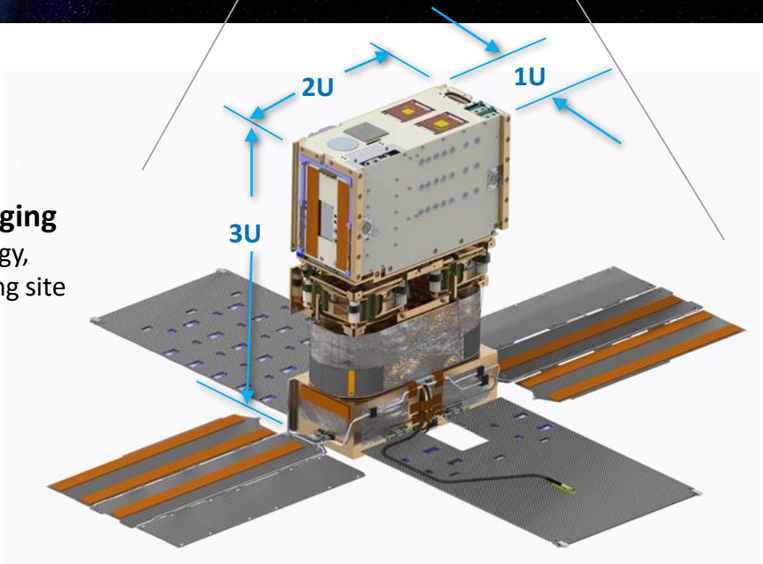
**Leverages:** combined experiences of MSFC and JPL with support from GSFC, JSC, & LaRC



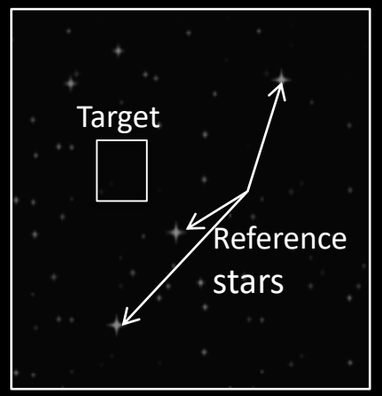
**Target Reconnaissance with medium field imaging**
Shape, spin, and local environment



**Close Proximity Imaging**
Local scale morphology, terrain properties, landing site survey



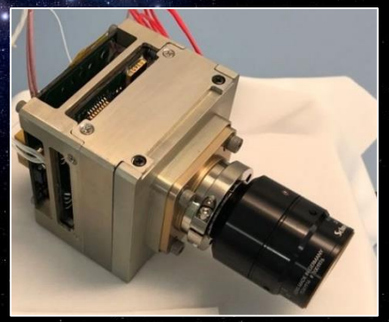
# Near Earth Asteroid Scout Science Overview




**1. Target Detection and Approach:**
50K km, Light source observation
**SKGs: Ephemeris determination and composition assessment**

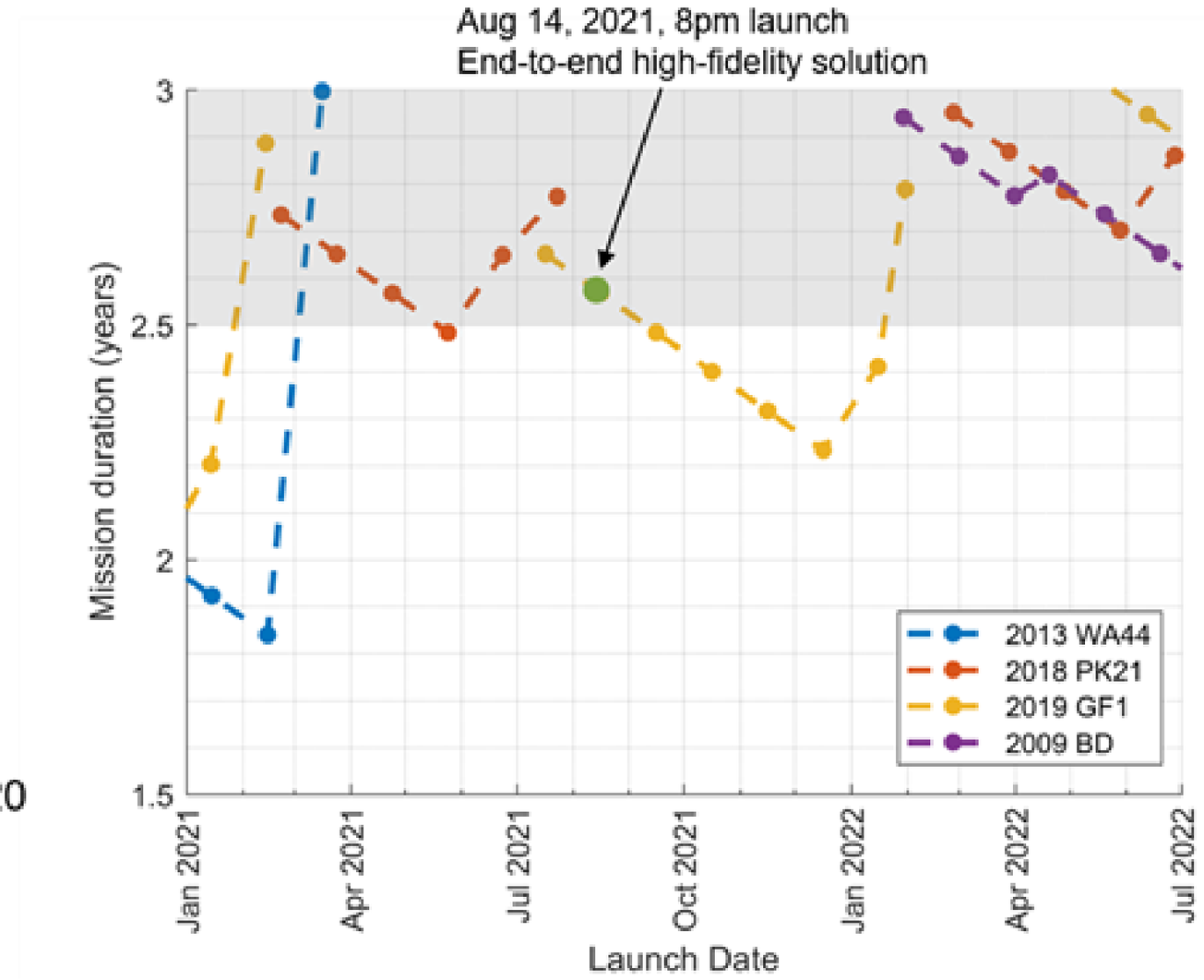
**2. NEA Reconnaissance**
<100 km distance at encounter
50 cm/px resolution over 80% surface
**SKGs: volume, global shape, spin properties, local environment**

**3. Close Proximity Science**
High-resolution imaging,
10 cm/px over >30% surface
**Strategic Knowledge Gaps (SKGs):**
**Local morphology**
**Regolith properties**



**JPL**

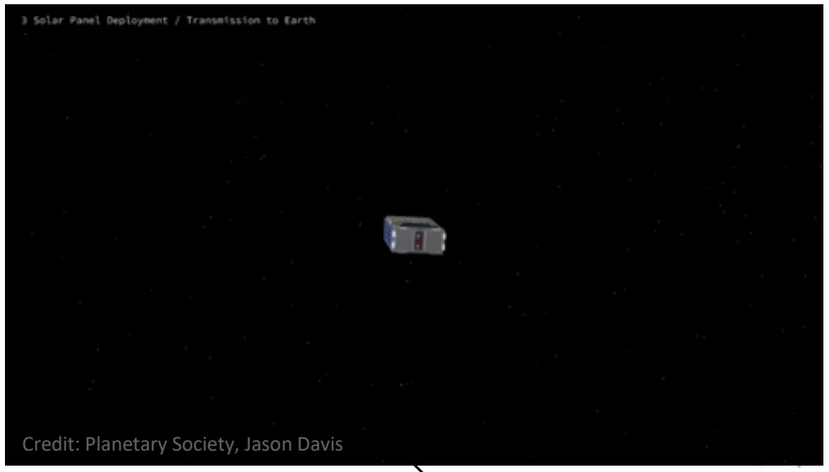
# Baseline Target Asteroid



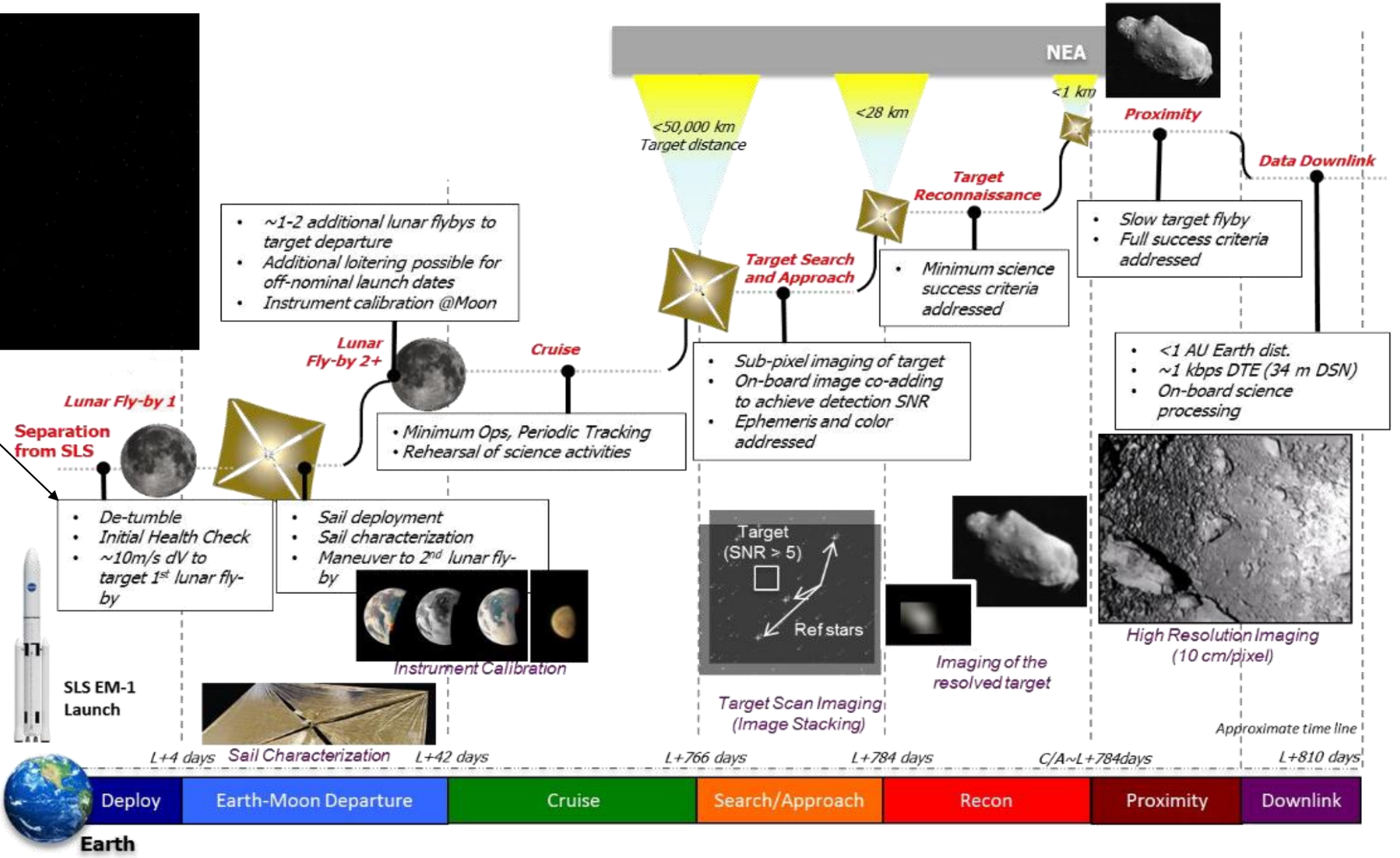

04/14/20 version

- Target changes with launch date and trajectory baseline from SLS
- Current target is 2019 GF1
- Available for launch dates from August 2021 thru February 2022

# Concept of Operations Overview

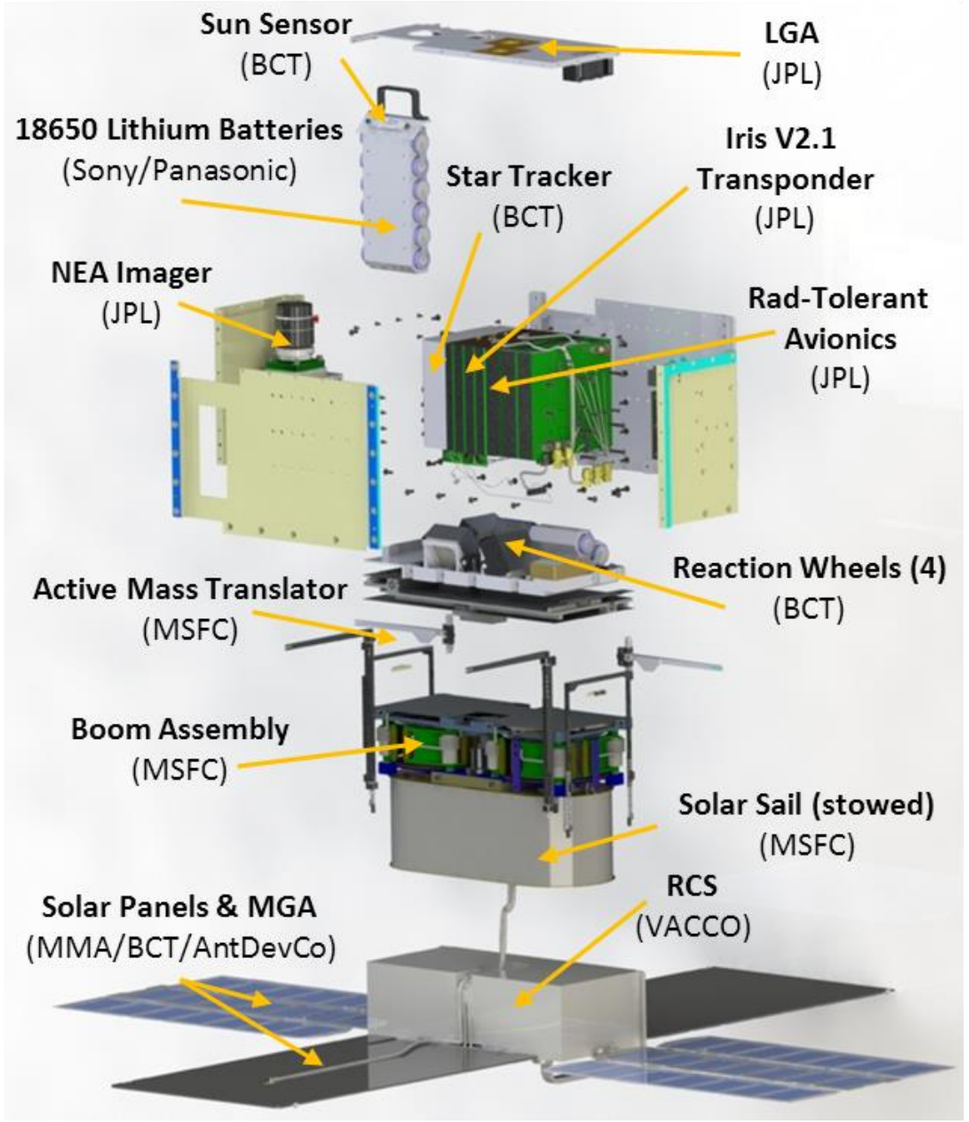


Credit: Planetary Society, Jason Davis



# Flight System Overview

| | |
|---|---|
| **Payload** | • Updated OCO3 Context Camera |
| **Mechanical & Structure** | • “6U” CubeSat form factor<br>• <14 kg total launch mass<br>• Modular flight system concept |
| **Propulsion** | • ~86 $m^2$ aluminized CP-1 solar sail (based on NanoSail-D2) |
| **Avionics** | • Radiation tolerant architecture |
| **Electrical Power System** | • Trifold deployable solar arrays with GaAs cells (~51.2 W EOL at 1 AU solar distance)<br>• 6.2 Ah Battery<br>• 10 -12.3 V unregulated, 5 V/3.5 V regulated |
| **Telecom** | • JPL Iris 2.1 X-Band Transponder; 4 W RF output power supports doppler, ranging, and D-DOR<br>• 2 pairs of INSPIRE-heritage LGAs (RX/TX)<br>• 8x8 element microstrip array MGA (TX); ~1 kbps to 34m DSN at 0.8 AU |
| **Attitude Control System** | • 15 mNm-s (x4)<br>• Active mass translation system<br>• VACCO R-236fa (refrigerant gas) Reaction Control System<br>• Nano StarTracker, Coarse Sun Sensors & MEMS IMU for attitude determination |



# NEA Scout Approximate Scale


**Deployed Solar Sail**

**School Bus**

Folded, spooled and packaged in…

**Human**

**6U Stowed Flight System**

# Assembly, Integration, and Test (AI&T) Overview

Completed

Current Step

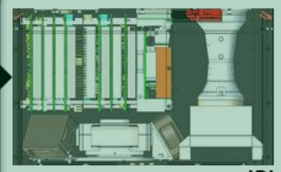
Solar Sail Assembly

MSFC

DSN Compatibility Test / ETE Testing

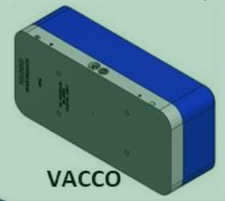
JPL

Upper Assembly



JPL

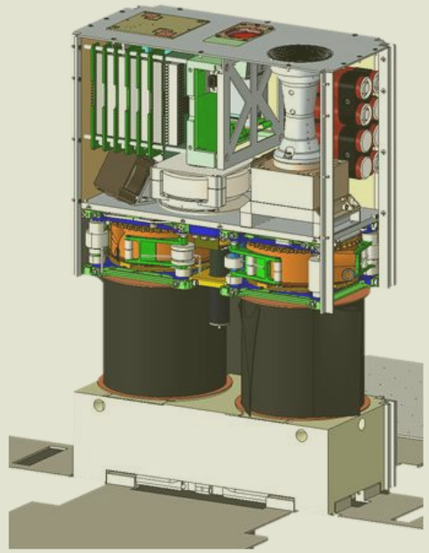
Lower Assembly



VACCO

*SHIP*

Flight System Integrated



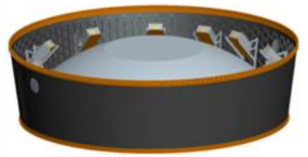
MSFC

Functional and Environmental Testing

MSFC

*SHIP*

Install into MSA



KSC

*SHIP/HANDOVER*

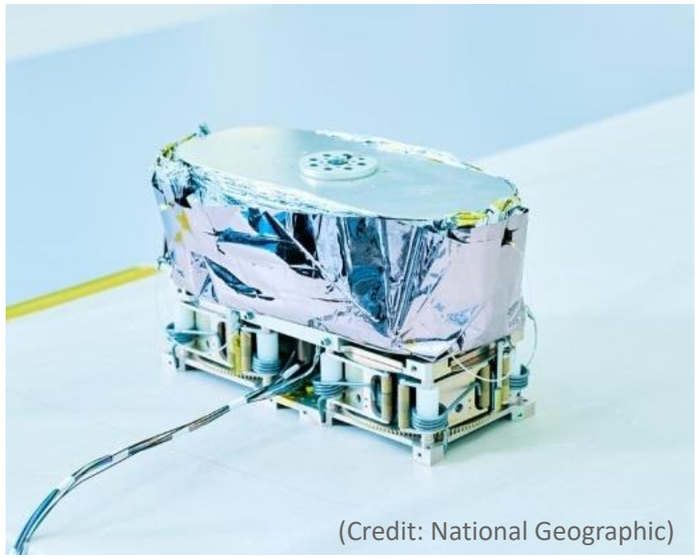
Integrate Dispenser & Flight System & Acceptance Test

Dispenser Vendor

KSC

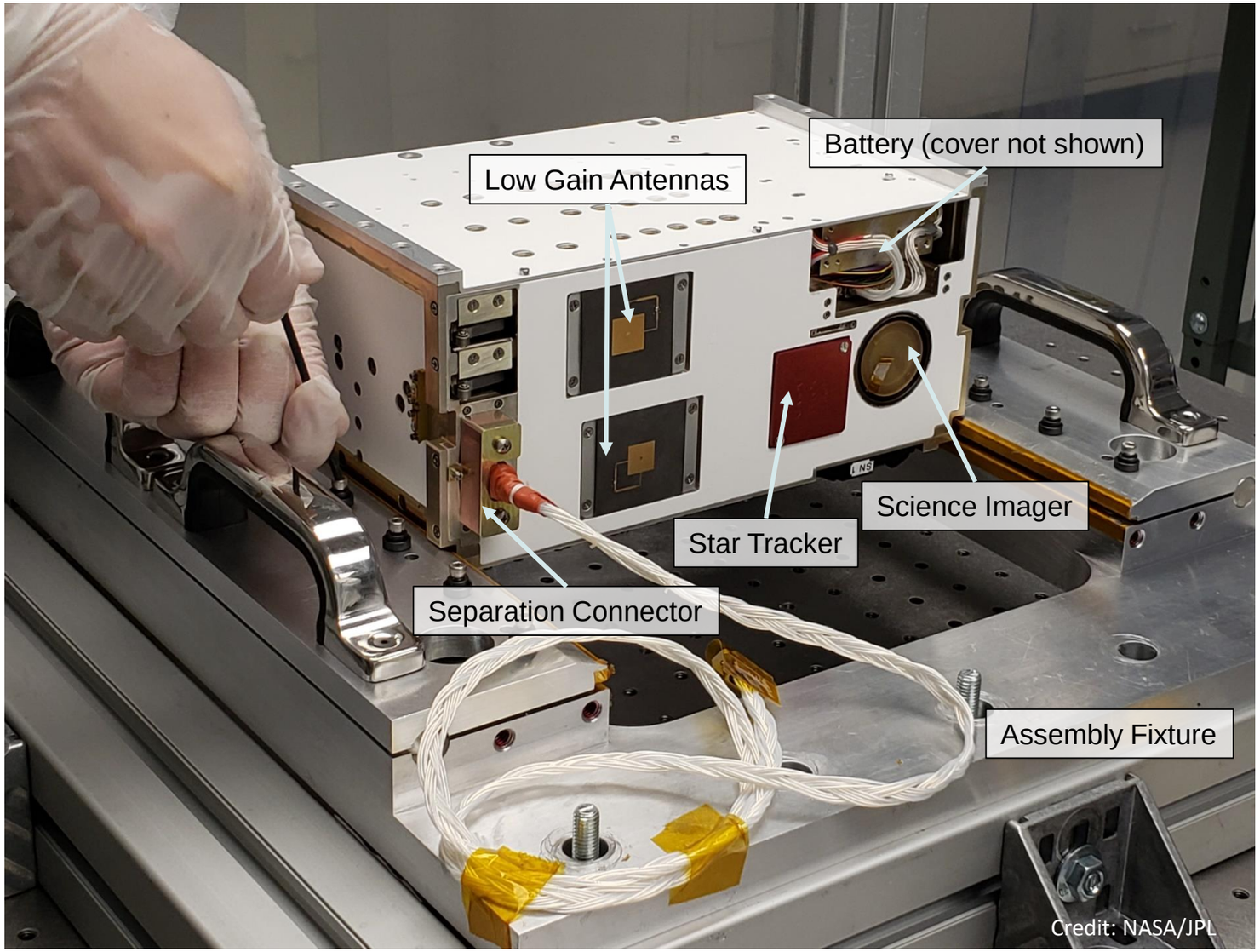
# Solar Sail Construction and Deployment

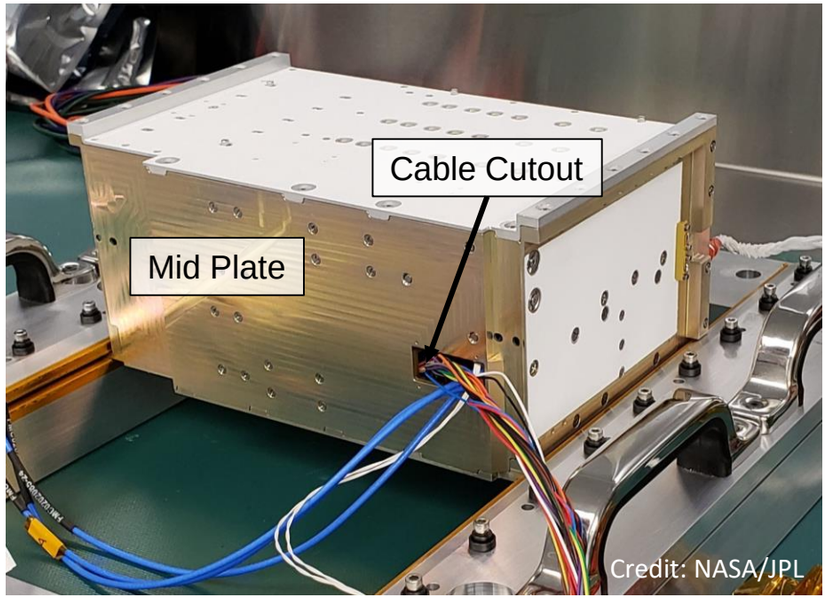

Credit: Planetary Society, Jason Davis

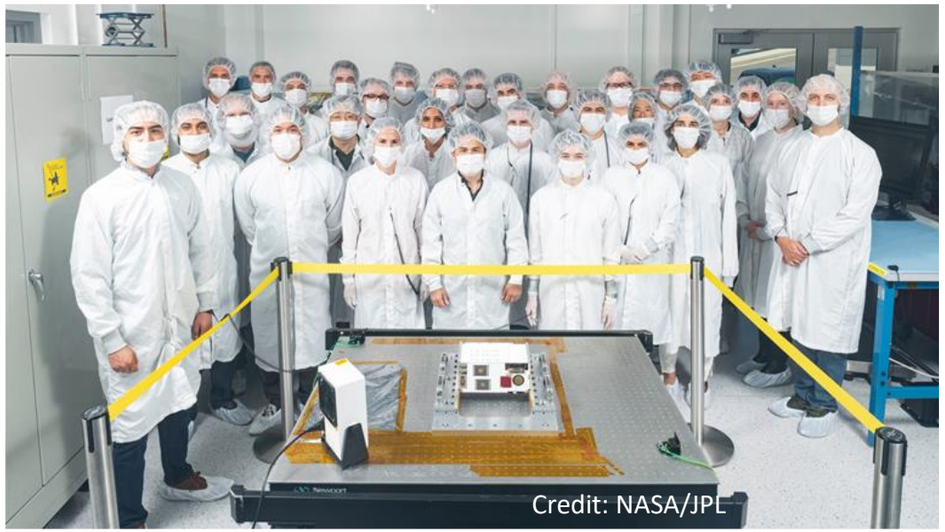

(Credit: National Geographic)


(Credit: National Geographic)

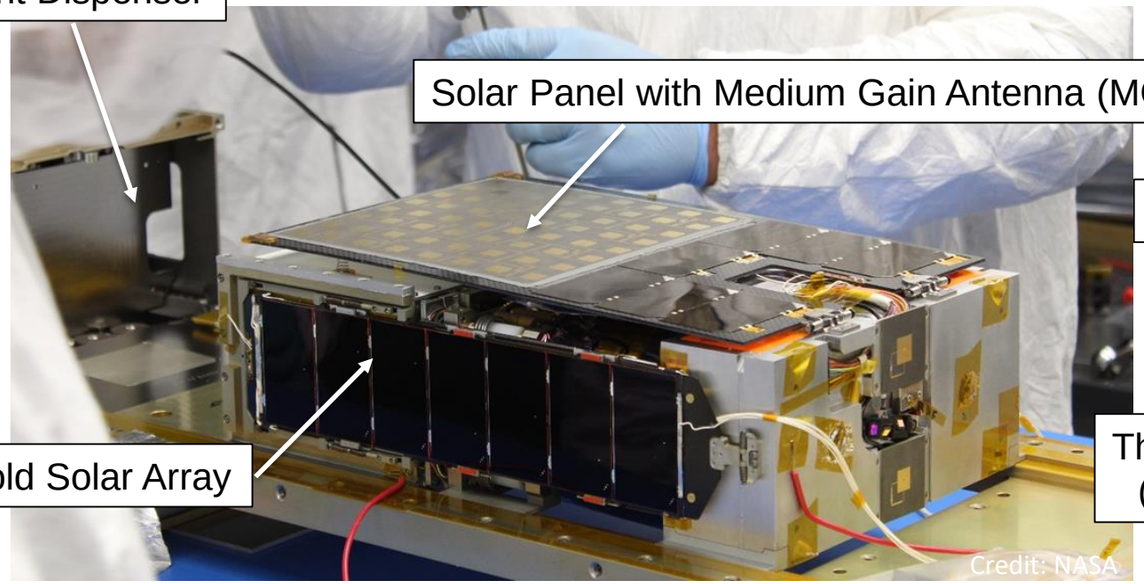
# Avionics Box Delivery – August 2019



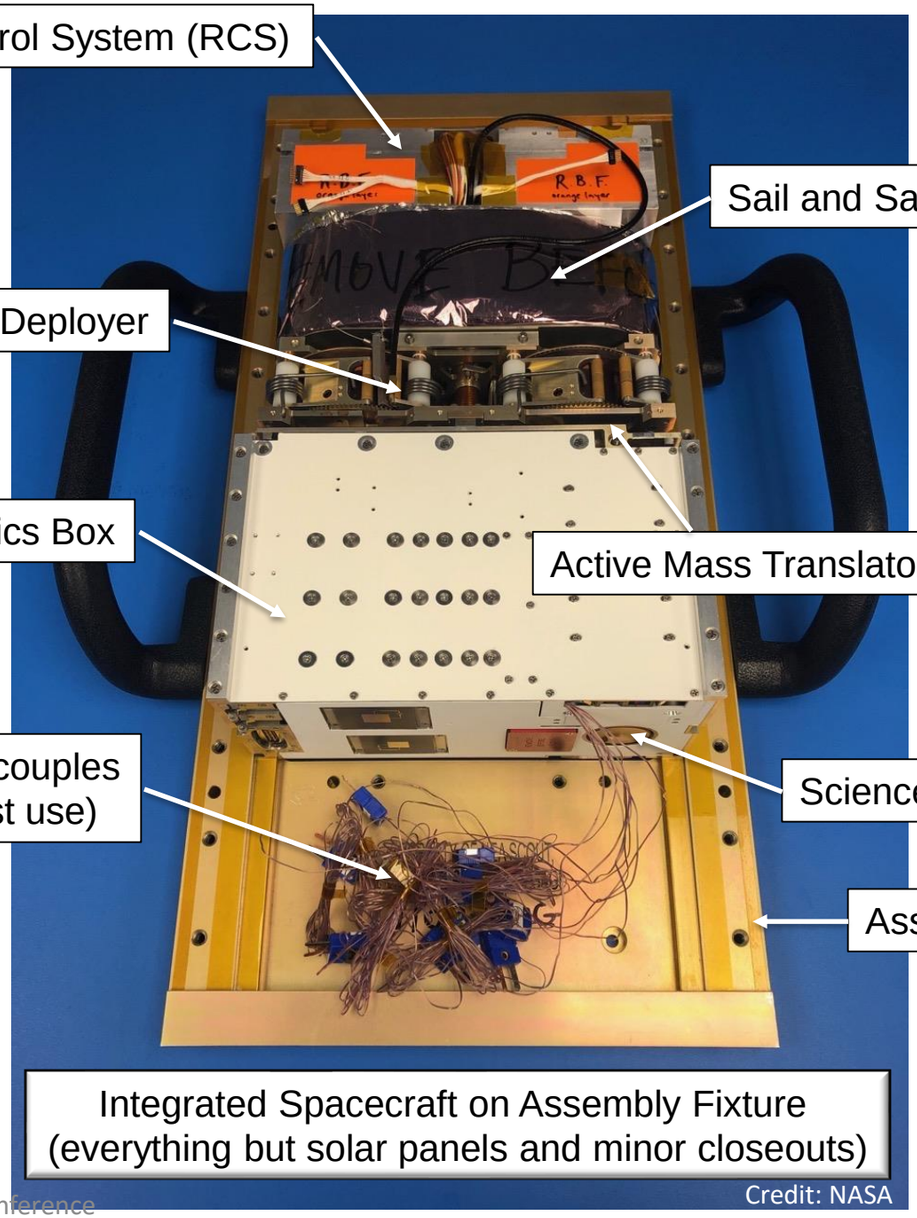



# Full Spacecraft Integration




Integrated Spacecraft Undergoing Fit Check with Flight Dispenser




Integrated Spacecraft on Assembly Fixture (everything but solar panels and minor closeouts)

# NEAS Status Summary

- Spacecraft integration ~95% complete, delayed by pandemic
  - Awaiting final installation of solar panels
- System level testing planned to begin once integration is complete
  - Functional
  - EMI/EMC
  - Vibration
  - Thermal
  - Day in the Life
- Delivery to SLS/ Tyvak for flight No Earlier Than end of Sept 2020

# Questions?