



Naval Postgraduate School

NPS 2B: ESPA-Compatible, Multiple Cubesat/P-POD
Launcher System

A Path to ESPA-Class Multiple
Cubesats/P-PODs

Concept Overview



Space Systems Academic Group
777 Dyer Rd., Code (SP)
Monterey, CA 93943

CAL POLY

CUBESAT



Genesis

- STP-1 Mission: one empty slot
- NPSAT1 Mass Simulator
 - Built & flown in lieu of NPSAT1
 - Non-functional ballast





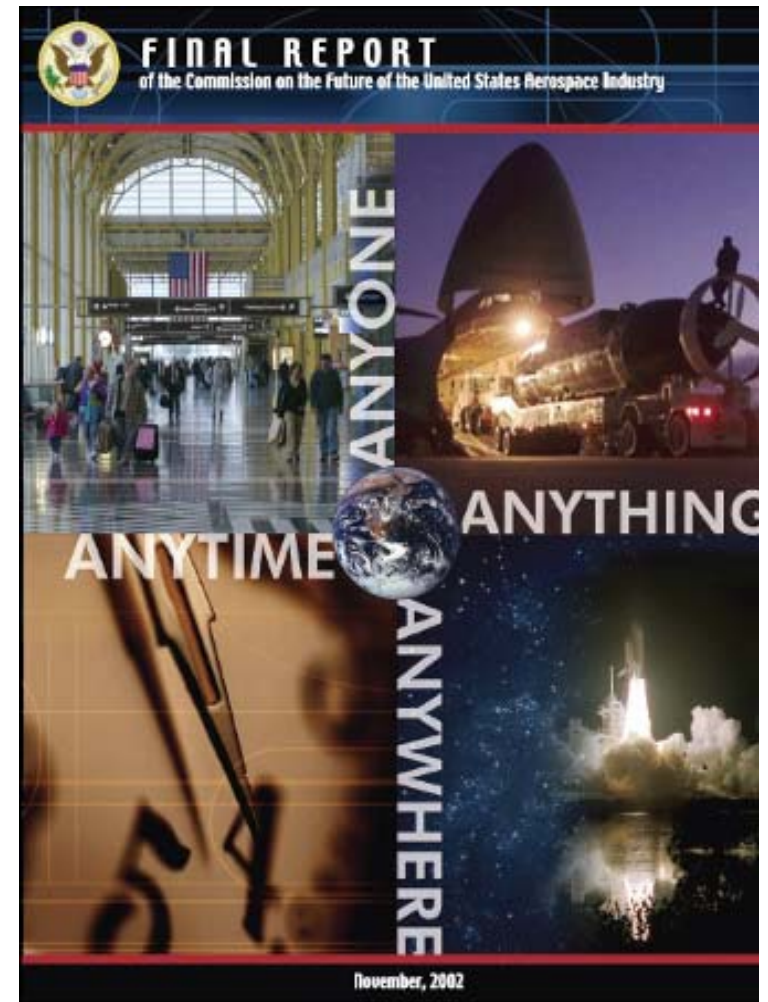
Genesis

- Future ESPA carrier missions
 - Potential for many ESPA payloads
 - 30 (est.) between FY09-FY13
 - April 09 opportunity on Minotaur
- Vibrant university cubesat development community
- Lack of (U.S.) launch opportunities



Objectives

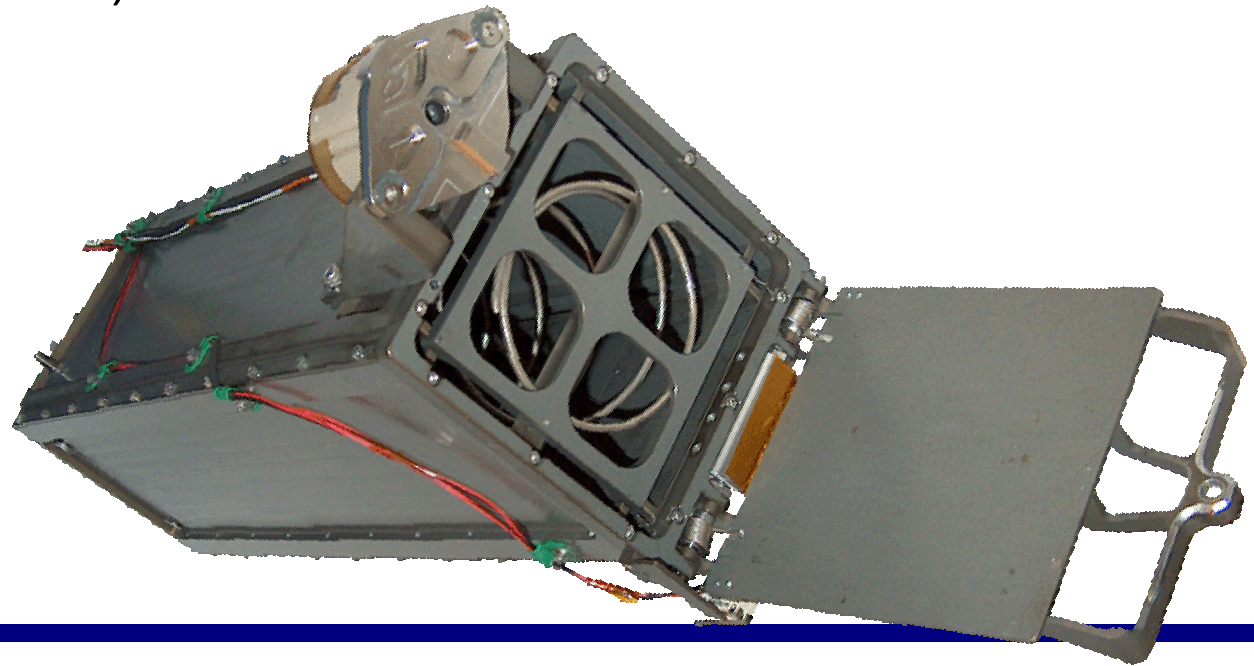
- Provide a launcher capability to meet objectives of:
 - NPS Space Systems Education
 - Small (pico-) satellite development
 - Shorter development cycle
 - Technology innovations for DOD
 - Exploit creative minds in higher education
 - Advance S&T for spacecraft technology (flight demonstrations)
 - Addressing the emerging crisis of aerospace work force
 - DOD / Gov't aerospace professionals
 - U.S. international competitiveness
 - 'Graying' aerospace work force





Concept

- Utilize existing standards and processes
 - ESPA carrier interface
 - Cal Poly Cubesat organization
 - Broker for university satellites
 - Standards for Cubesat and Poly-Picosatellite Orbital Dispenser (PPOD)

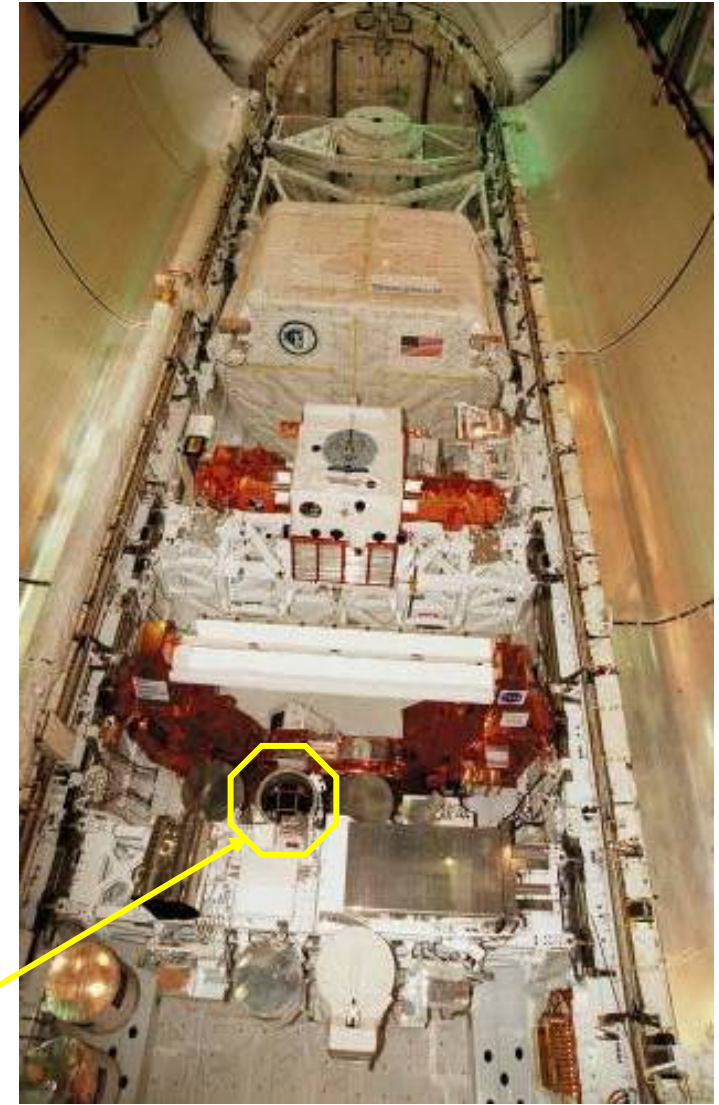




Concept (cont'd.)

- Utilize existing standards and processes (cont'd.)
 - Space Test Program
 - Established process for DOD space flight experiments
 - DOD sponsor for space flight = NPS
- Build on NPS expertise
 - Officer student involvement (directed study / thesis research)
 - Potential for direct tie-in with curriculum (e.g., integration & test)
 - Space flight hardware development
 - STP process

PANSAT
(STS-95, Oct. '98)





Concept

University Space
Flight Experiments

DOD / NASA
Cubesat Experiments

Cal Poly
Cubesat
Program



Space Test Program



University Space
Flight Experiments

Multiple Cubesat/P-
POD Launcher

- Integration
- Test
- Payload Processing

Integration & Launch

Photo: <http://exploration.grc.nasa.gov/education/rocket/gallery/atlas/atlas1.html>



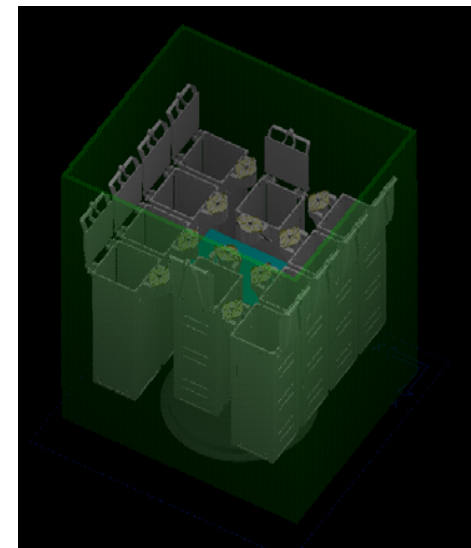


Requirements

- Programmatic Requirements
 - Cal Poly as broker for university cubesats
 - Completion of survey form
 - Mission: description, objectives, schedule, etc.
 - Technical: mechanical, electrical, orbital, safety, etc.
 - ESPA-compatible payload flight request to STP
 - Brief to Navy SERB (June/July '07)
 - Follow-on brief to Tri-Service SERB
 - Earliest launch target: FY09



ESPA Ring

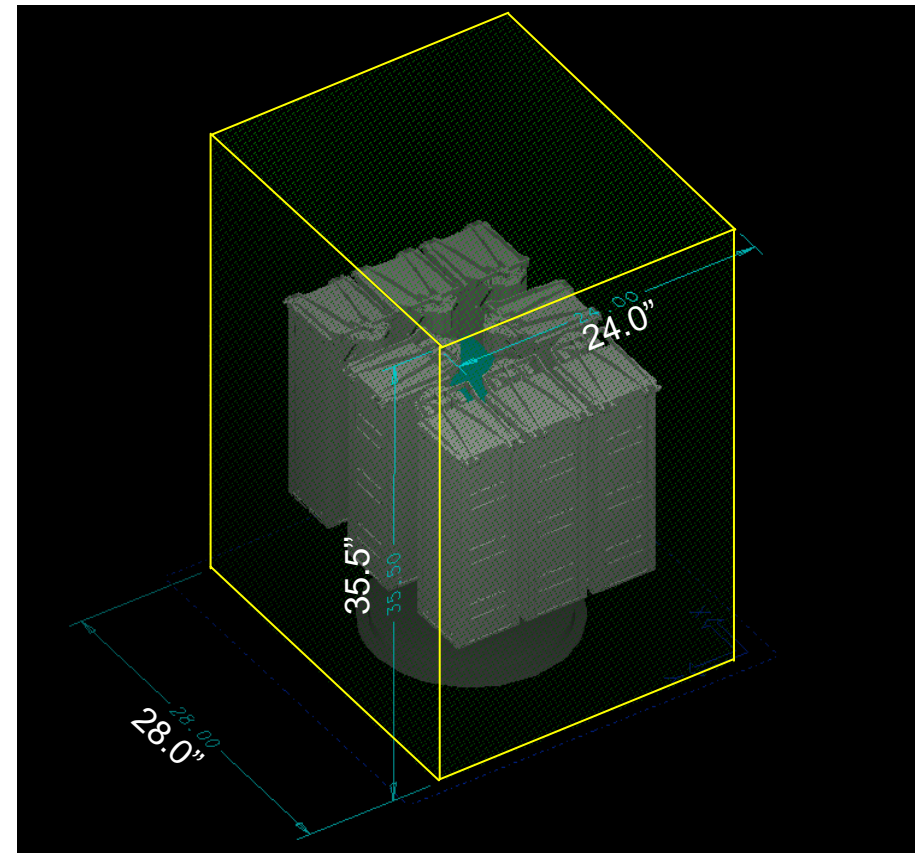


Notional concept of
launcher
(10 P-PODs)



Requirements

- Technical Requirements
 - Integrate multiple P-PODs
 - Maximize cubesats
 - Be ESPA-compatible (mechanical / electrical)
 - Meet all safety requirements
 - Ease manufacturability
 - Implement certification & verification program
 - Allow experimenter access up to final assembly and ESPA integration
 - Reconfigurable: (ESPA-class functional mass simulator)



Notional concept of launcher (8 P-PODs) within ESPA payload envelope



Questions?