CubeSats in Education and Industry
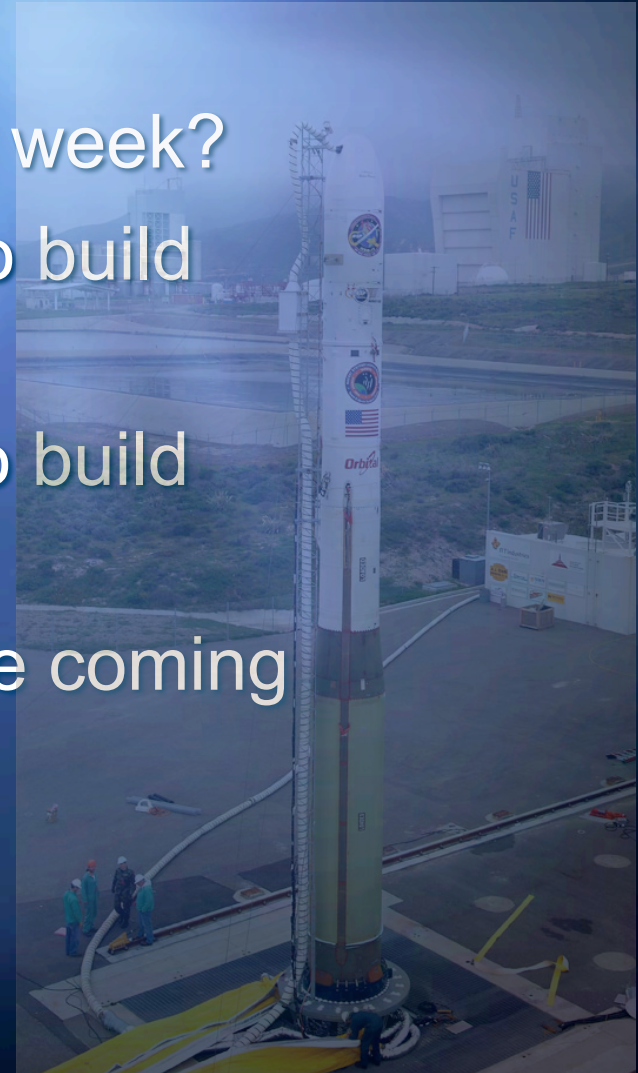
Lori Brooks

CubeSat Program Manager

California Polytechnic State University, San Luis Obispo

CubeSat Developers Workshop

April 2007

Questions for You:

± Whom should you talk to this week?

± Can Universities be trusted to build CubeSats?

± Can Businesses be trusted to build CubeSats?

± What launch opportunities are coming up for CubeSats?

CubeSat Community

The Aerospace Corporation
AeroCube-2
Downlink 902-928 MHz
9600 bps GFSK, 2W

THE AEROSPACE CORPORATION

POLYSAT

BOEING

The Boeing Company
CSTB1
Downlink 400.0375 MHz
1200 bps FSK (AX.25), 1W

Cal Poly
CP4
Downlink 437.325 MHz
1200 bps FSK (AX.25), 1W

CubeSat Community

CubeSat Community

CubeSat Community

University of Arizona
SACRED
Downlink 436.870 MHz
1200 bps AFSK, 400 mW
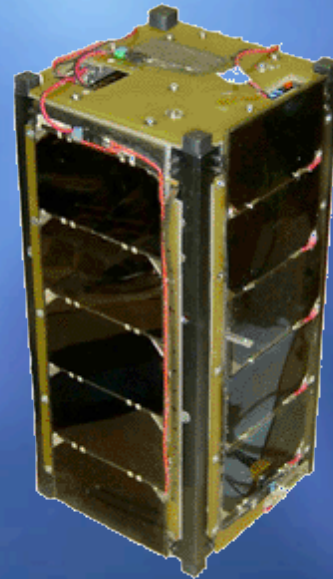
University of Illinois
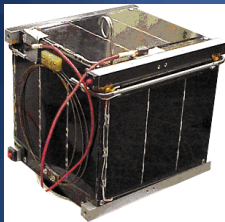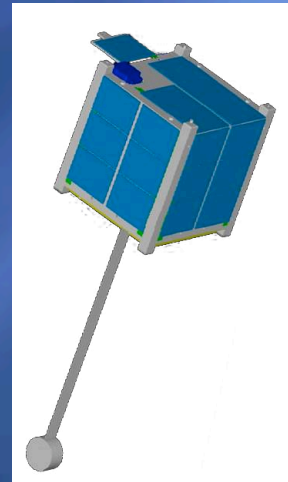**ION**
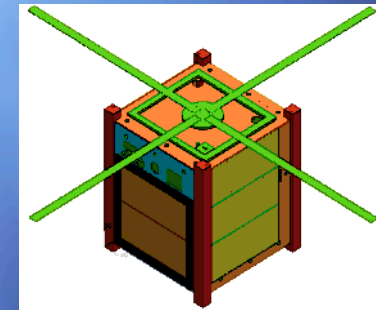**Downlink** 437.505 MHz
1200 bps FSK (AX.25), 2W

CubeSat Community

University of Arizona
RINCON
Beacon 437.345 MHz
1200 bps PSK, 10 mW
Downlink 436.870 MHz
1200 bps AFSK, 400 mW

Cornell University
ICE Cube 1
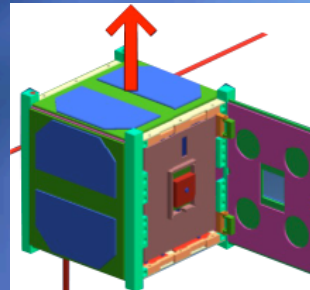**Downlink** 437.305 MHz
9600 bps FSK (AX.25), 1W

University of Kansas
KUTESat
Downlink 437.385 MHz
1200 bps FSK (AX.25), N/A

CubeSat Community

Norwegian University of Science and Technology

nCube
Downlink 437.305 MHz
9600 bps GMSK (AX.25), 1W
Downlink 2 2407.250 MHz
9600 bps GMSK (AX.25), 3W
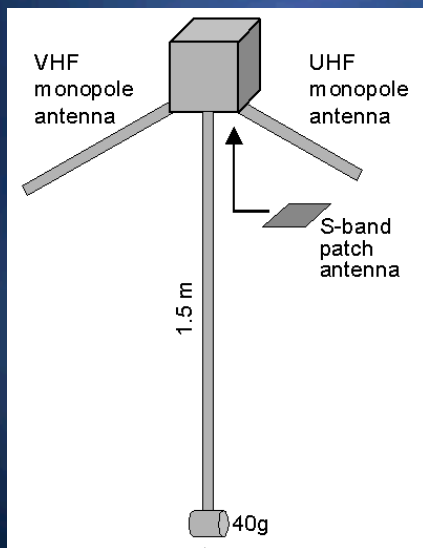
Nihon University
SEEDS
Downlink 437.485 MHz
1200 bps FSK (AX.25), 400 mW

Hankuk Aviation University
HAUSAT 1
Downlink 437.465 MHz
1200 bps FSK (AX.25), 500 mW

CubeSat Community

The Aerospace Corporation
AeroCube-1
Downlink 902-928MHz
9600 bps GFSK, 2W

Montana State
MEROPE
Downlink 145.980 MHz
1200 bps FSK, 1W
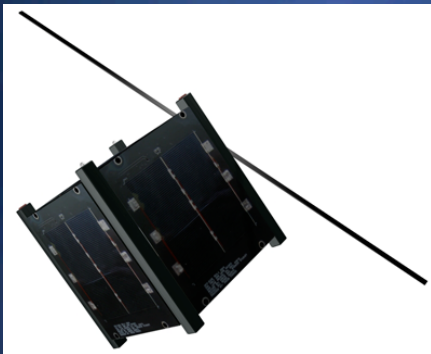
Cal Poly
CP2
Downlink 437.325 MHz
1200 bps FSK (AX.25), 1W
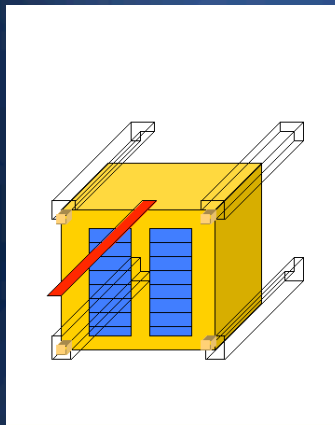
CubeSat Community

University of Hawaii
Voyager
Downlink 437.405 MHz
1200 bps FSK, 500 mW
Downlink 2 5.84 GHz, 1 mW

Cornell University
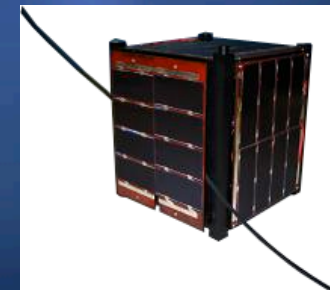**ICE Cube 2**
Downlink 437.425 MHz
9600 bps FSK (AX.25), 1W
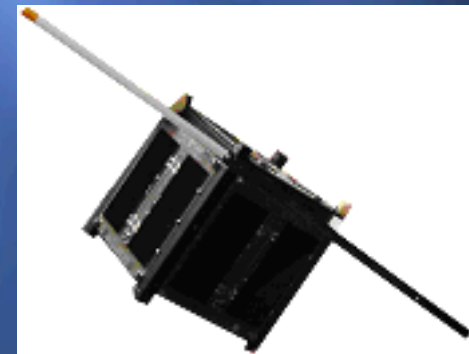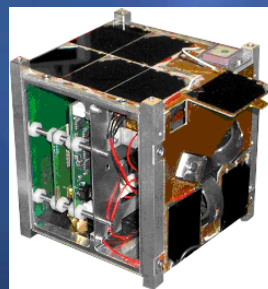
Cal Poly
CP1
Downlink 436.845 MHz
15 bps DTMF, 500mW

CubeSat Community
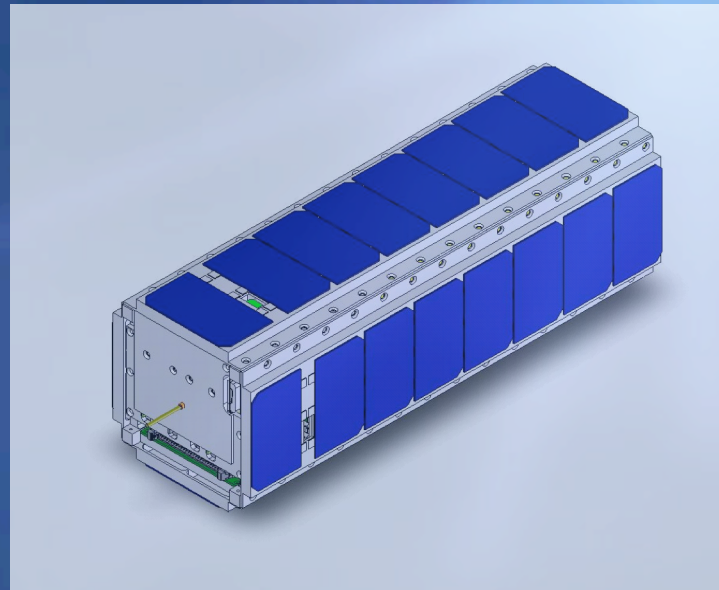
GENESAT-1

NASA Ames Research Center
Santa Clara University
Stanford University
San Jose University

Previous CubeSat Launches
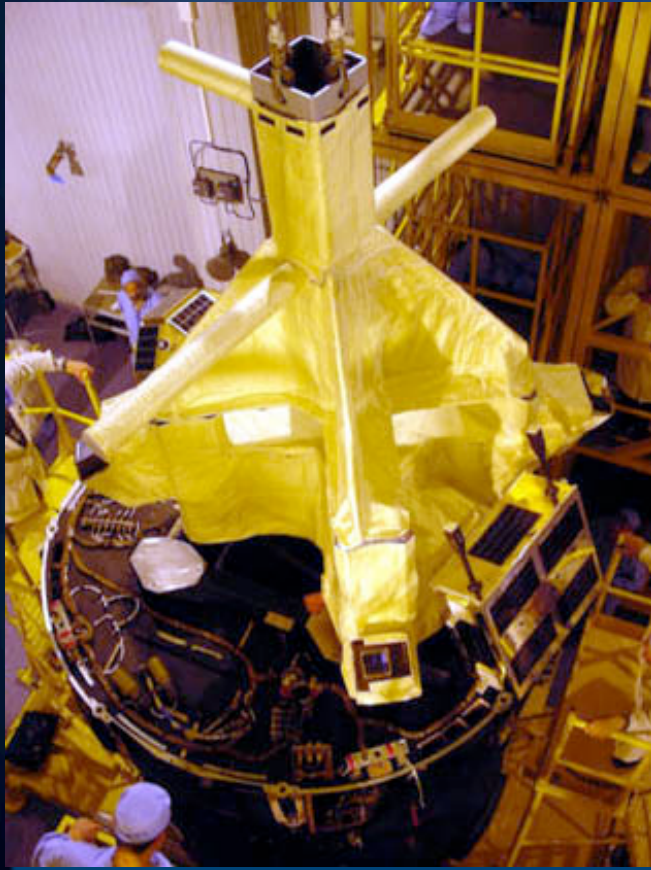
Eurokot: June 30, 2003   SSETI Express: October 27, 2005

Previous CubeSat Launches

M-V-8: February 22, 2006

Current Participants

± CubeSat developers
(concept through flight)

± Amateur Radio operators

± Future Launch Providers

University Benefits

± Application of Engineering

± Team-building

± Experience in project management

± Systems integration on a multi-disciplinary team

± Experience building to flight standards

University Benefits

- ± Experience in integration, testing, and documentation
- ± Distributed engineering collaboration
- ± Oversee a complete mission lifecycle
- ± Involvement in Aerospace Community

Industry Benefits

- ± LOW COST
- ± Riskier Missions have high potential payback
- ± Missions are highly valuable to future opportunities
- ± Broad spectrum of application of data
- ± Gain close relationships with future coworkers/subordinates/managers
- ± Tax-deductible donations to Universities improve PR

Current Challenges

± Gaining access to frequent launch opportunities

± Finding funding for one/multiple missions

± Finding support for mission/payload
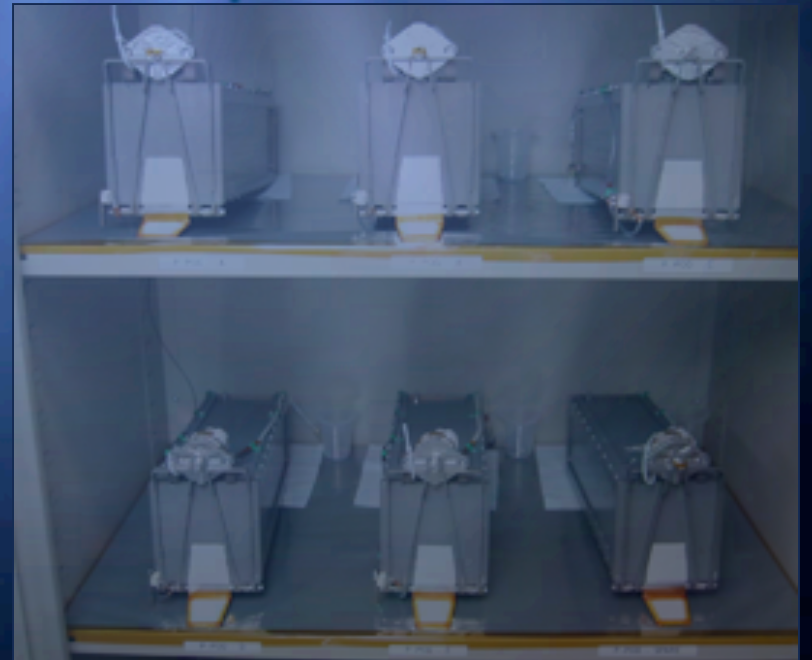
Culmination: Success in 2006

Belka: July 26, 2006

Successful Integration
of 14 CubeSats onto
the SHM

Launch failed; all
satellites were
destroyed

Culmination: Success in 2006

TacSat-2: December 16, 2006

NASA Ames developed
GeneSat-1 and launched in
a modified P-POD.

Future launches will benefit
from these modifications.

Culmination: Success in 2007

EgyptSat: April 17, 2007

Launch of 7 CubeSats into
Sun-synchronous orbit

CubeSat Status as of 4/18/07:
-Data recovered from
      Libertad-1
      CAPE 1
      AeroCube 2
      CSTB 1
-Contact made with
      CP4

Looking Ahead: Our Objectives

± Further develop US and international launch capability

± Increase number of participating organizations

± Continue to demonstrate CubeSats as a viable platform for simple, low cost missions

± Continue to educate students

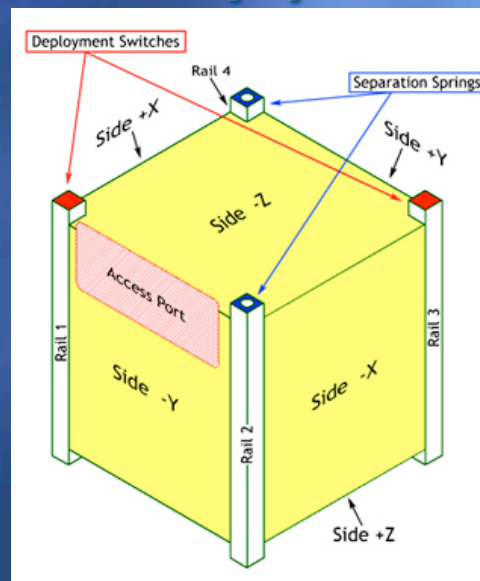± Continue to contribute valuable data to science and industry

Looking Ahead: Planned Launches

± RazakSAT mission on Falcon-1 Q4 2007

± Dnepr mission in Q3 2008

± Other potential launches TBD (2007-2010)

The End
Thanks to all of our participants and supporters.

www.cubesat.org