Naval Postgraduate School
2009 CubeSat Developers Workshop
California Polytechnic State University

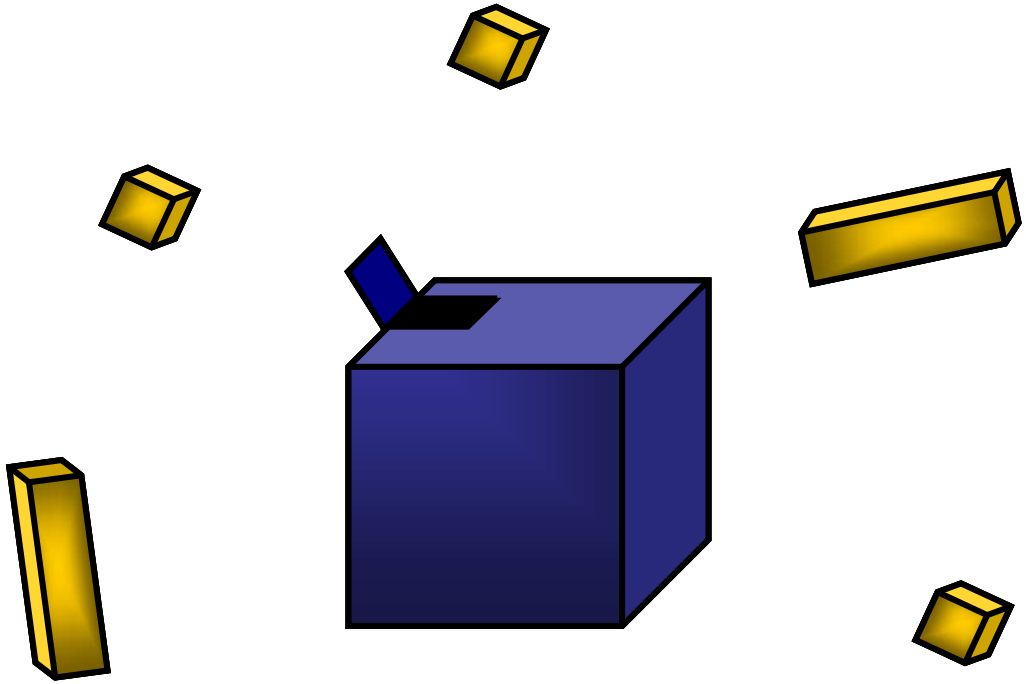
NPS CubeSat Launcher (NPSCuL) Program Update

LCDR Adam "Tito" DeJesus, USN (I&T Manager)

LT Christina Hicks, USN (Program Manager)
LT Matthew Crook, USN (Structural Design)
LTJG Anthony Harris (Sequencer System Design)
Dr. Jim Newman (Professor, Space Systems)

Naval Postgraduate School
Space Systems Academic Group
Monterey, CA 93943

What is “coach class” on a rocket?



NPSCuL

COACH-CLASS

TO ORBIT

What is “coach class” on a rocket?

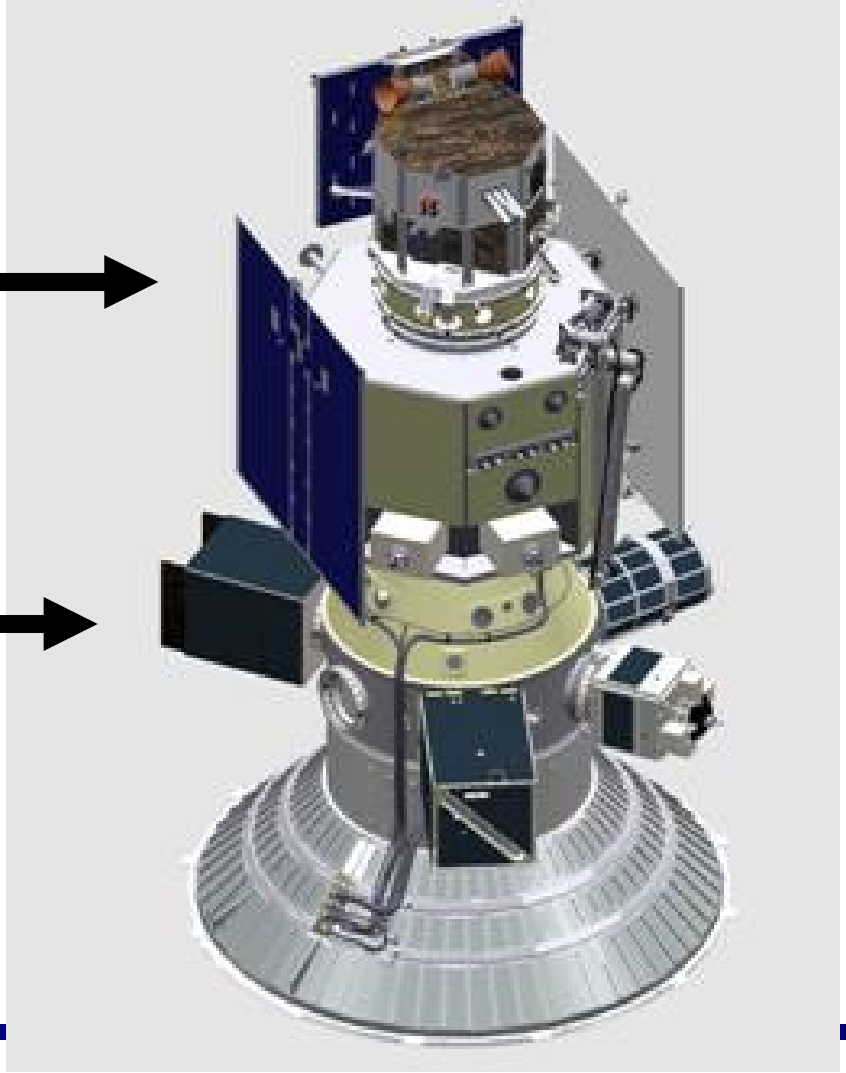
The “airliners” of the US unmanned space program.

What is “coach class” on a rocket?

Seating Arrangement

First Class →

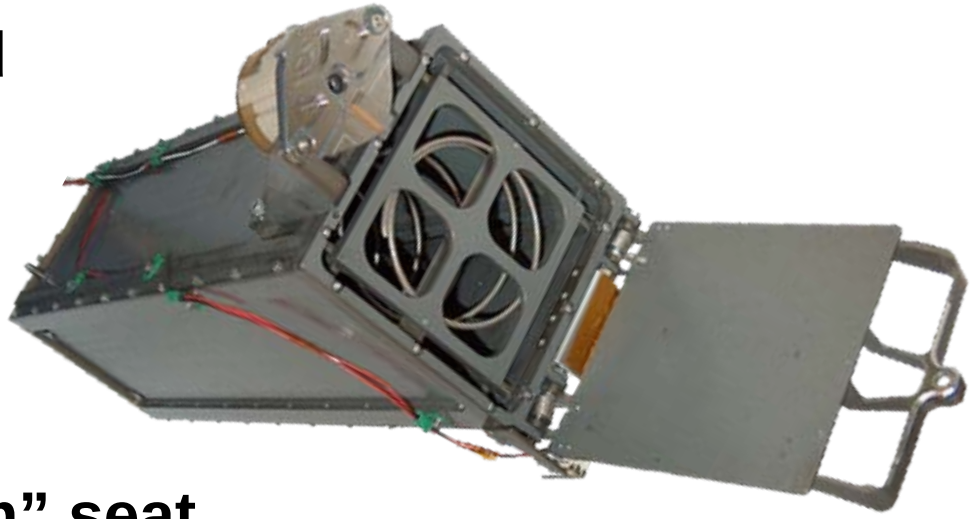
Business Class →



What is “coach class” on a rocket?

The under-served customer

And



The “limited leg-room” seat

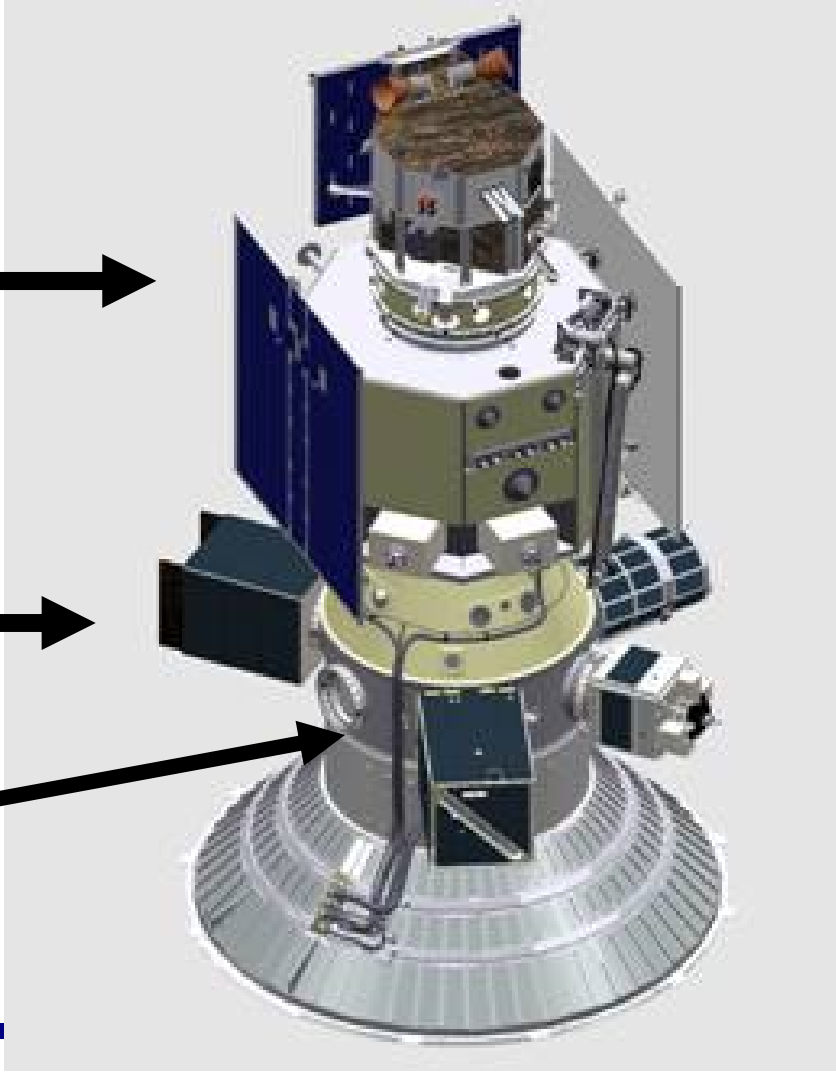
What is “coach class” on a rocket?

Seating Arrangement

First Class

Business Class

Coach Class?



This is the Coach Class Section!

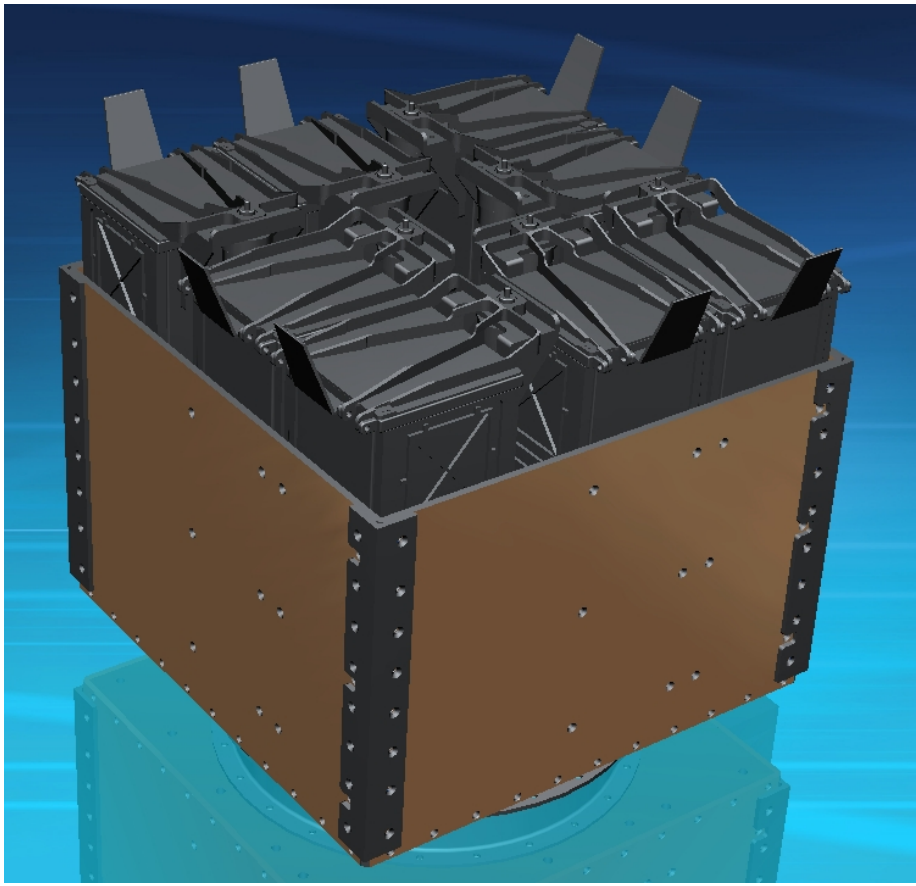
P-PODs packaged as a secondary payload.

-high capacity (24U-50U)

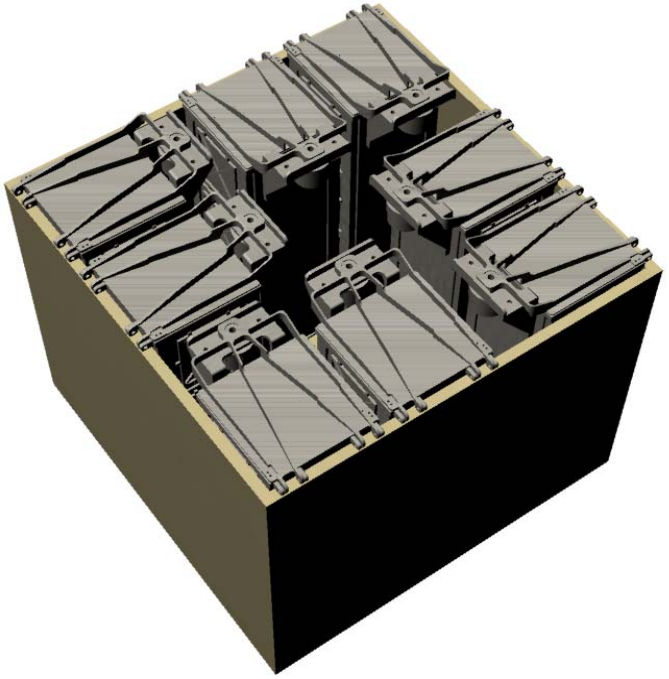
-leverages mature technology

-multi-LV compatible

-low risk to primary payload or other secondary payloads



NPSCuL Design



NPSCuL (10 5U P-PODS)

(ESPA-Compatible)

NPSCuL-Lite (8 3U P-PODS)

(Compatible with ESPA and other, smaller Secondary Payload Adapters)

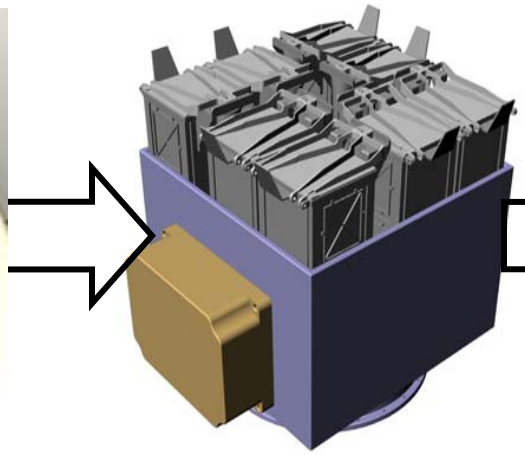
Integration Process

DoD / Government/ University CubeSat Experiments

CubeSats integrated into P-PODS

Finished P-PODs delivered to NPSCuL Integration Site

Integrated P-PODs



P-PODS integrated into NPSCuL structure

Finished NPSCuL delivered to Space Vehicle Integration Site

Space Test Program

(or other launch provider)

Space Vehicle Integration and flight preparation

Launch!

NPSCuL-LITE Test Program

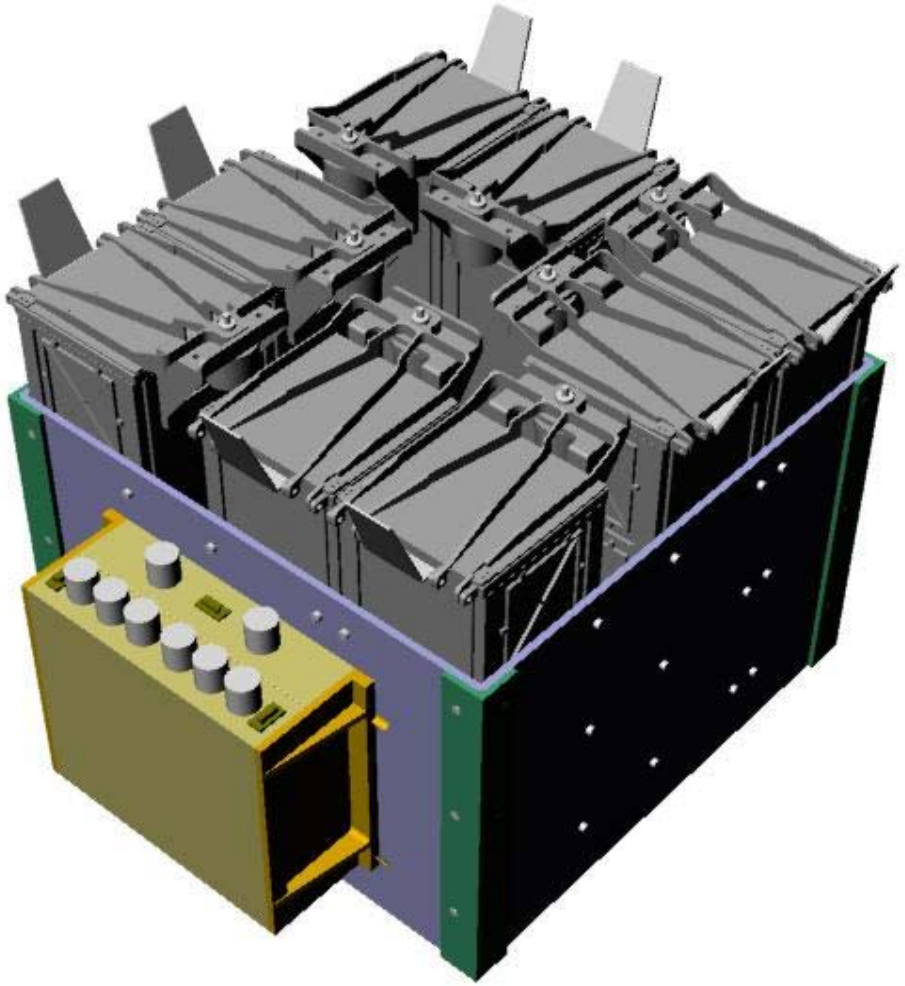
Structure Qualification

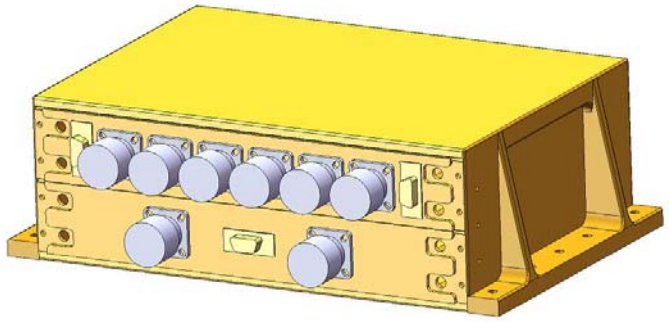
- Launch environments +6dB using Mass Models to simulate loaded P-PODs
- Must accommodate minimum expected CubeSat mass (1 kg/U)
- NPS will perform all structural tests

Functional Developmental Testing

- On-board electronics fire the deployment systems in sequence
- Currently in development by a launch provider
- NPS to develop mission specific electrical harnesses

Sequencer Design





Requirements:

- **28V power from LV**
- **RS-422 programming interface**
- **8-channel redundant output**

Program Progress To Date

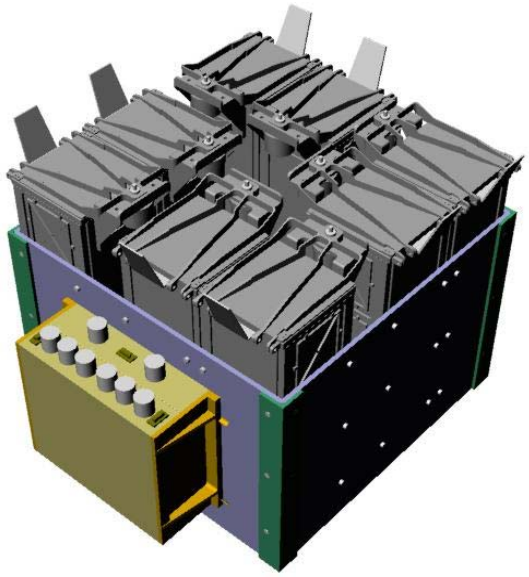
NPSCuL-Lite

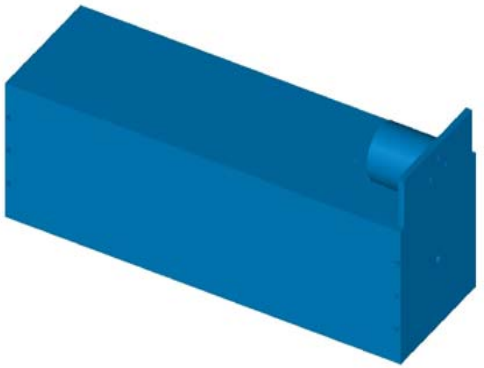
- Qualification Test structure produced and assembled.
- Mass model of sequencer unit has been integrated
- Structural and TVAC testing to begin shortly.

P-POD Mass Models

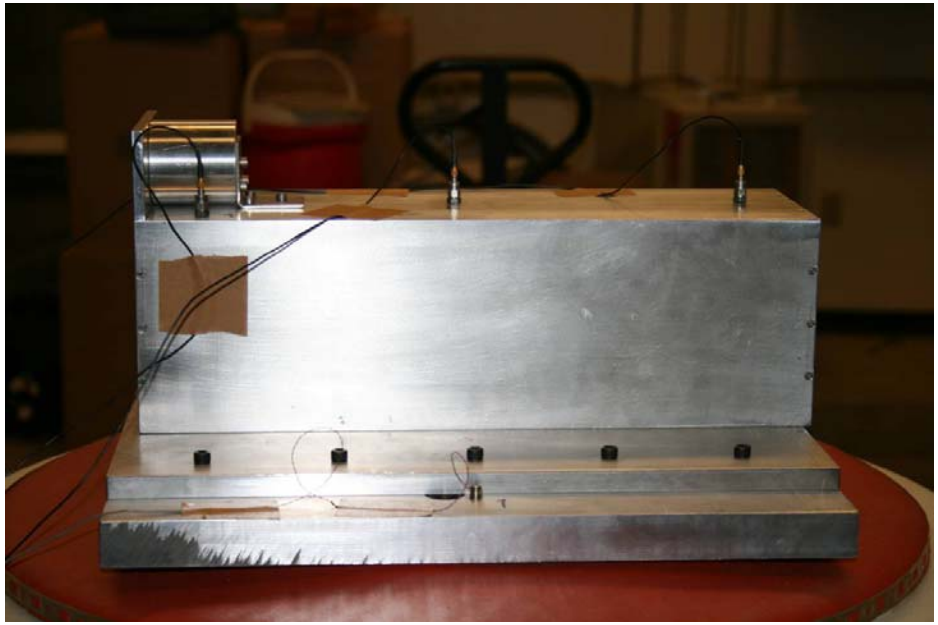
- 9 units produced
- design went through a thorough qualification test battery

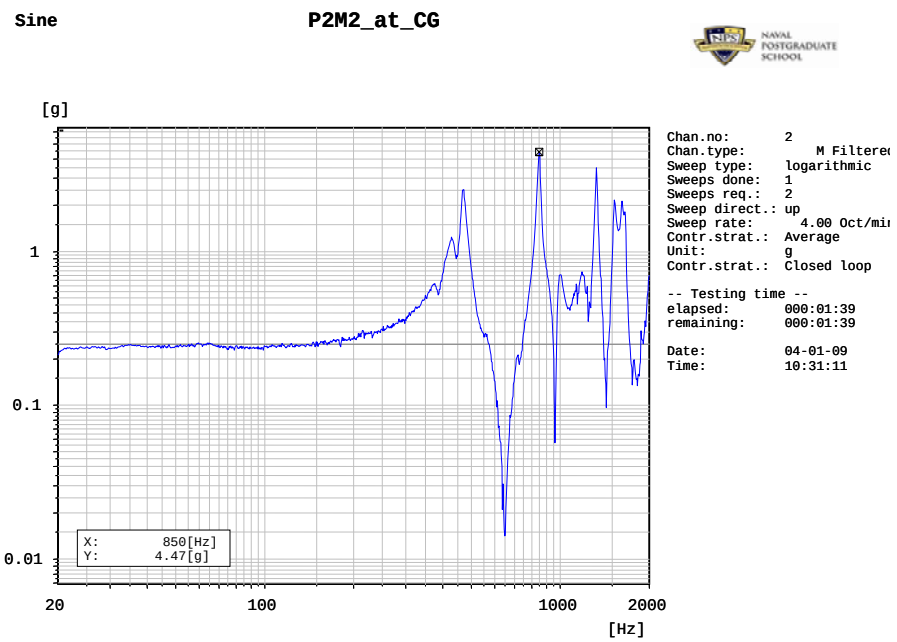
Sequencer – development by industry is underway.





Program Progress To Date





P-POD Mass Model Structural Test at NPS Vibration Test Facility, Monterey, CA

Future of NPSCuL/NPSCuL-Lite

Potential flight opportunity exists in 2010. To support this opportunity:

- Flight Article Build – through DEC 2009
- Harness Design and Build – through JAN 2010
- Acceptance Test– no later than March 2010
  - Requires sequencer and 8 integrated, flight-ready P-PODs
- Launch Vehicle Integration – April 2010
- 1st Launch – August 2010

2nd Flight Opportunity

- Possible slot on an ESPA ring expected in 2012
- NPS will seek to fill any unfilled slots with payloads from University developers

Questions?

NPSCuL Contacts

- ***Principal Investigators:***
  Dr. Jim Newman
  Professor, Space Systems Academic Group, NPS
  (831) 656-2487
  jhnewman@nps.edu

  Dr. Rudy Panholzer
  Chairman, SSAG, NPS
  (831) 656-2154
  rpanholzer@nps.edu

  Mr. Dan Sakoda
  Research Associate, SSAG, NPS
  dsakoda@nps.edu

- ***Project Manager:***
  LT Christina Hicks
  cmhicks@nps.edu