RocketPod™ Update

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Ecliptic Enterprises Corporation
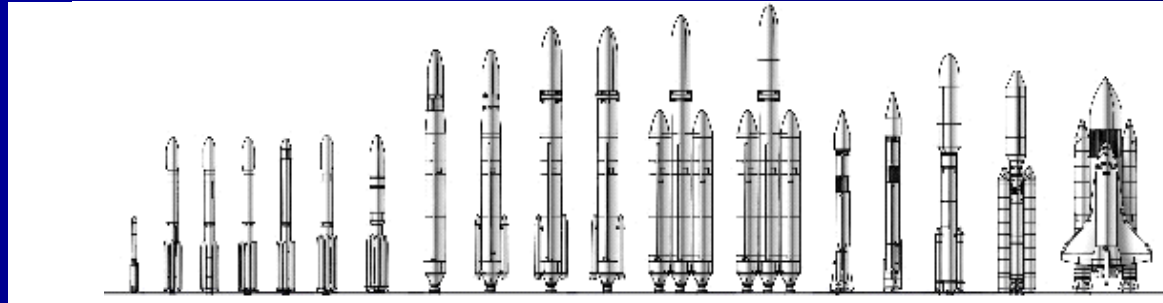**Pasadena, CA**

2006 Aug 12-13   **CubeSat Workshop**   **Utah State University**

Flagship Product: RocketCam™

RocketCam™ is Qualified for These Systems, Plus Several Spacecraft and Other Platforms

MER A "Spirit"
2003

SpaceShipOne
2002-2004

Shuttle *Discovery*
2005

RocketCam Space Heritage

- **Launched on 41 projects since 1997**
  - 29 rockets to orbit (61 cameras)
  - 11 suborbital launches (20)
  - 1 spacecraft (1)
- **All relatively simple integrations**
- **All relatively low cost**
- **All successful**
- **Many more to come**

ECLIPTIC

RocketPod™ Objectives

- **Leverage RocketCam interfaces and experience**
- **Create cost-effective nanosat launch <u>program</u>**
- **Address selected responsive space objectives**
  - U.S. ELVs (multiple families and models)
  - Predictable and reliable launch opportunities
  - <<1-year integration time (<1 week for selected payloads?)
  - Multiple launch opportunities on a single launch
- **Enable multi-mission capability**
  - Tech demo and operational
  - Deployable and attached payloads
  - Varied orbits (or suborbital)
- **Migration path to spacecraft host platforms**

RocketCam to RocketPod
(Delta II example)
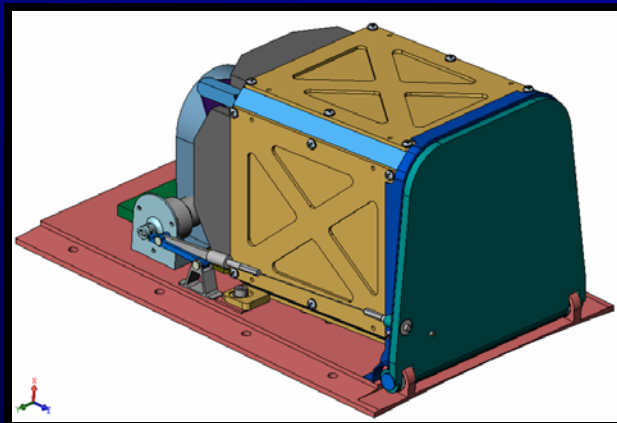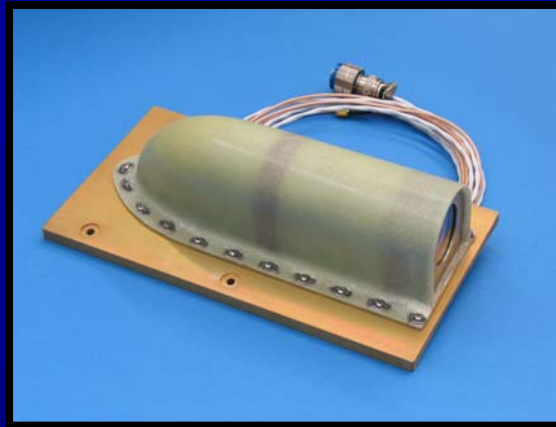
RocketPod Integration
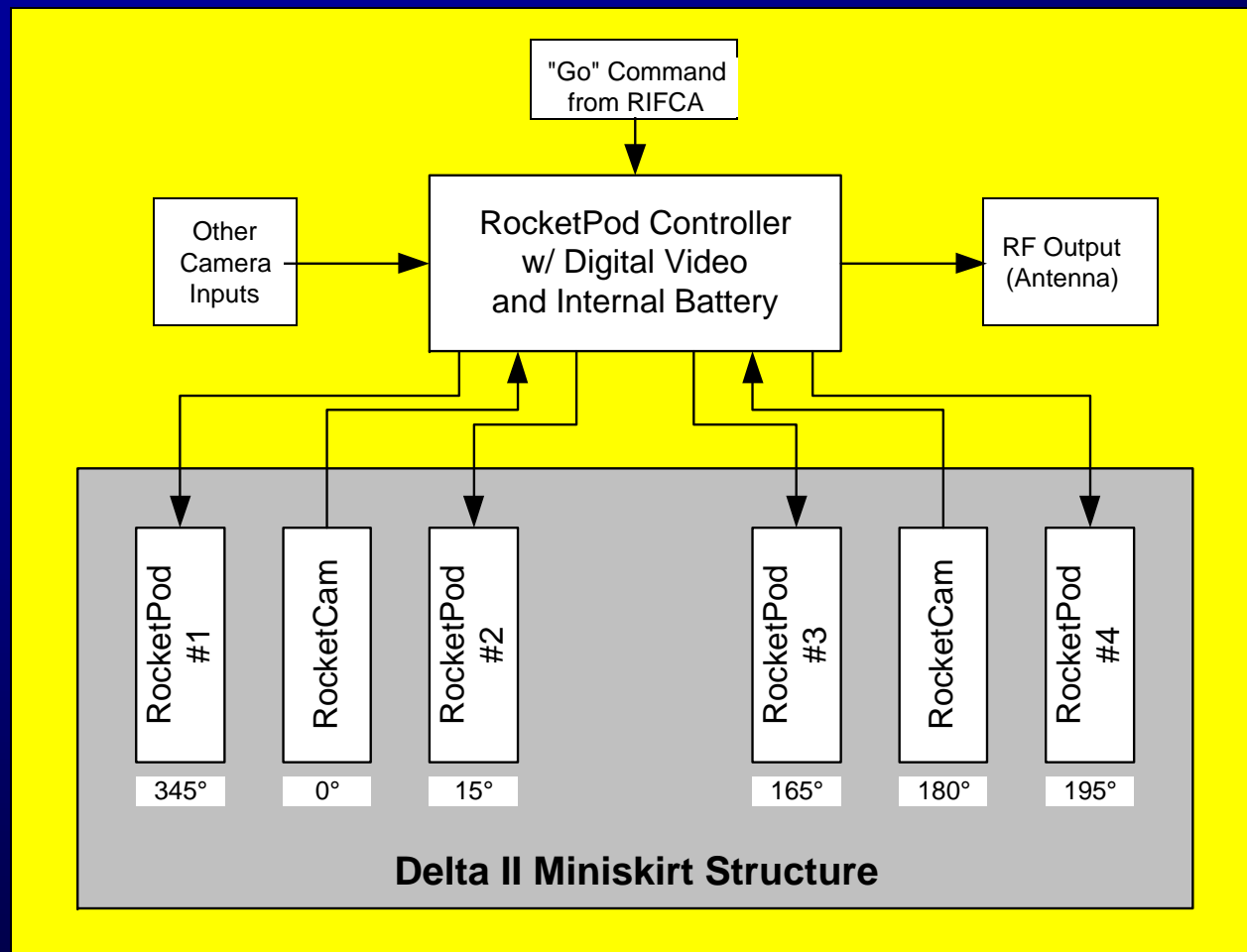## (Delta II example)

RocketPod and
RocketCam

Control Avionics
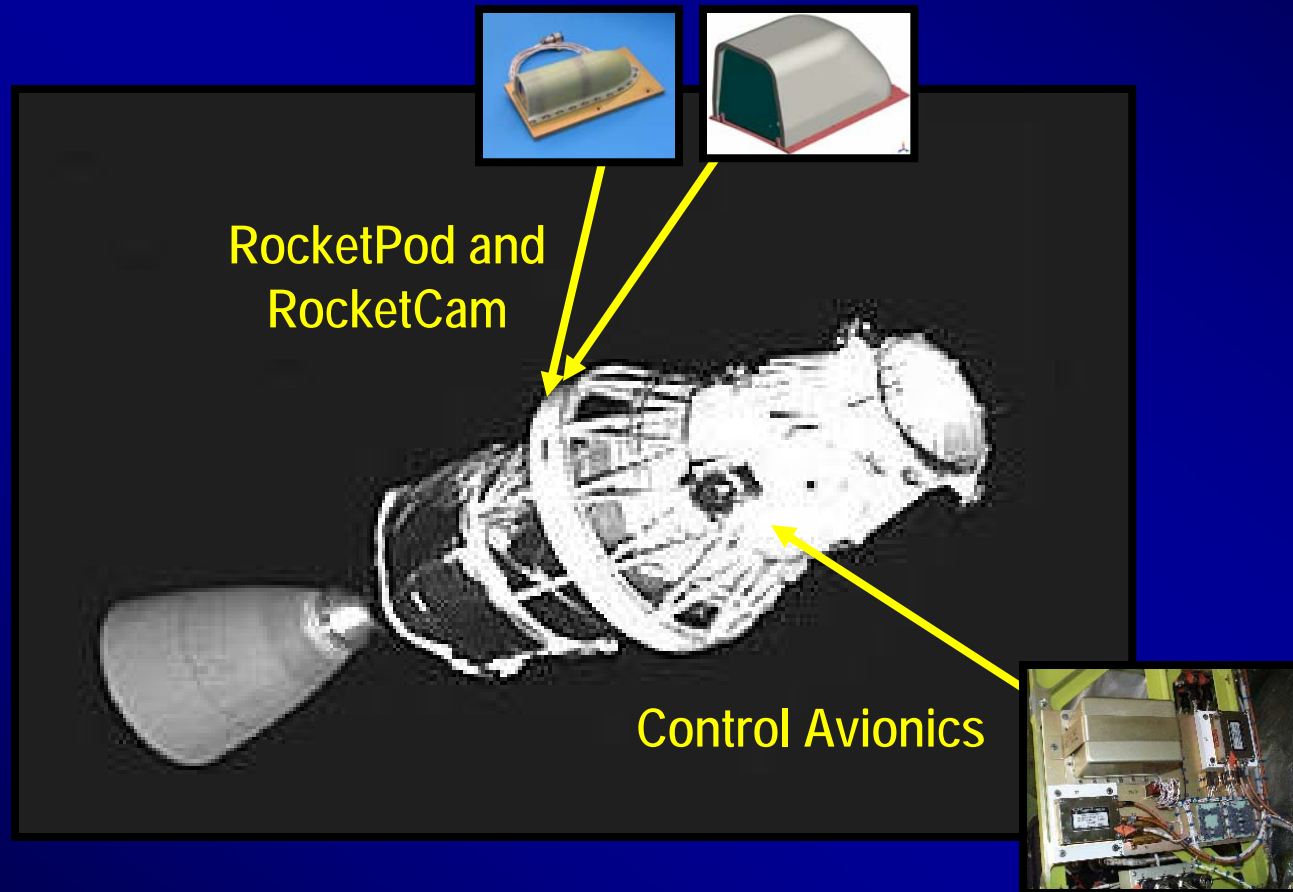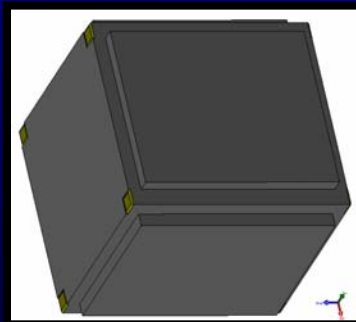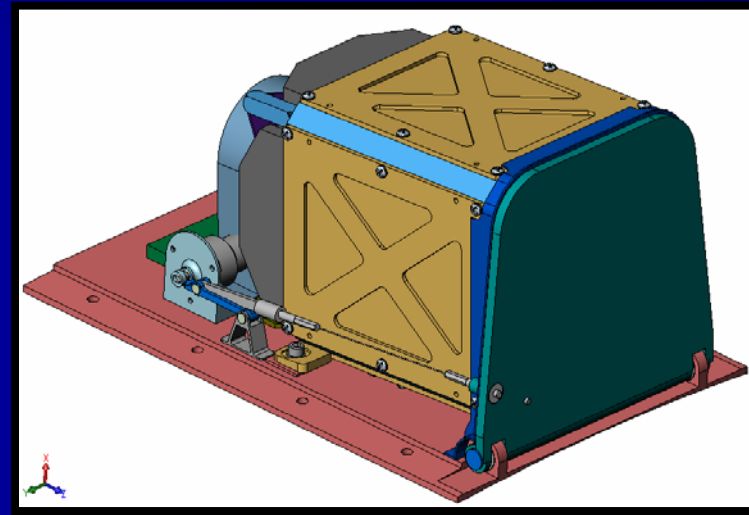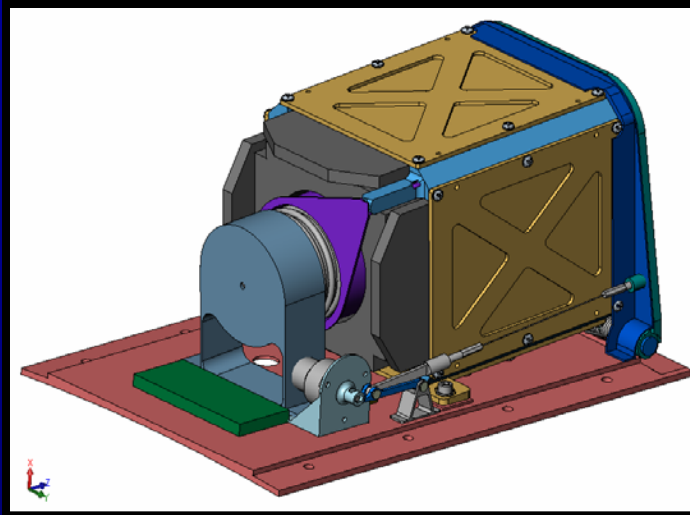
RocketPod Key Features

- **Sized to hold one CubeSat**
- **Sized to fit on Delta II miniskirt structure**
- **Provides more payload mass and volume than CubeSat**

- **Payload is kinematically restrained during launch**
- **Release behavior is independent of payload mass**
- **Fault-tolerant with respect to premature release**

- **Payload final integration is completed before shipping**
- **Environmental closeout protects payload after integration**
- **Electrical access to payload until mounting to host**
- **Nitrogen purge option**

Baseline Delta II Configuration

"Go" Command from RIFCA

Other Camera Inputs

RocketPod Controller w/ Digital Video and Internal Battery

RF Output (Antenna)

RocketPod #1 — 345°
RocketCam — 0°
RocketPod #2 — 15°
RocketPod #3 — 165°
RocketCam — 180°
RocketPod #4 — 195°
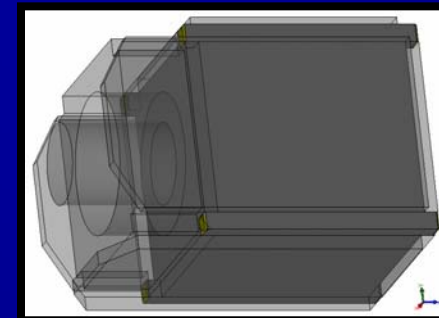
Delta II Miniskirt Structure

RocketPod Internal View

Sep velocities:
- 2.6 m/s for 0.6 kg payload
- 2.0 m/s for 1.0 kg
- 1.4 m/s for 2.0 kg

What Makes RocketPod™ Attractive?

| Traditional Secondary Payload Model		RocketPod™ Secondary Payload Model
Unique payload design	→	Standard payload design
Single payload per launch	→	Multiple payloads per launch
Mission-specific interfaces	→	Standard interfaces
Mission-specific analyses	→	Enveloping analyses
Mission-specific trajectory	→	Standard deployment options
Mission-specific safety requirements	→	Standard safety requirements
Unique launch-site processing	→	Standard launch-site processing

Standardization enables lower recurring launch cost and a low-cost secondary launch program; can be key component of Responsive Space for kg-class systems
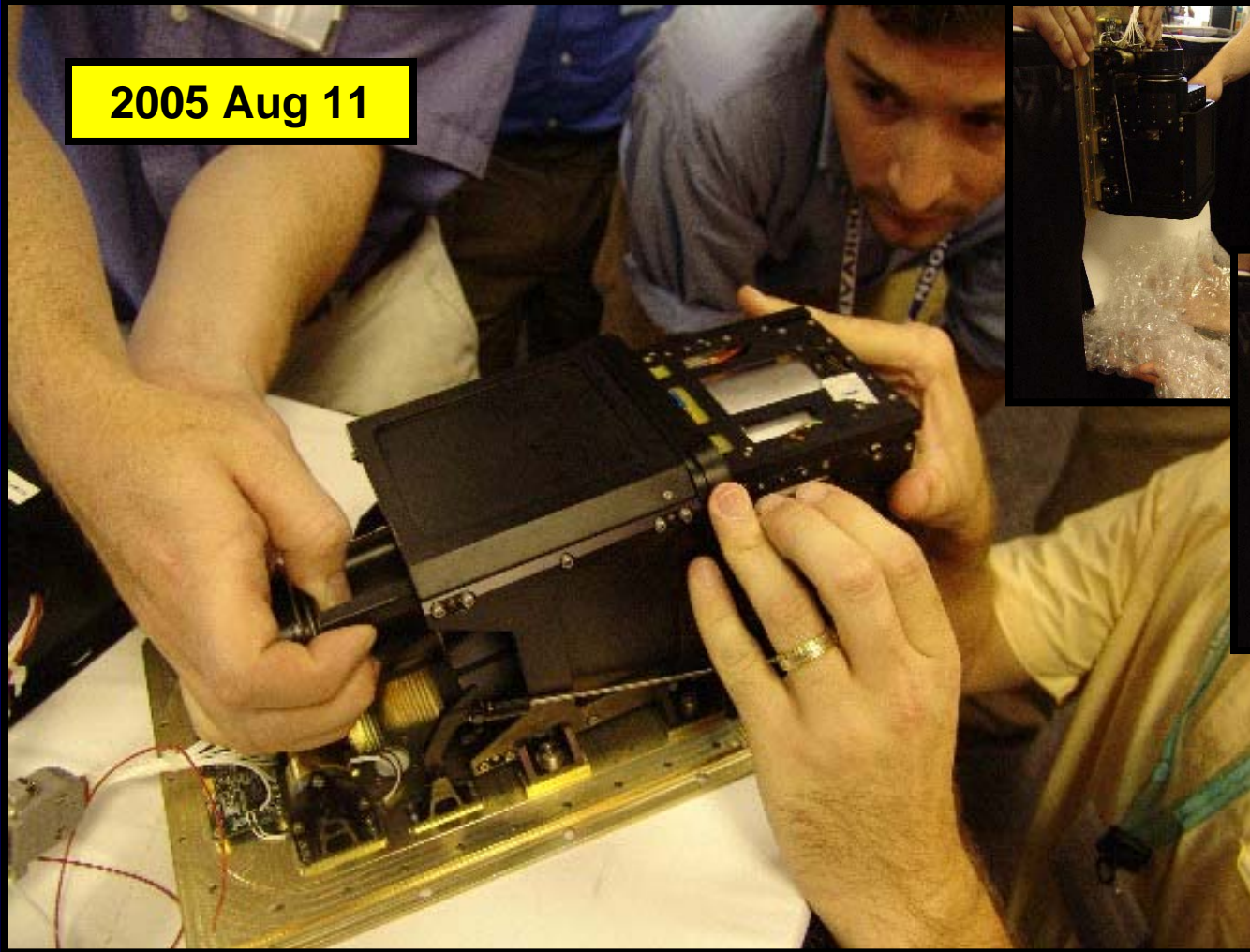
Launchable Hardware
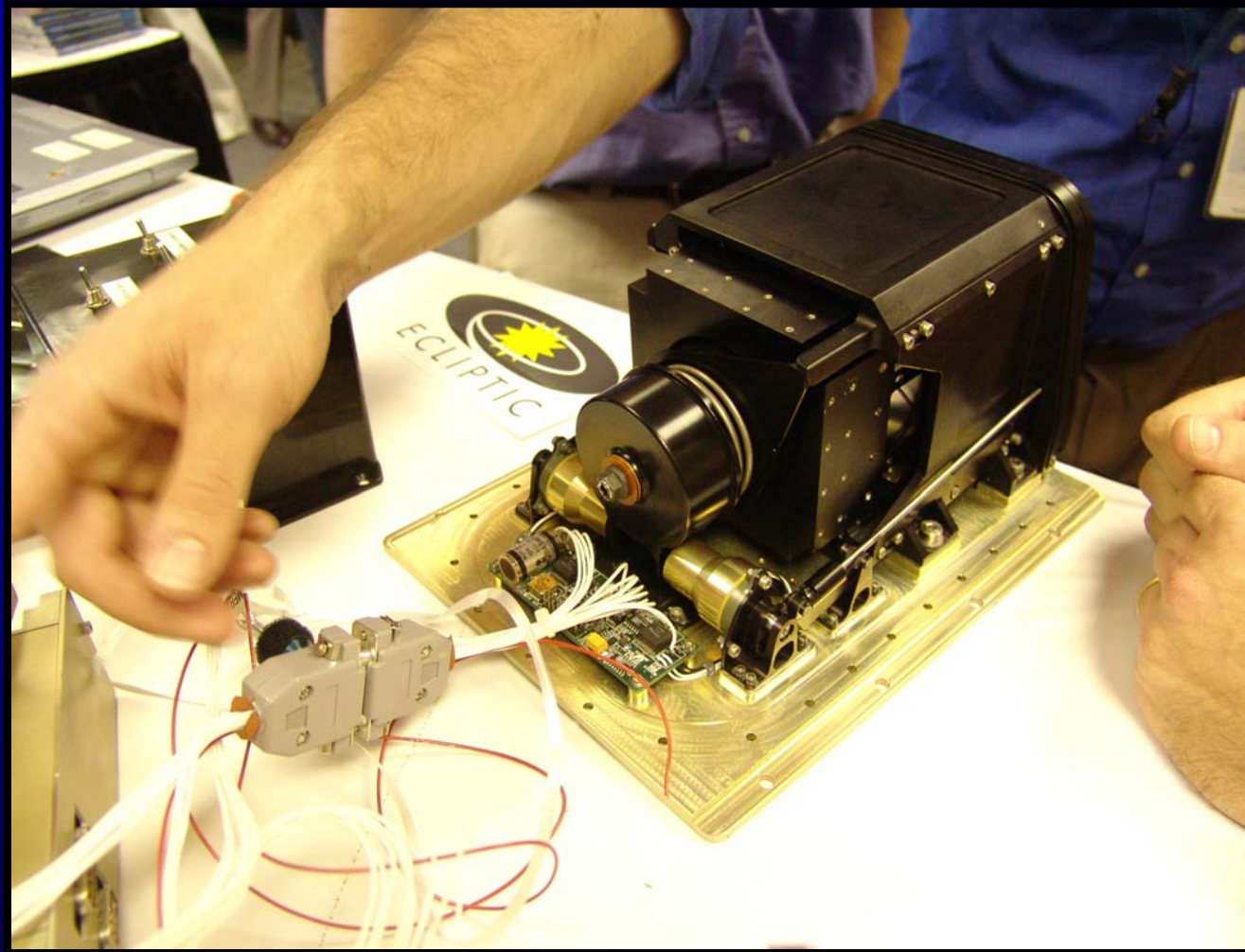
Zero-G Tests

2004 Sep 16

Fit Check and Deployment Tests

2005 Aug 11

Current Near-Term Activities

- **Currently assessing integration issues for other U.S. ELVs besides Delta II, plus on spacecraft**
  - E.g., Delta IV, Atlas 5, Minotaur, Taurus, SpaceX Falcons
- **On contract to provide flight system for suborbital launch in about a year**
- **Working several ways to take advantage possible launch opportunity to orbit mid next year**
- **Working w/SAT to assess launch option for Falcon launch next year (Malaysians)**

Longer-Term Efforts

- **Discussing CubeSat payload opportunities with several interested parties**
  - U.S. government
  - Commercial
- **Discussing business case for recurring RocketPod launch program with one U.S. ELV supplier**
- **Pursuing RocketPod improvements via IRAD**
  - Concept and design details
  - Integration and test process

Making progress!