



# A Radar Calibration CubeSat

Ho'oponopono

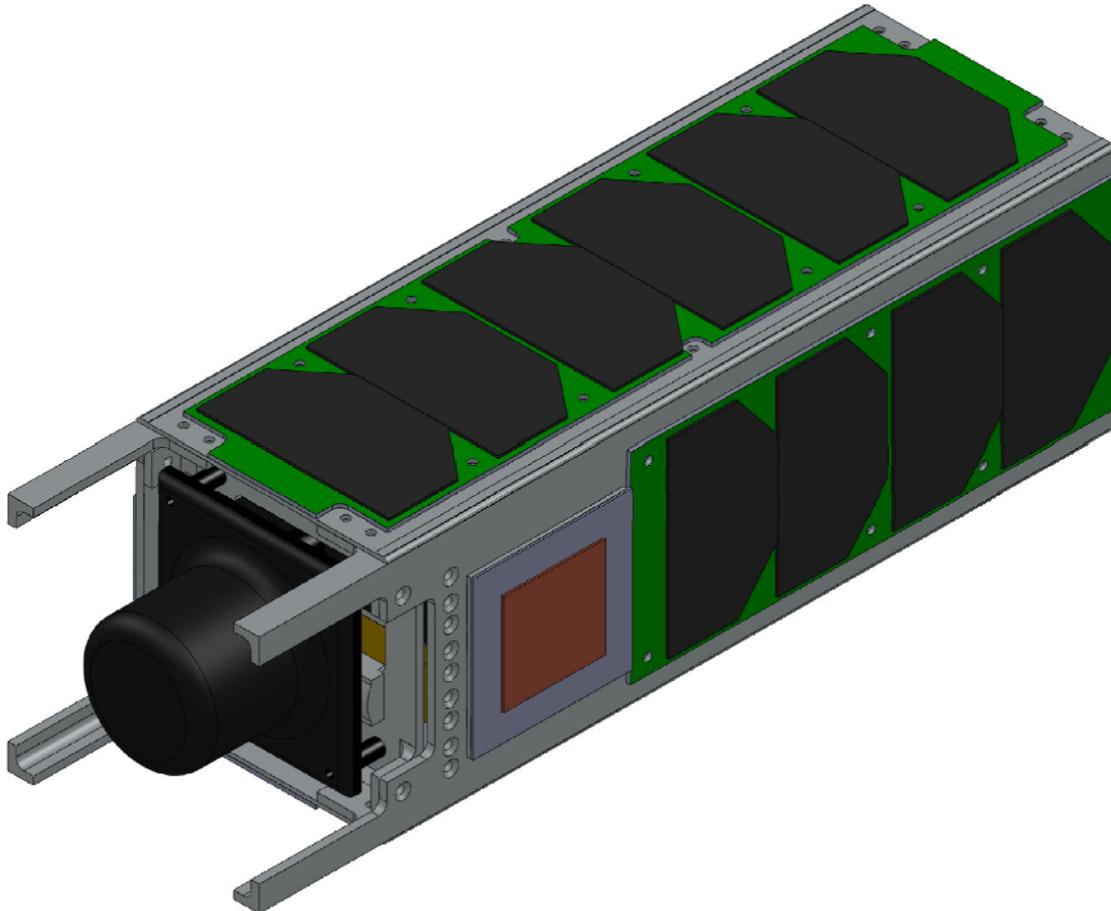
"To Make Right"

University of Hawaii  
Nanosat-6

**Nick Fisher**

August 8<sup>th</sup>, 2010

Logan, Utah





# UH CubeSat Projects

2001



Mea Huaka`i (Voyager)

2003

2005



Ho`okele (Way Finder)

2007

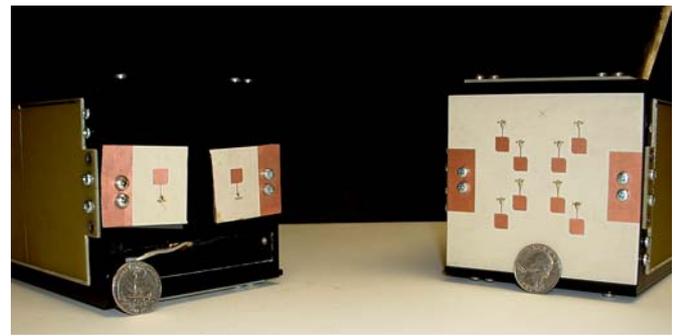


Kumu a`o  
(Source of Learning)

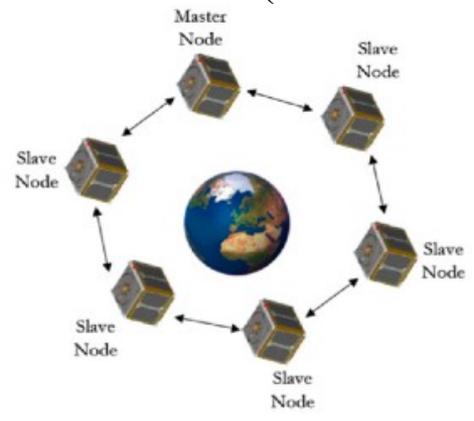
2009



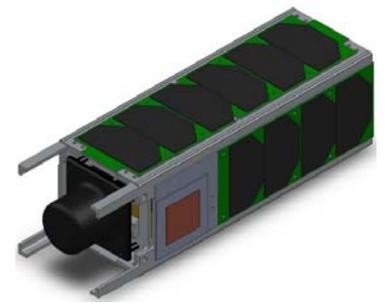
Ho`i Mai  
(To Return)



Hokulua (Twin Stars)



Ho`okia`i (Watchman)



Ho`oponopono  
(To Make Right)

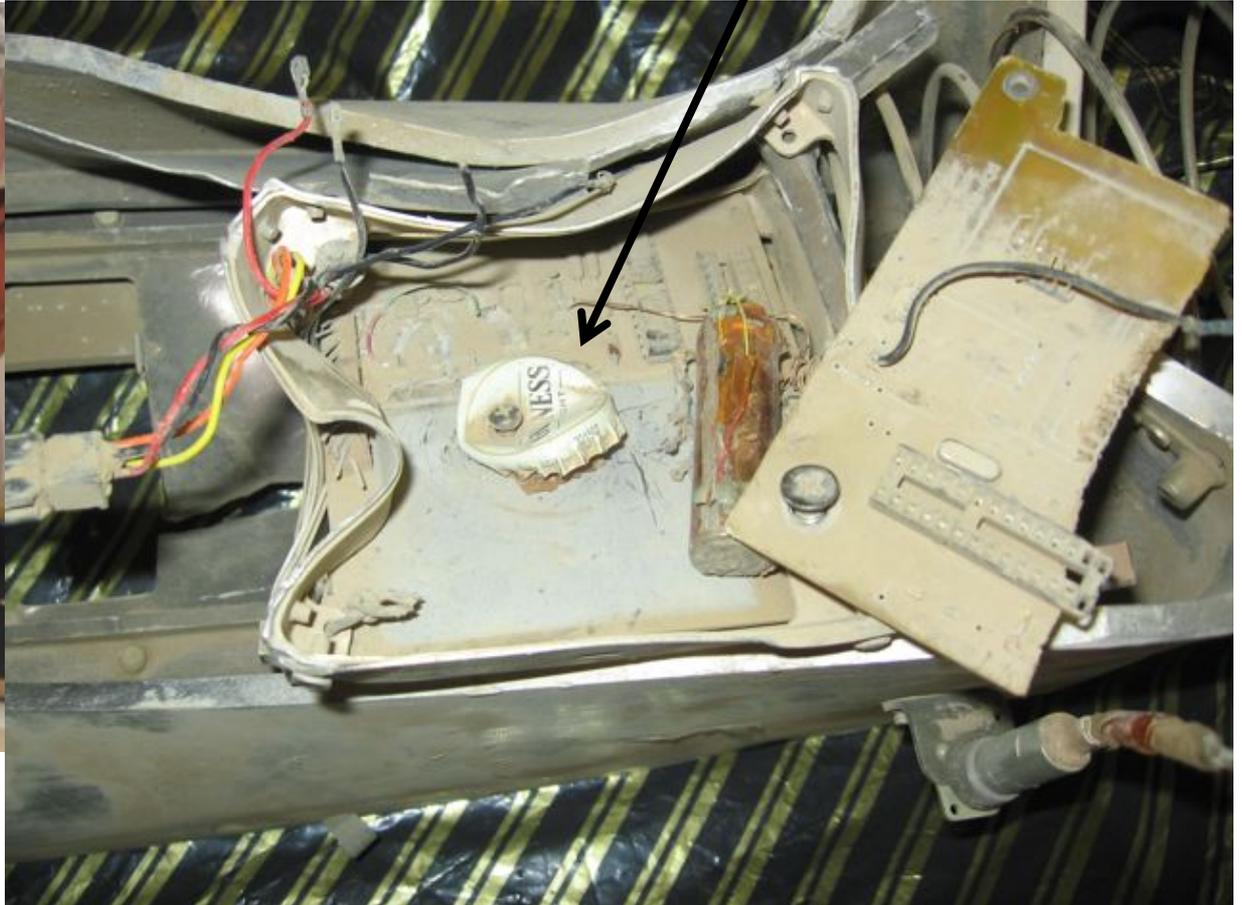
## Program Sponsors





# Surviving the Crash

Guinness...the only way to survive a crash





# Mission Overview

- **Mission**

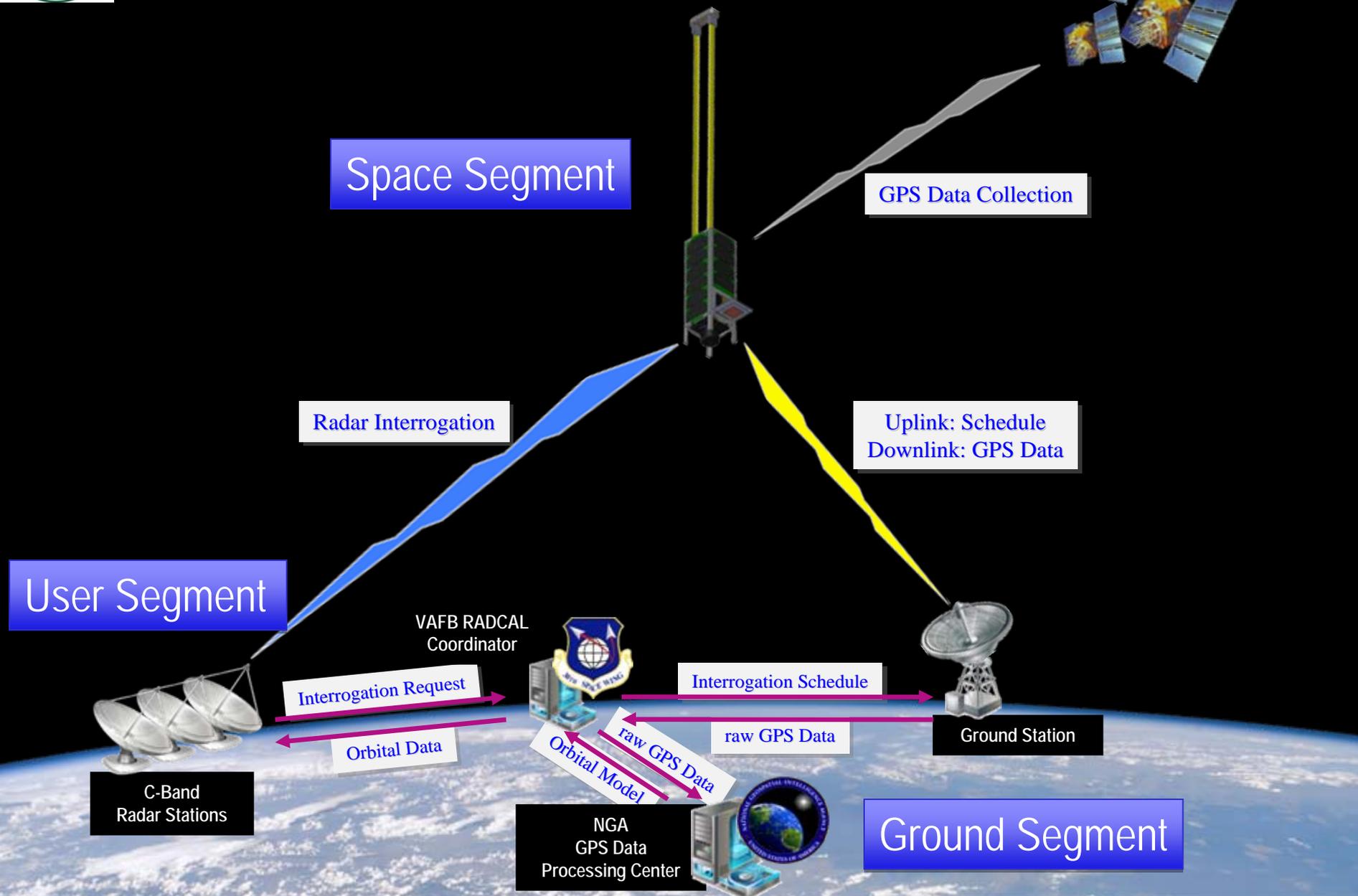
- To provide orbital radar calibration support to the U.S. Air Force by collecting and disseminating ephemeris data in response to radar interrogations

- **Why Radar Calibration?**

- 82 DoD C-band radar systems need calibration
- Range users are currently depending on RADCAL and DMSP-F15 to meet their performance monitoring requirements
- RADCAL (June 1993)
  - 17 years in orbit
  - Usage now restricted to 10%
- DMSP F-15, RADCAL payload (Dec 1999)
  - 6 years beyond its expected life and did not meet accuracy requirements

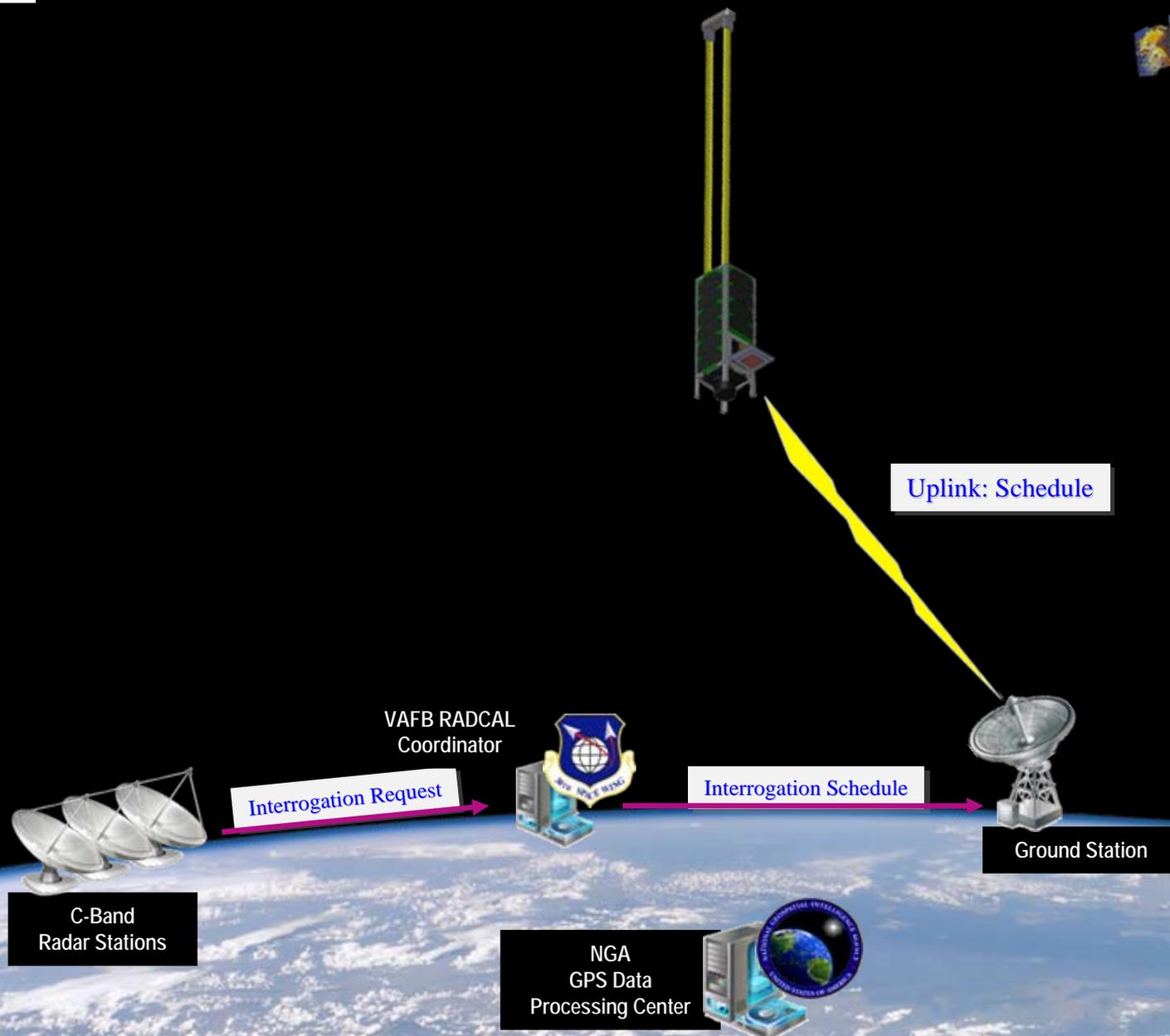
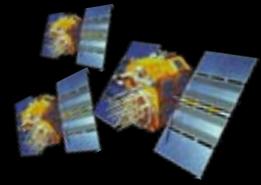


# Mission Operation Diagram



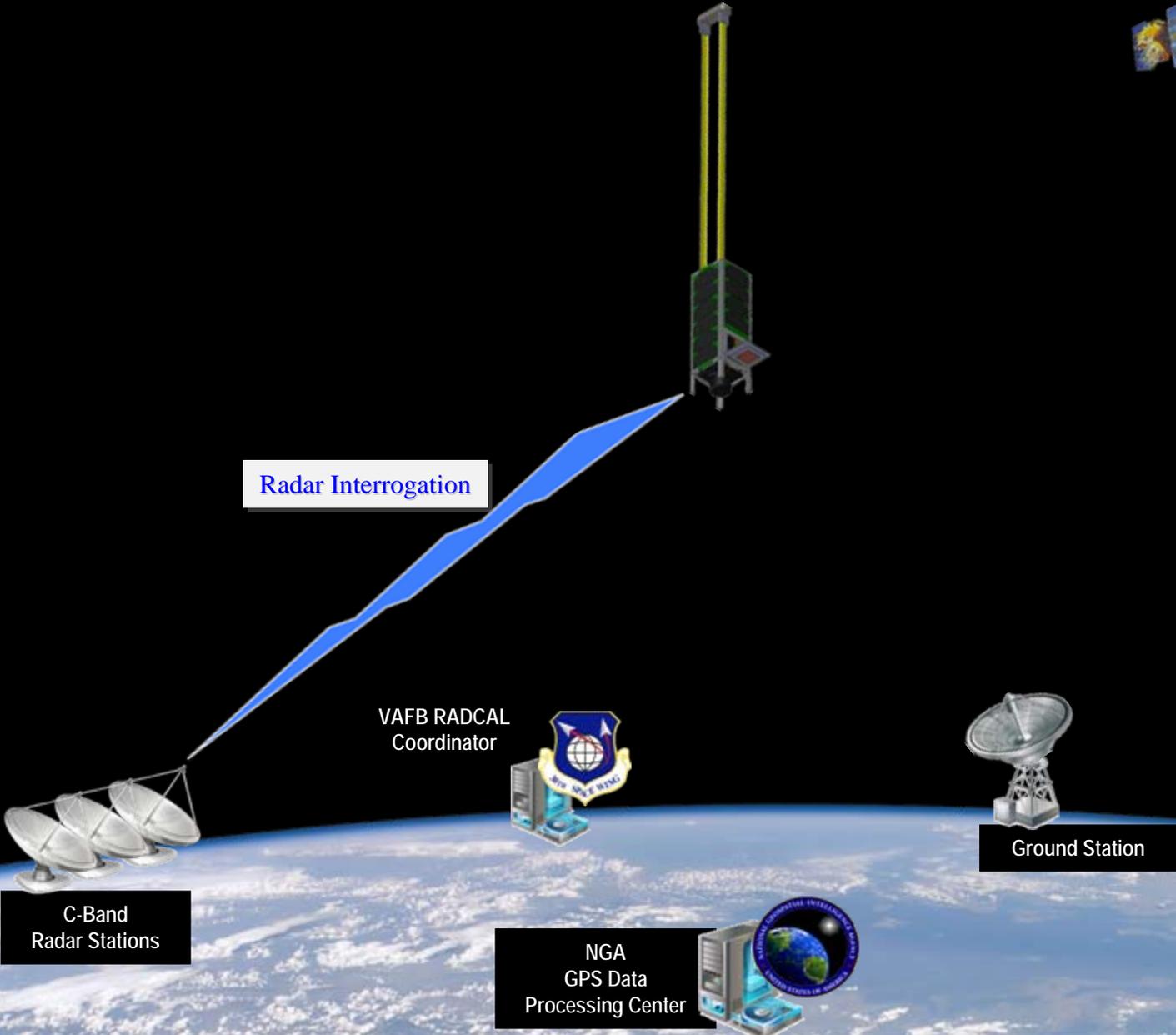
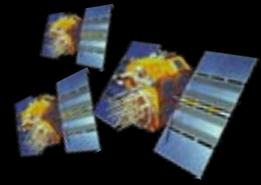


# Mission Operation Diagram



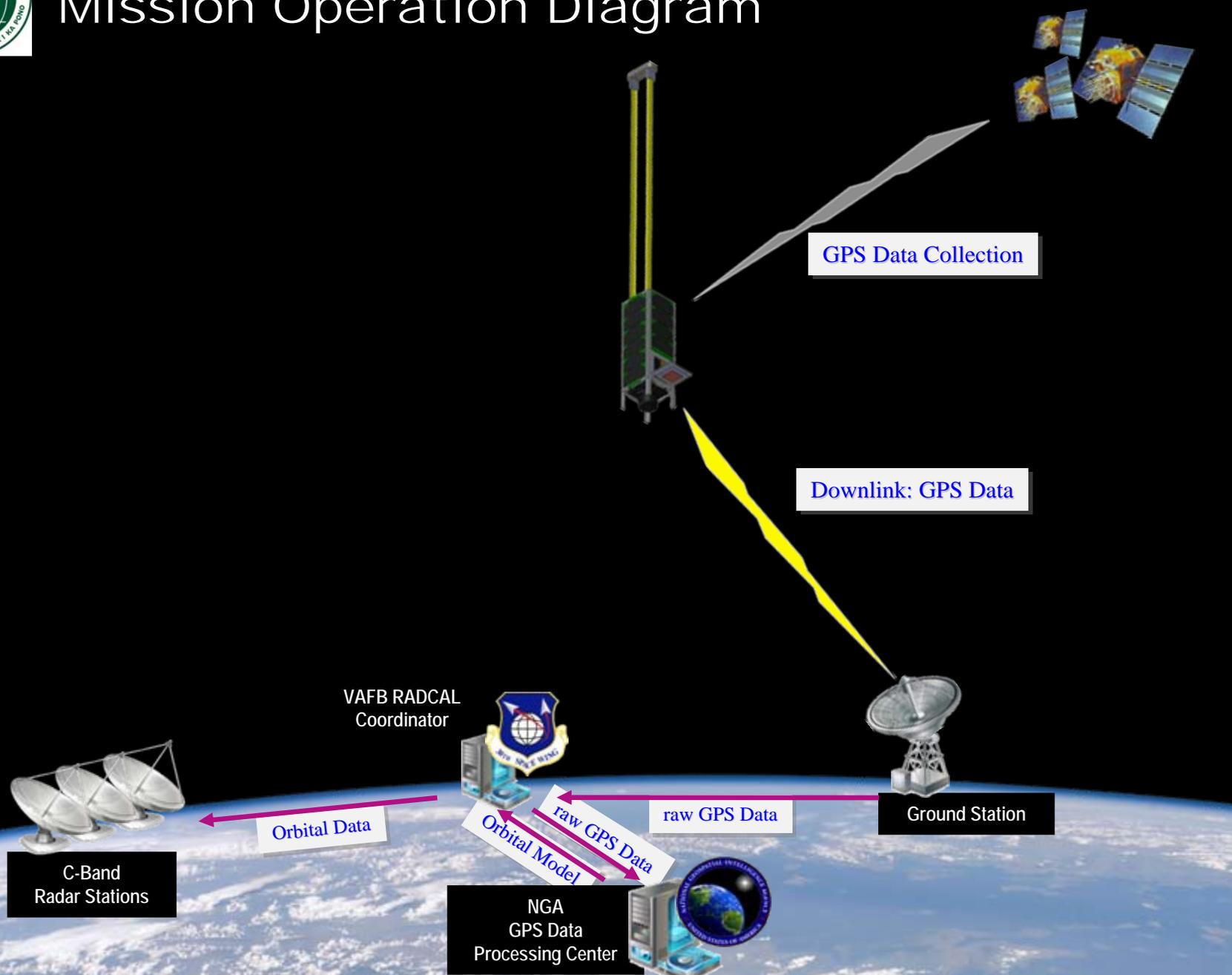


# Mission Operation Diagram





# Mission Operation Diagram



GPS Data Collection

Downlink: GPS Data

VAFB RADCAL Coordinator

C-Band Radar Stations

Orbital Data

raw GPS Data

raw GPS Data

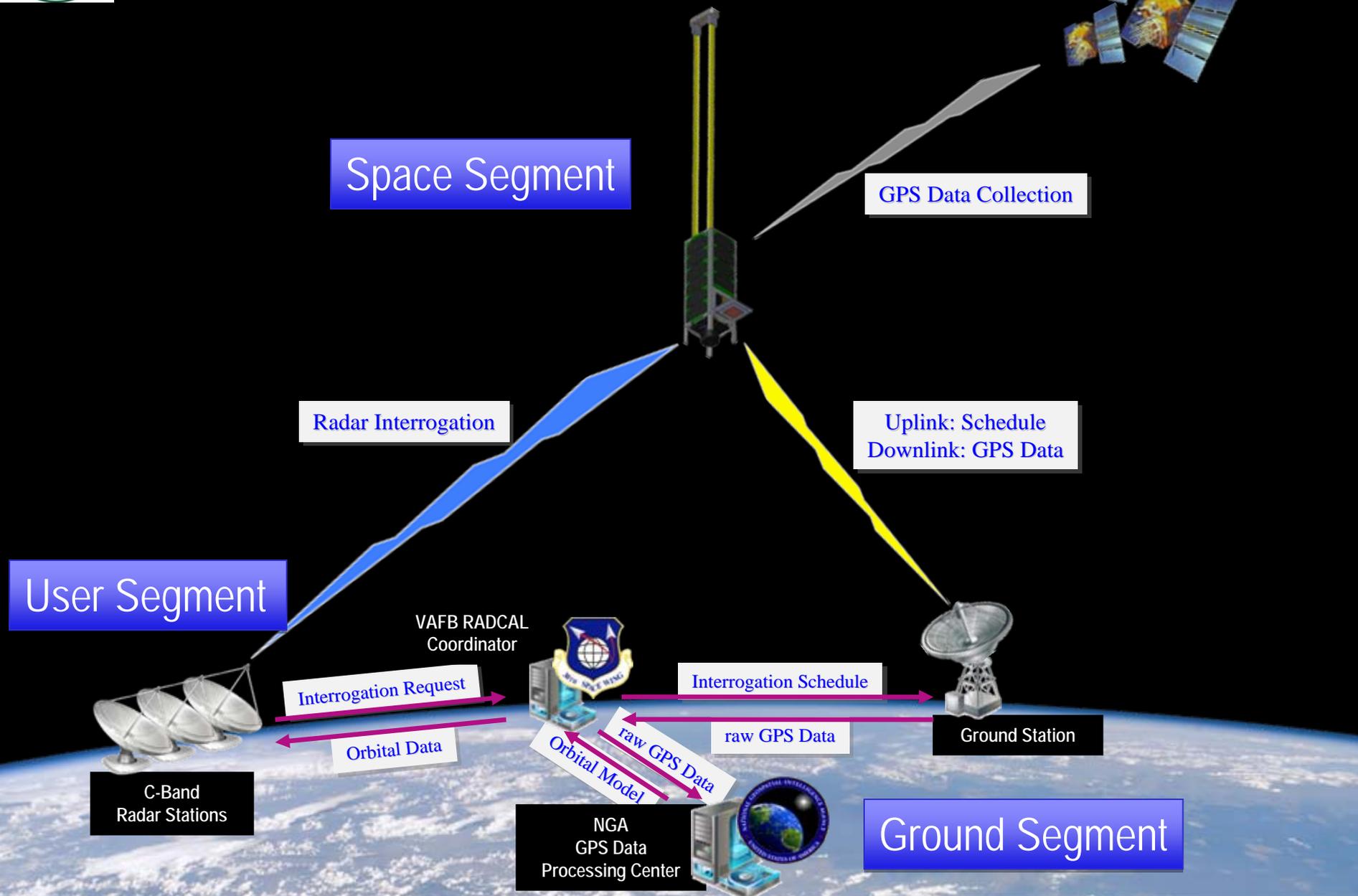
Ground Station

NGA GPS Data Processing Center

Orbital Model



# Mission Operation Diagram



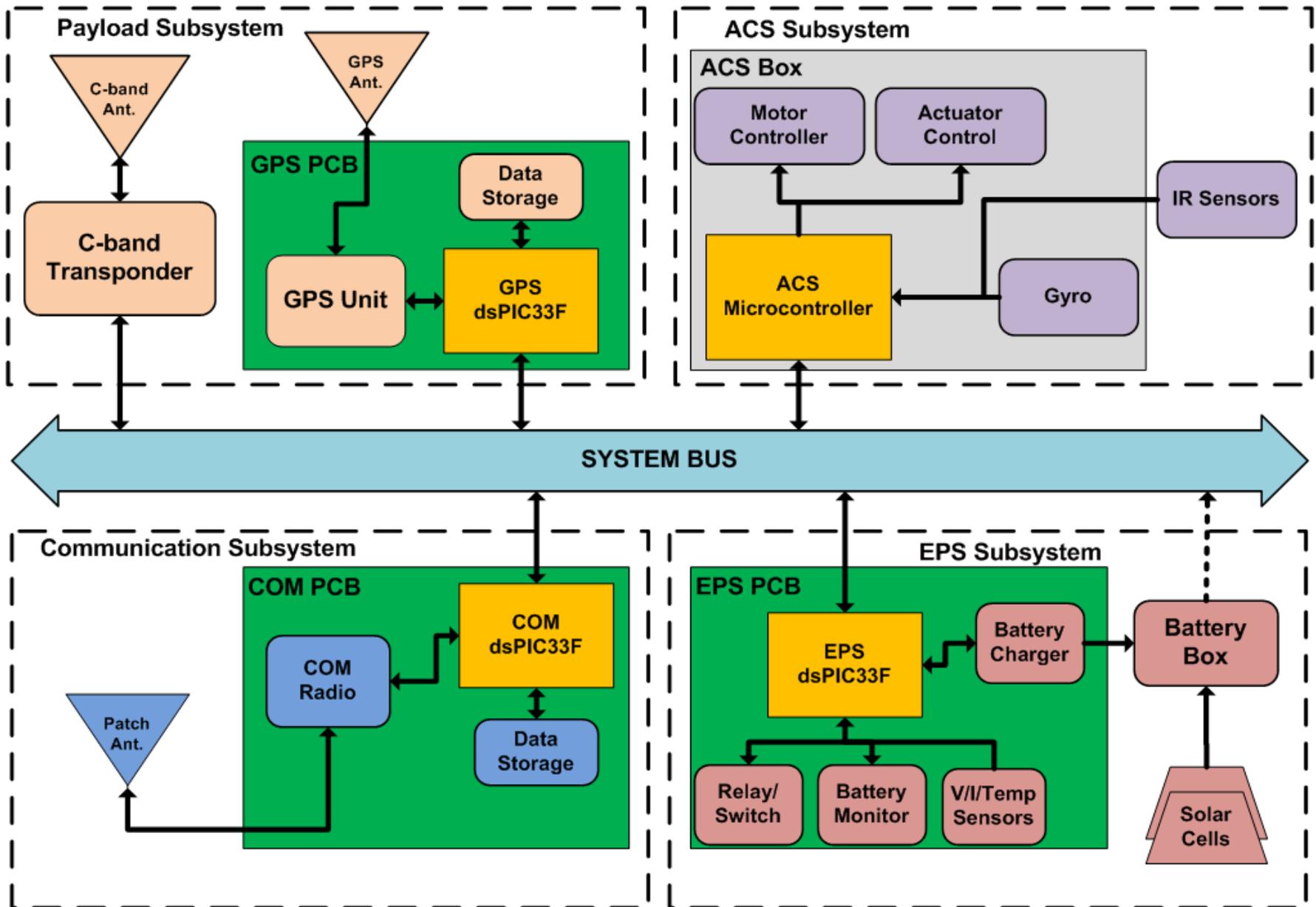


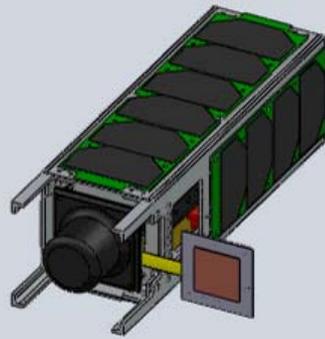
# Mission Success Criteria

- **Nominal success criteria**
  - Demonstrate the collection of accurate (<5m) ephemeris data
  - Provide radar calibration information at an average rate of five radar ranges every day for 1 year
- **Minimum success criteria**
  - Demonstrate the collection of ephemeris data
  - Provide radar calibration information at an average rate of one radar range every week for 1 year



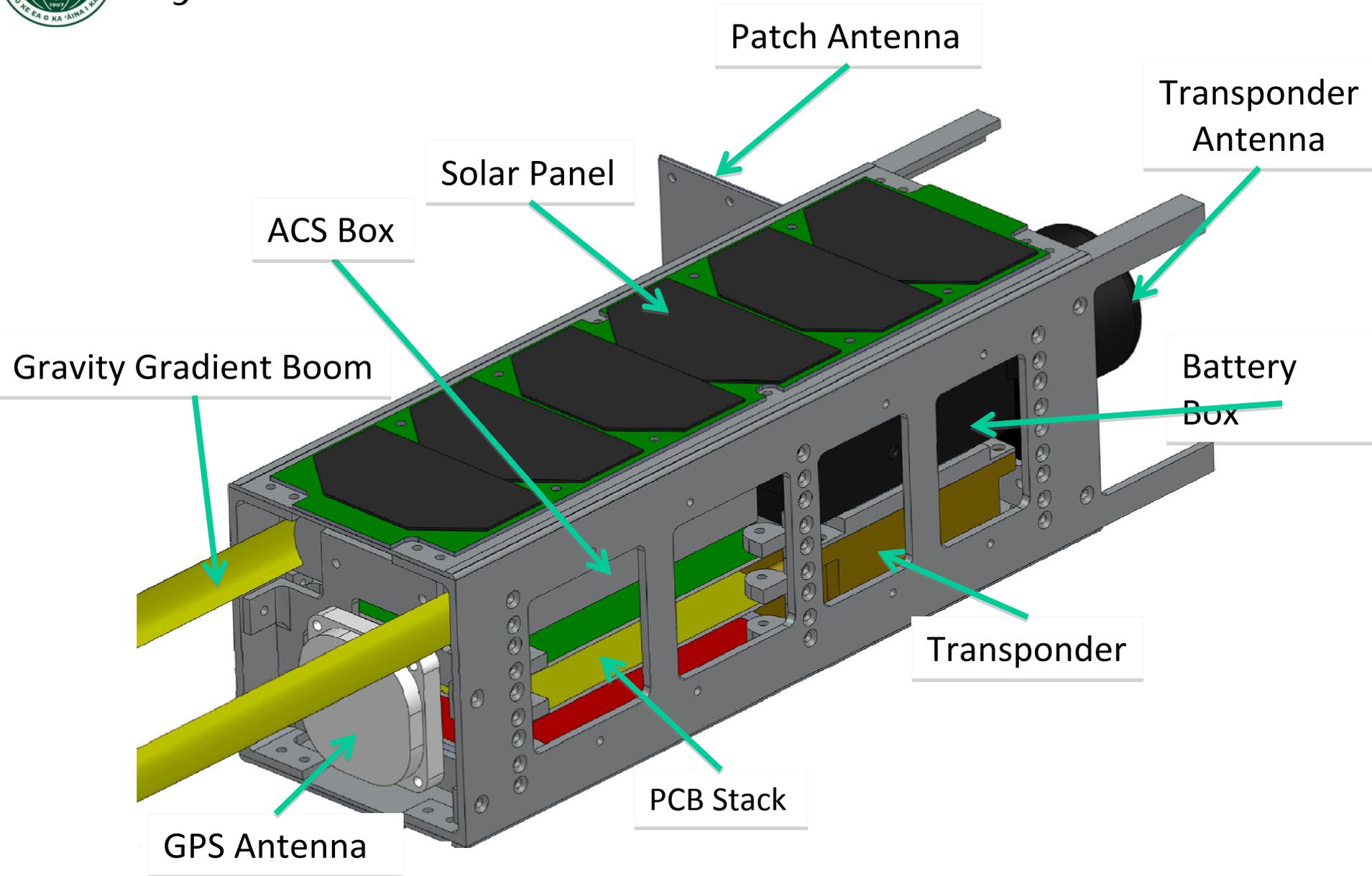
# System Block Diagram





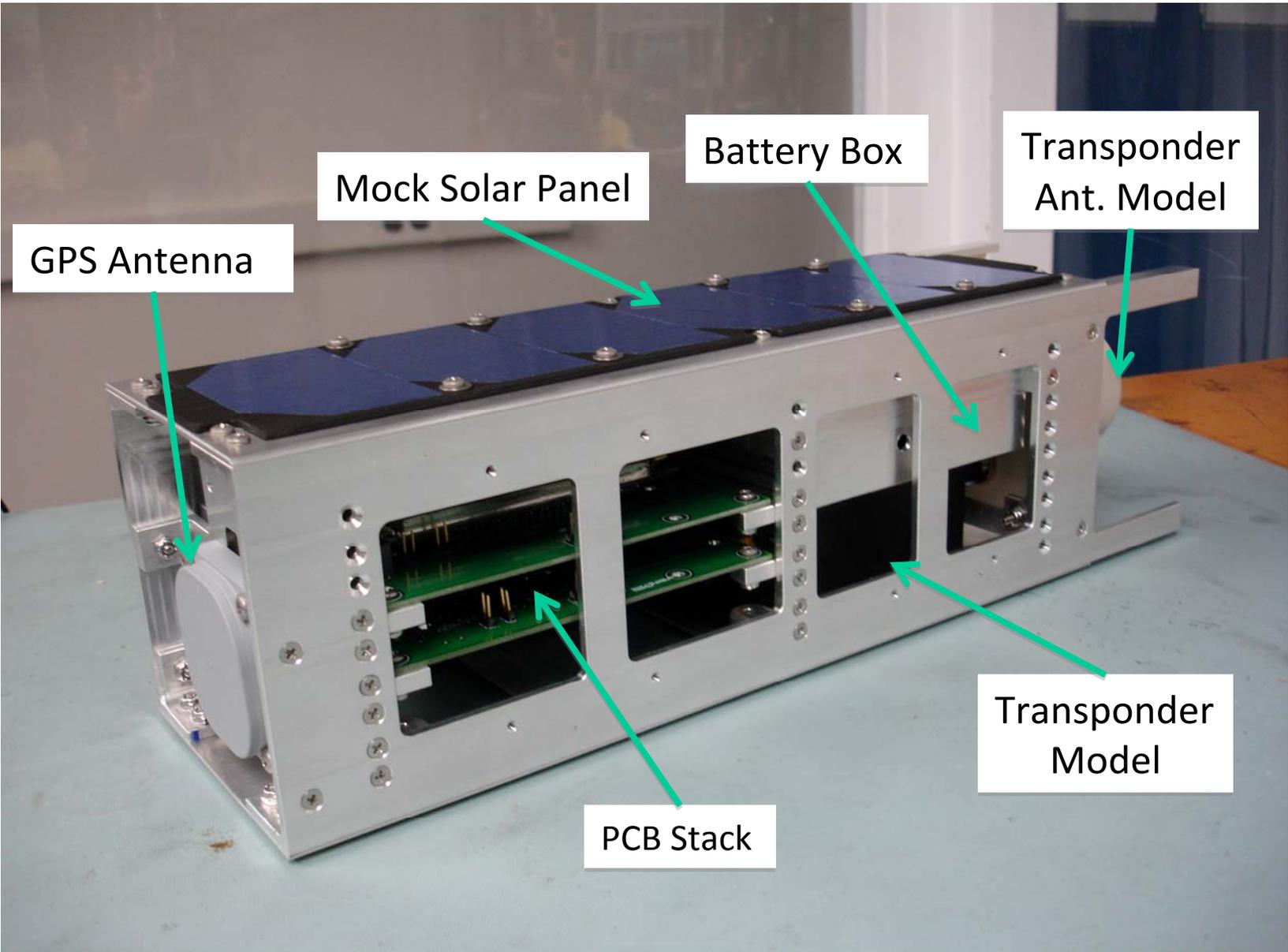


# System Model



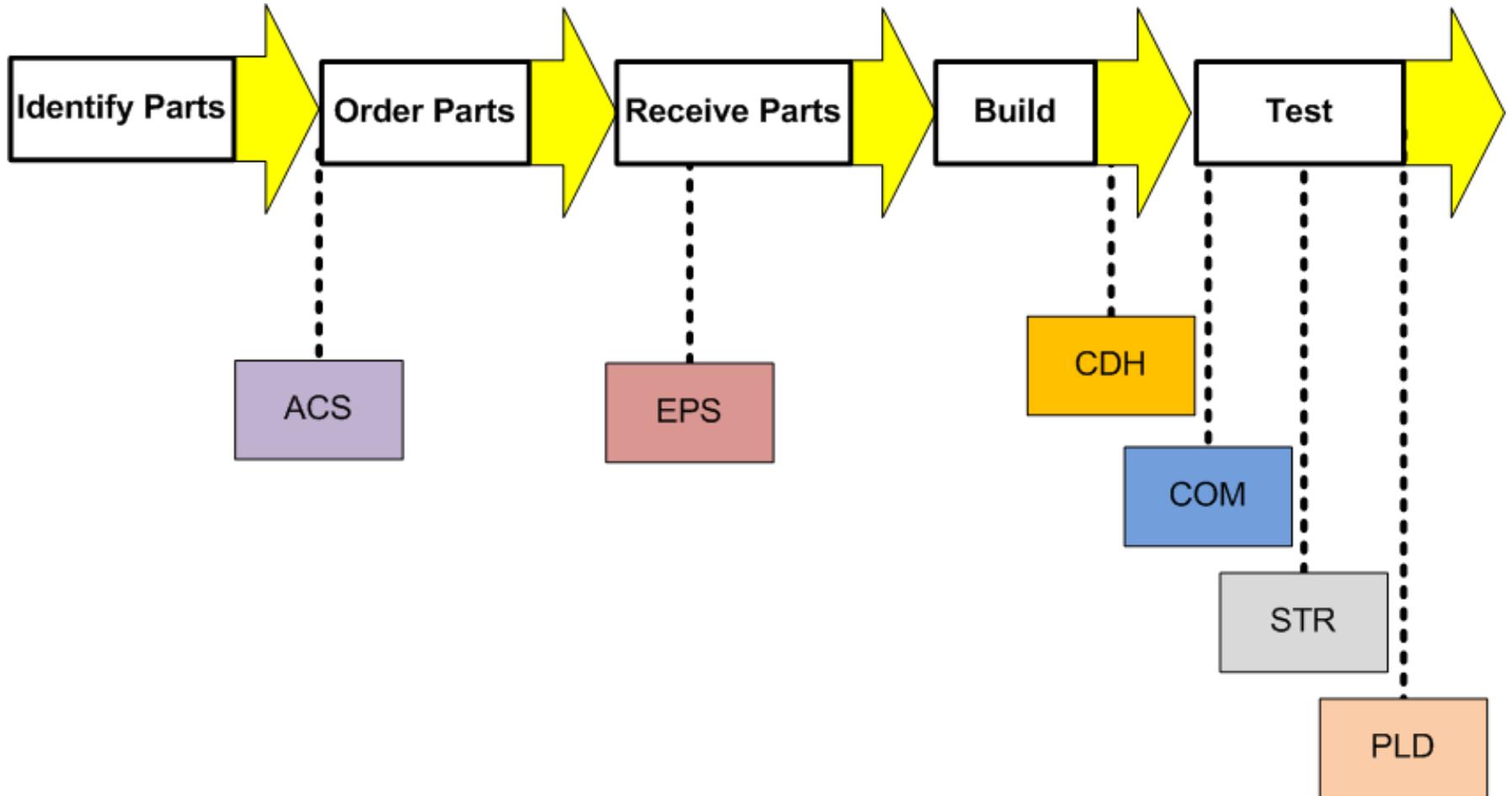


# Build Status: Engineering Design Unit (EDU)





# Build Progress





## Future Work

- UH is proactively working on a solution for RADCAL
- Flight Concept Review is in January 2010
- Further question can be answered at our Smallsat Conference Exhibit



# Small Satellite Conference Exhibit

