National Aeronautics and
Space Administration

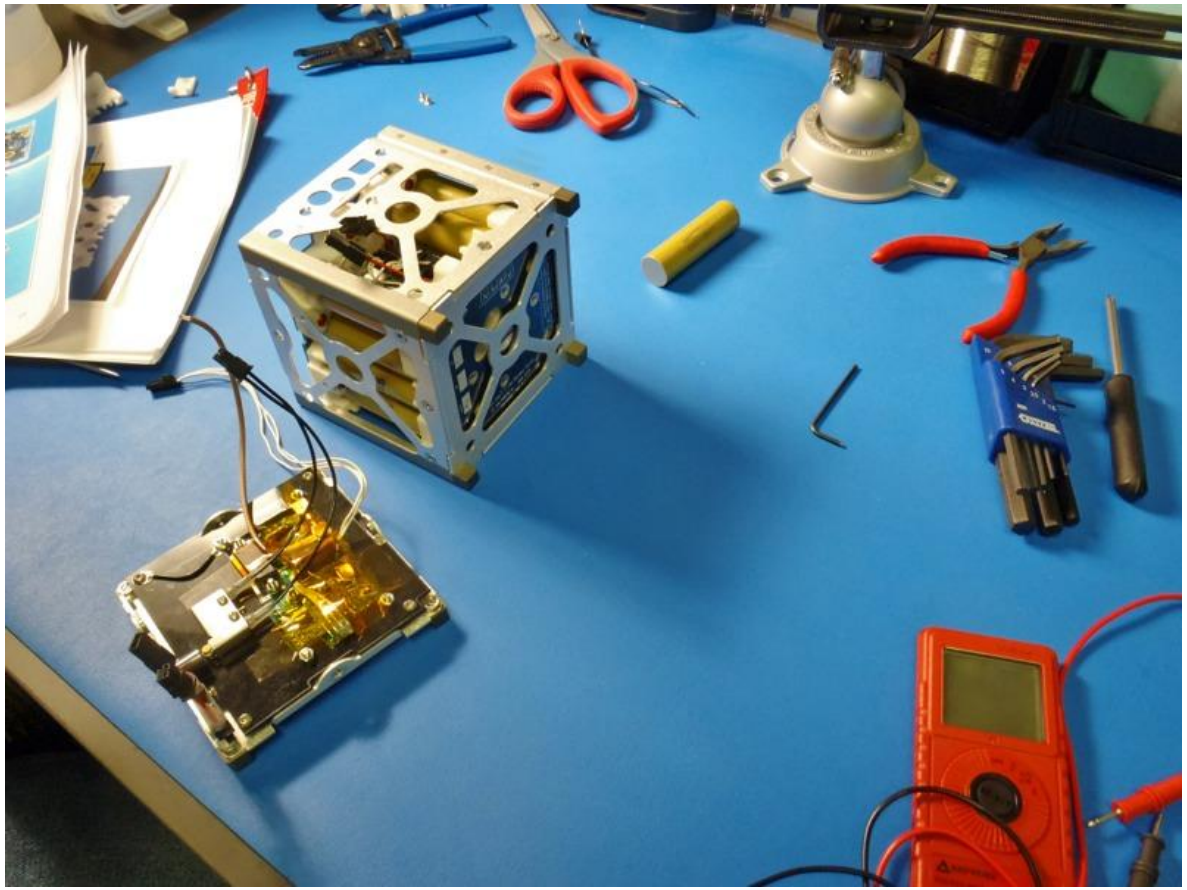
Small *Spacecraft* Technology

Andrew Petro

NASA TECHNOLOGY DAYS 2012
Cleveland, Ohio

www.nasa.gov

Spacecraft Development on a Human Scale



Spacecraft Development on a Human Scale

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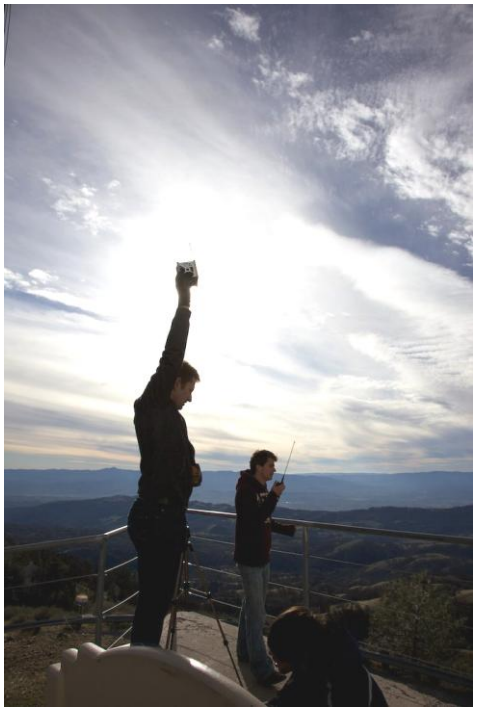


- smaller scale, lower cost and shorter schedules
- faster transition from laboratory to flight
- rapid, agile and aggressive technology development
- higher risk tolerance with higher potential payoff
- stronger workforce with early and frequent flight project experience
- components and techniques from non-traditional sources

Small *Spacecraft* Technology

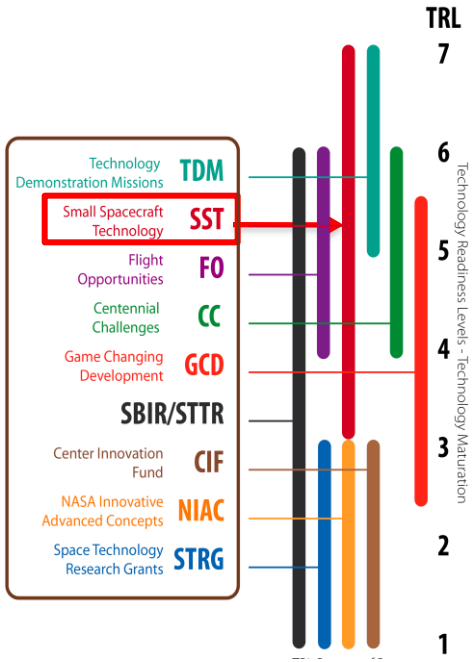
Franklin Small Satellite Subsystem Technologies + **Edison Small Satellite Demonstration Missions** = **Small Spacecraft Technology Program**

Technology Research and Development

- Maturing technologies from TRL ~ 3 to 5

Flight Demonstrations

- Maturing technologies & mission capabilities from TRL ~5 to 7+



Program Executive: Andrew Petro (NASA Headquarters)

Program Office at NASA Ames Research Center

Program Manager: Bruce Yost

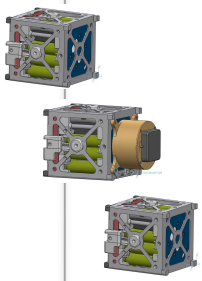
Benefits

Advance the capabilities of small spacecraft to support NASA missions in science, exploration and space operations

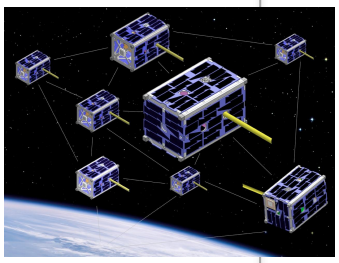
- **to perform missions or examine phenomena not possible otherwise**
- **to accelerate the introduction of new technologies and capabilities**
- **to unleash NASA's unique capabilities and assets into the already vibrant small spacecraft community**

Current Flight Demonstration Projects

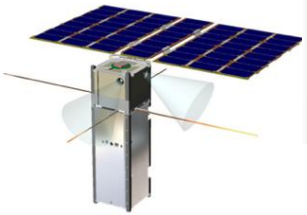
PhoneSat



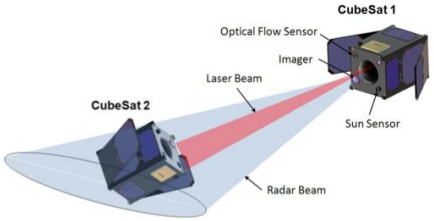
EDSN



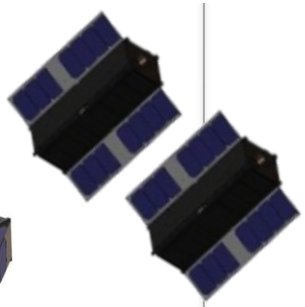
ISARA



Optical Comm & Nav



CPOD



2013 | 2014 | 2015

PhoneSat

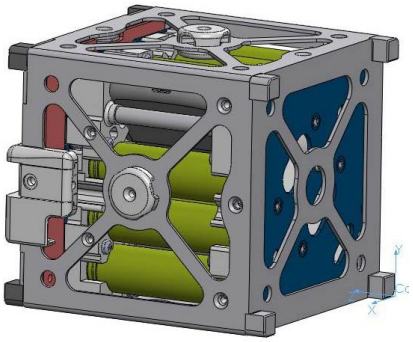
Demonstration of very low cost satellite bus based on smartphone electronics. Each is a 1U cubesat. 2nd generation PhoneSat will have solar panels.

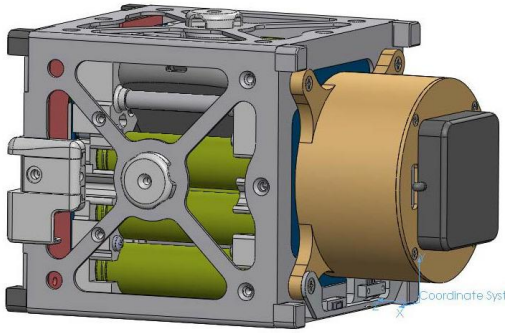
1st launch planned for early 2013 for PhoneSat 1.0/2.0b (3 satellites)

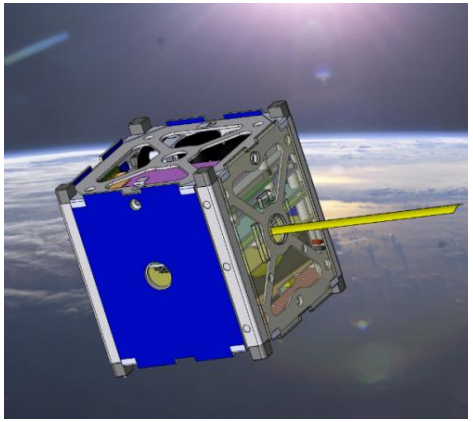
Team

NASA Ames Research Center

- James Cockrell







Popular Science – 2012 Best of What's New Award

Edison Demonstration of Smallsat Networks (EDSN)

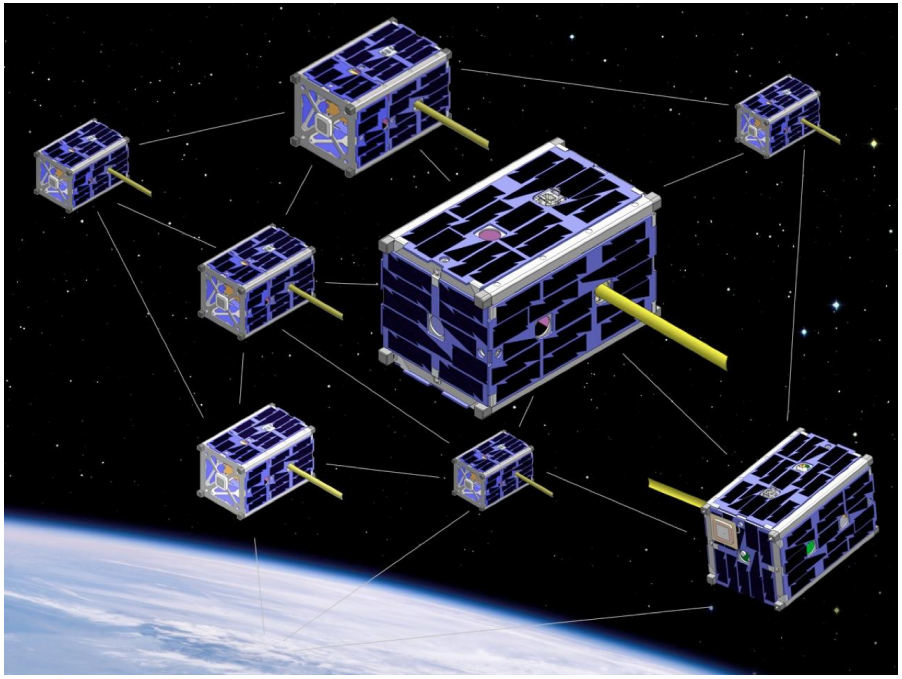
Eight low-cost 1.5U cubesats to demonstrate the operation of an intra-swarm communications and coordinated multi-point science observations.

Launch planned for September 2013

Team

NASA Ames Research Center
- Stephan Ord

Partners:
Montana State University – Payload
Santa Clara University – Ground Station
NASA Marshall Space Flight Center



ISARA - Reflectarray Antenna for High-Bandwidth Communications

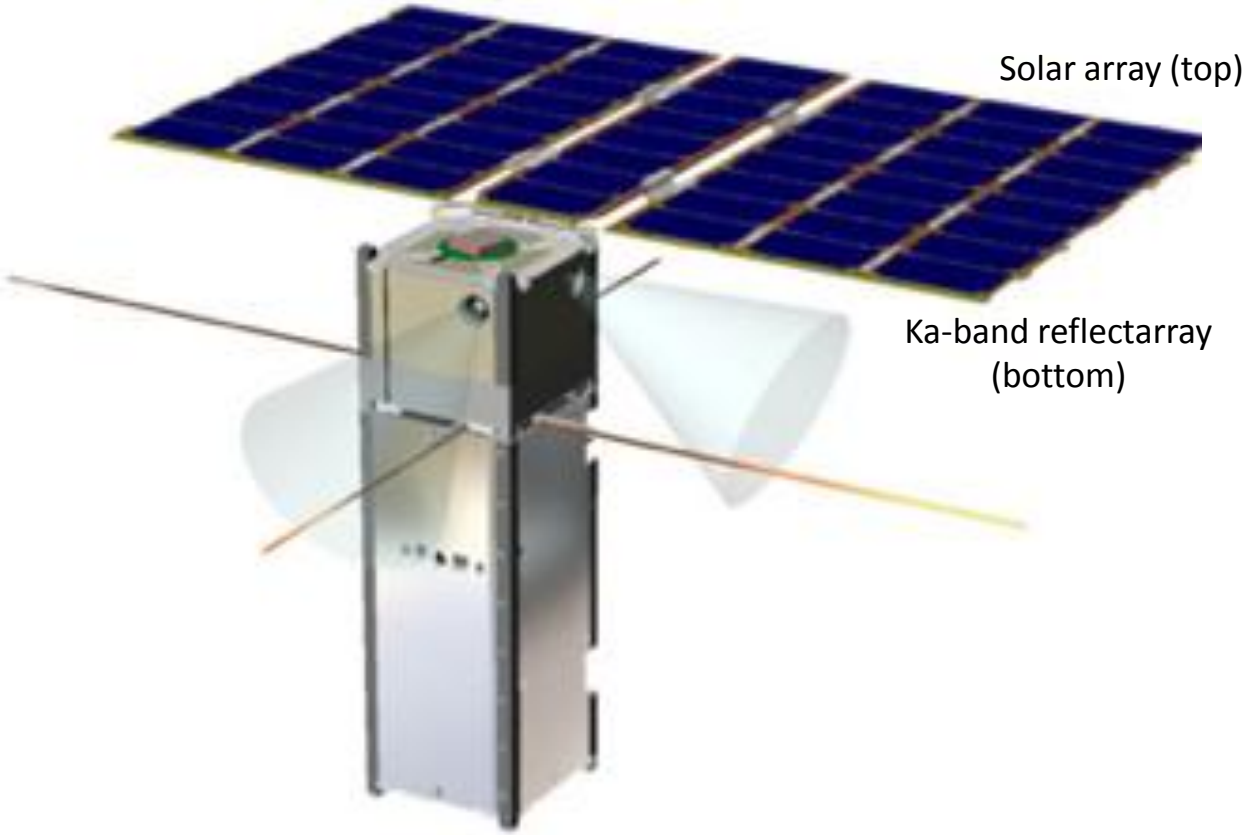
One 3U cubesat with a large, deployable solar array that doubles as a Ka-band reflectarray providing 100 Mbps of data downlink capability.

Launch is planned for 2014

Team

Jet Propulsion Laboratory
- Richard Hodges

Partner: Pumpkin, Inc. (spacecraft bus)



Optical Communication & Navigation for Cubesats

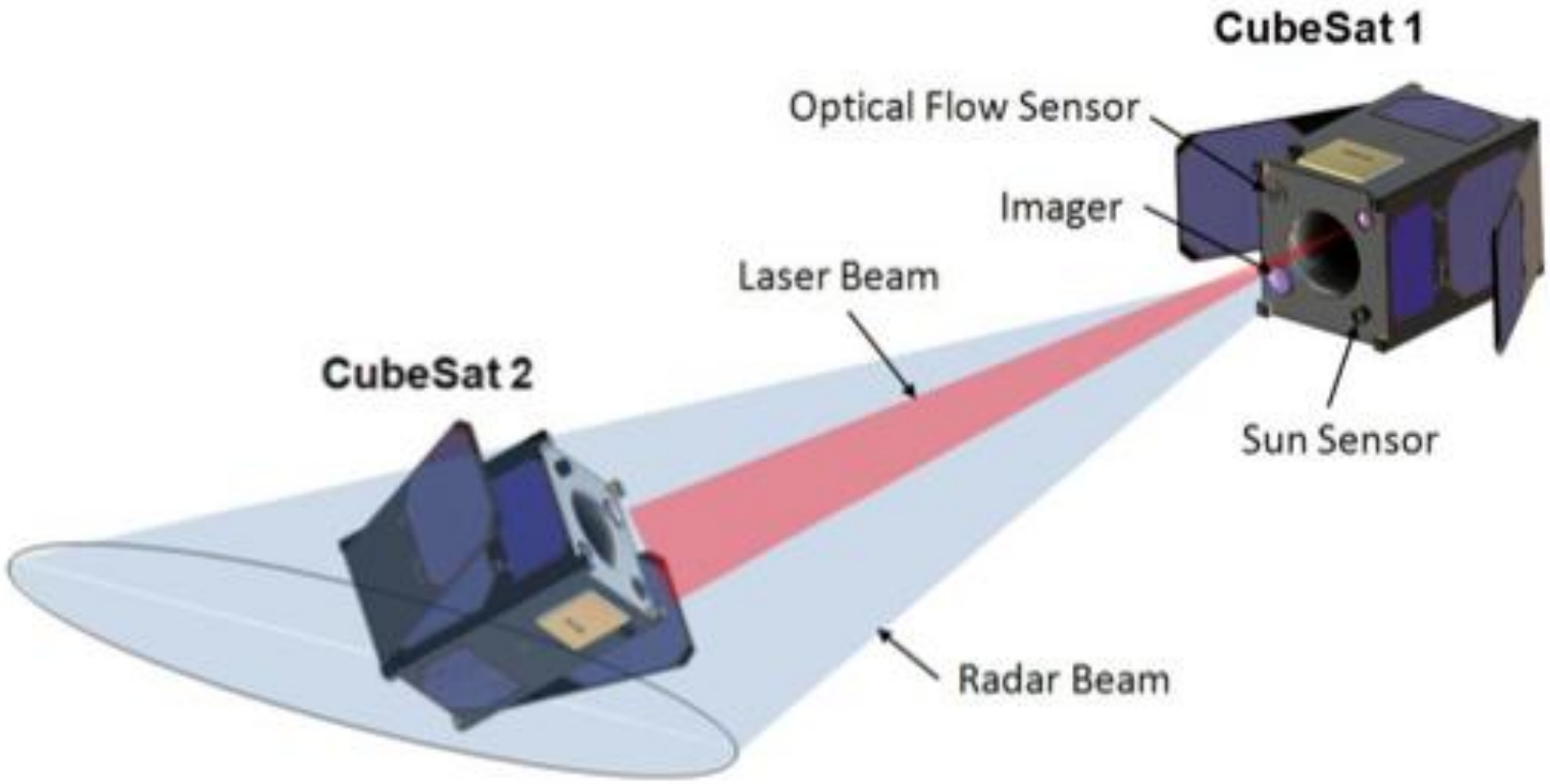
Demonstrate radar ranging, optical downlink, cold gas propulsion, and cross-track motion sensing with two 1.5U cubesats executing formation flying and rendezvous operations.

Launch is planned for 2015

Team

Aerospace Corp.

- Siegfried Janson



Cubesat Proximity Operations Demonstration (CPOD)

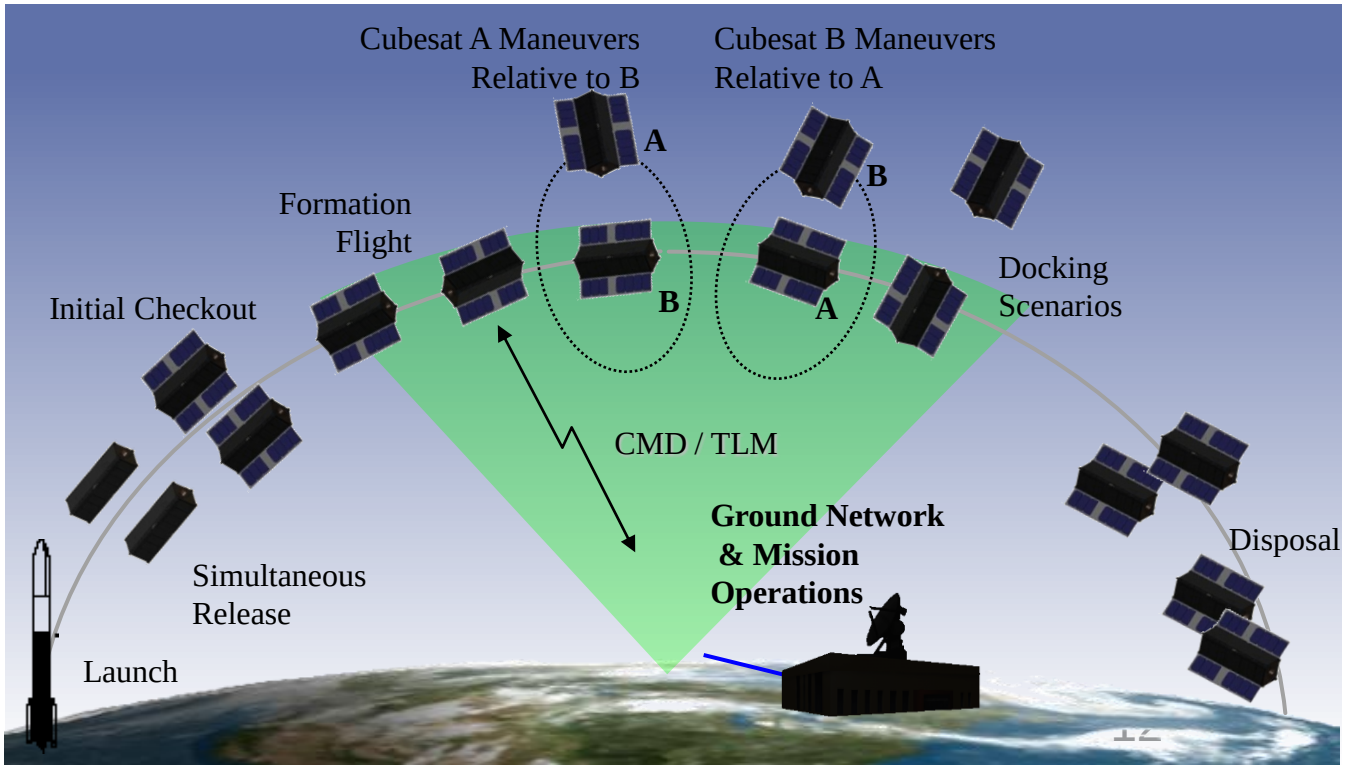
Two 3U cubesats demonstrate rendezvous, proximity operations, docking and servicing, and formation flight over a 1-year mission.

Launch planned for 2015

Team

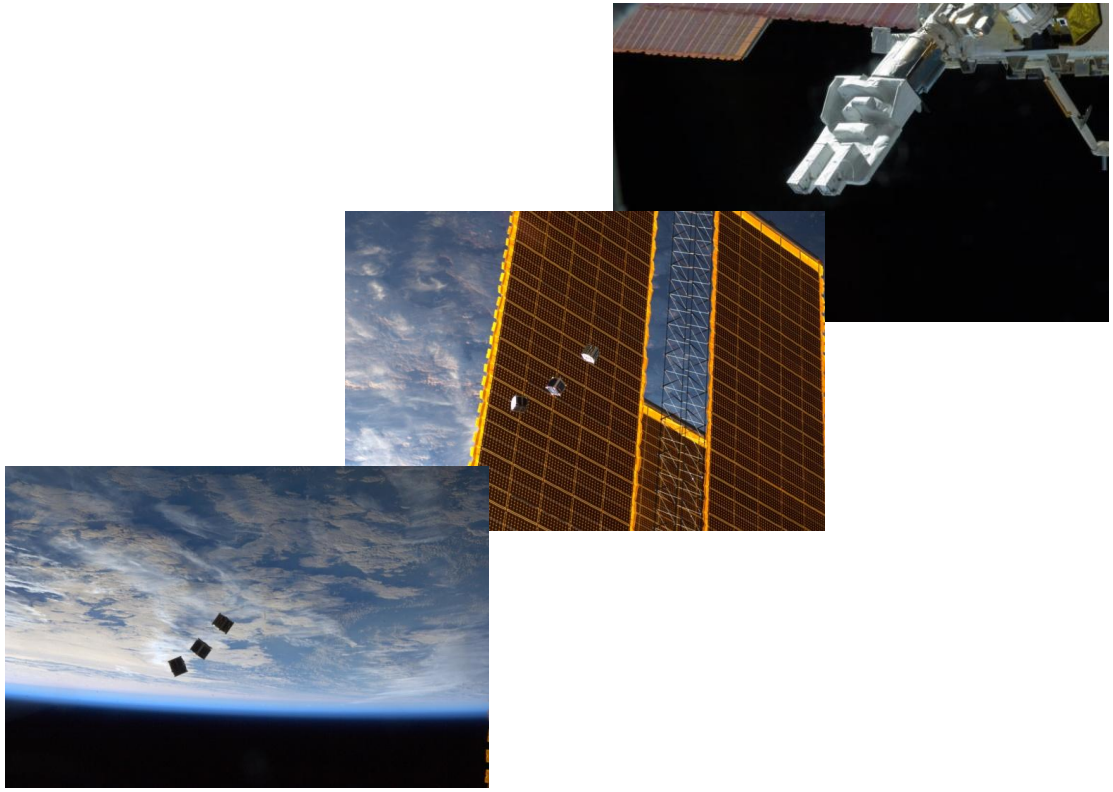
Tyvak Nano-Satellite Systems LLC
- Scott MacGillivray

Partners: California Polytechnic State University, 406 Aerospace, Applied Defense Solutions, Analytical Graphics Inc.



Launch Opportunities

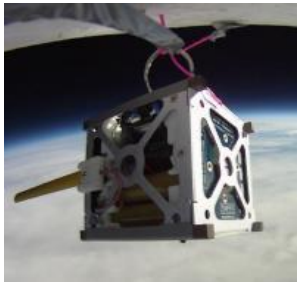
- **NASA Cubesat Launch Initiative and other Rideshares**
- **ISS deployments**

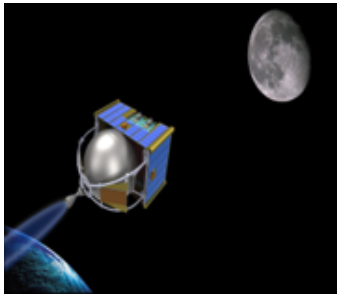


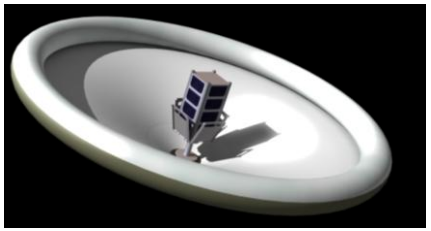
Cubesat Deployment from ISS

Plans for 2013

- **Solicitation for new technology development and demonstration projects planned for 2013**
- **Additional initiatives and collaborations**







Technology Days

- Please attend our in-depth presentation on Thursday, 11AM
- Please visit our exhibit
- And sign up for one-on-one meetings with Program Managers

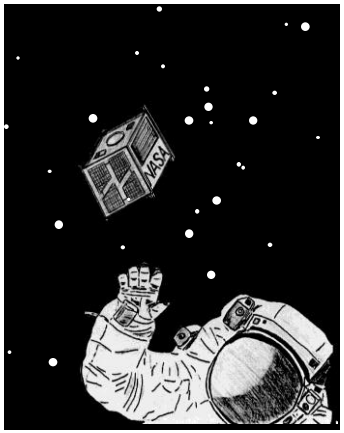
Contact Information

Please visit:

www.nasa.gov/smallsats

Program Executive: Andrew Petro (NASA Headquarters)
Andrew.J.Petro@nasa.gov

Program Manager: Bruce Yost (NASA Ames Research Center)
Bruce.D.Yost@nasa.gov



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