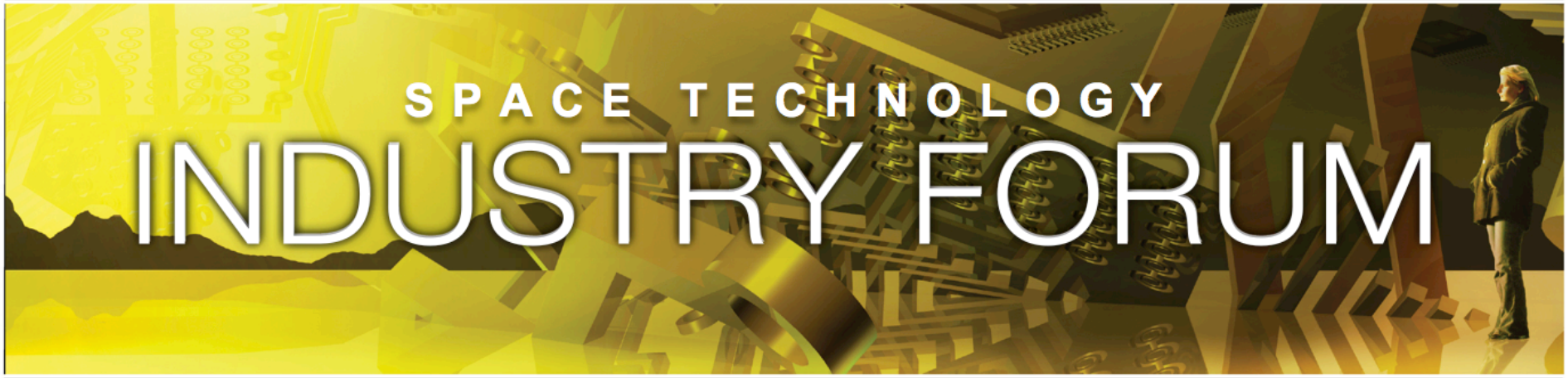
National Aeronautics and Space Administration

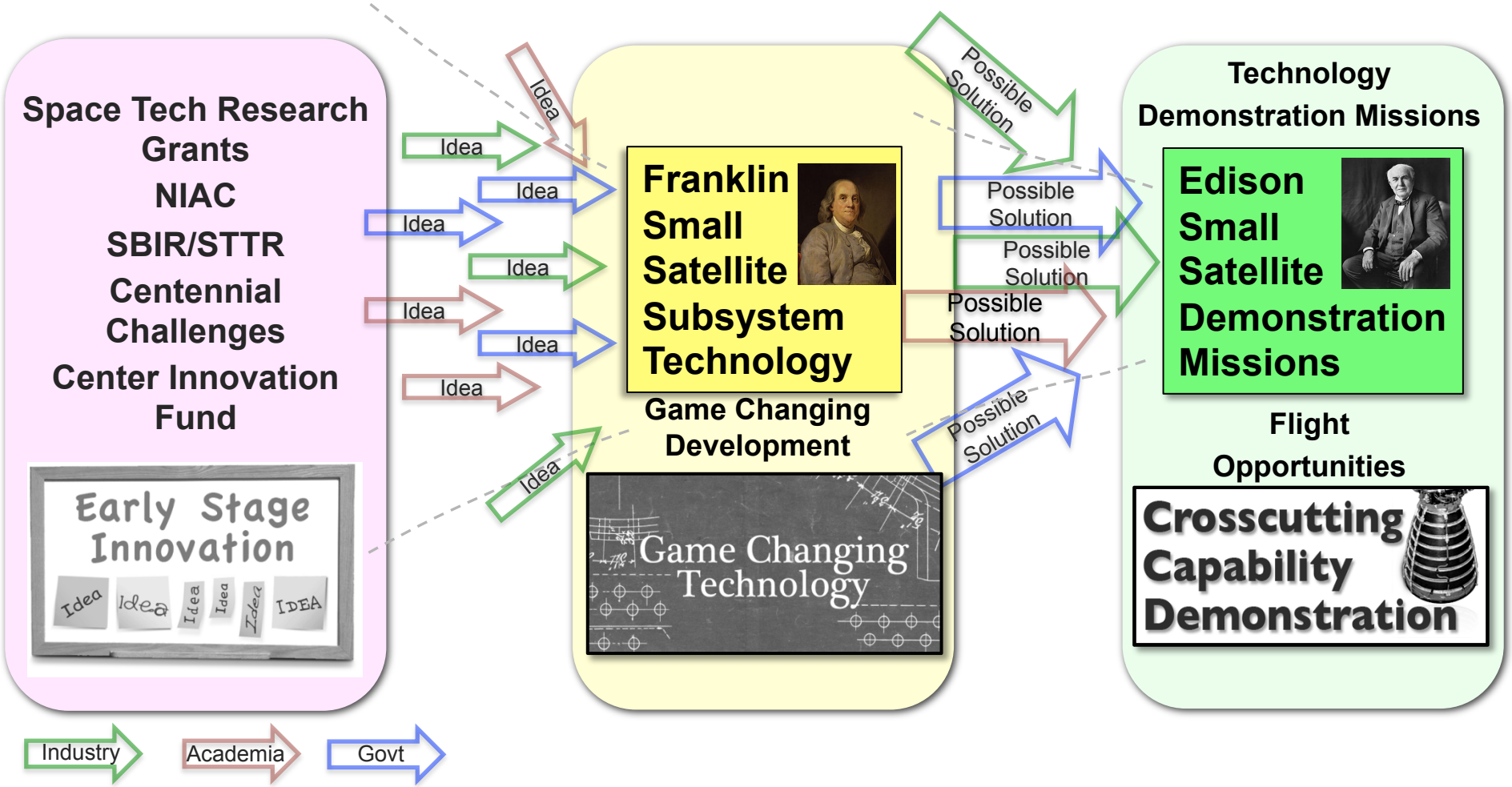
OFFICE OF THE CHIEF TECHNOLOGIST



Franklin Small Satellite Subsystem Technology Program & Edison Small Satellite Demonstration Missions Program

Brant Sponberg
Program Executive (Acting)
July 13, 2010

OCT Program Overview

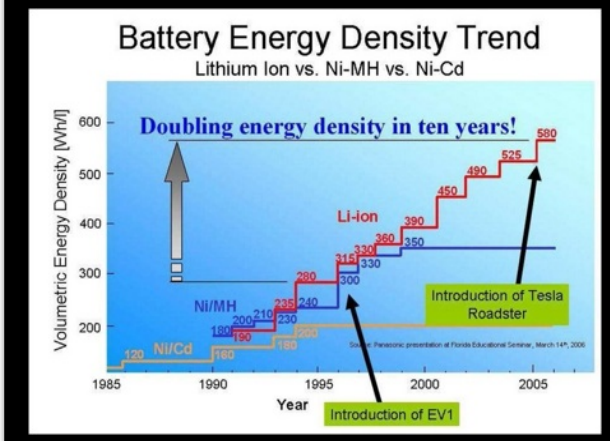


1	2	3	4	5	6	7

Technology Readiness Level (TRL)

OCT Small Spacecraft Programs
Why Small Spacecraft?

Innovation Rapidly Making Technology Smaller, More Powerful and Less Costly



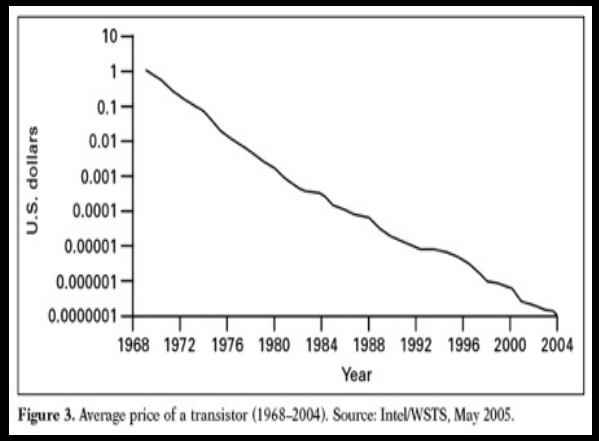
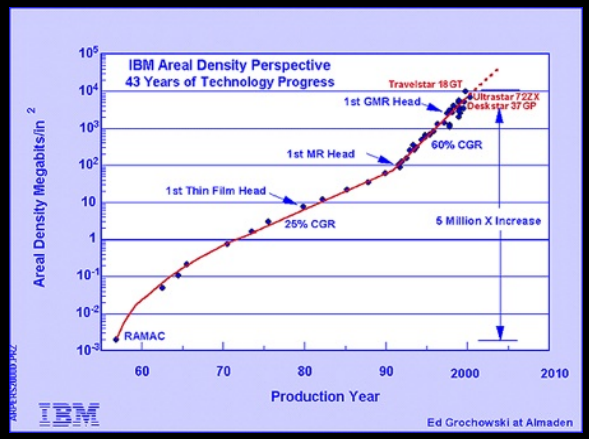
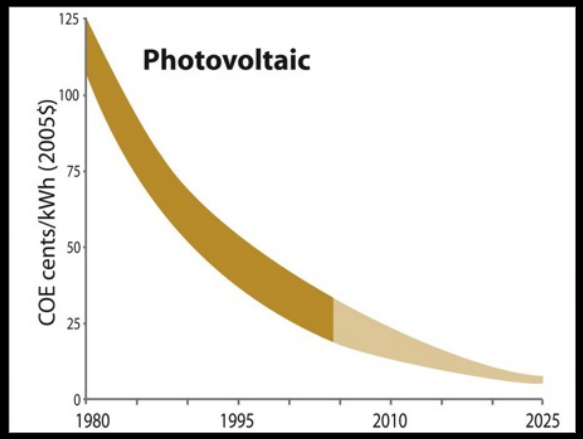
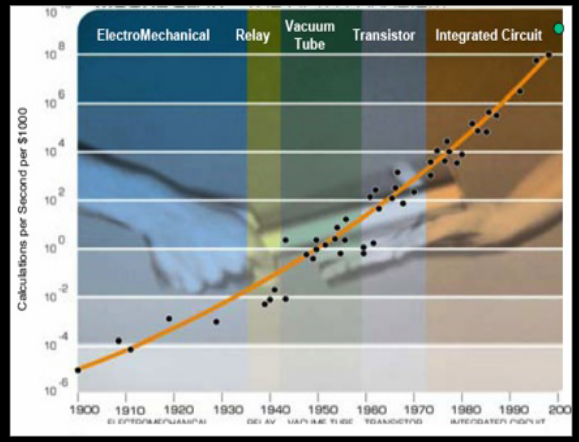
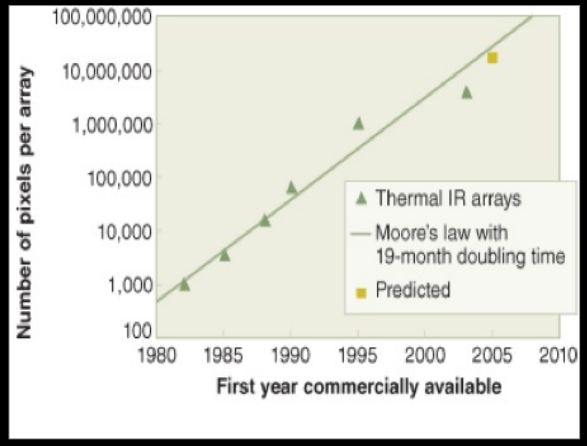


Figure 3. Average price of a transistor (1968–2004). Source: Intel/WSTS, May 2005.





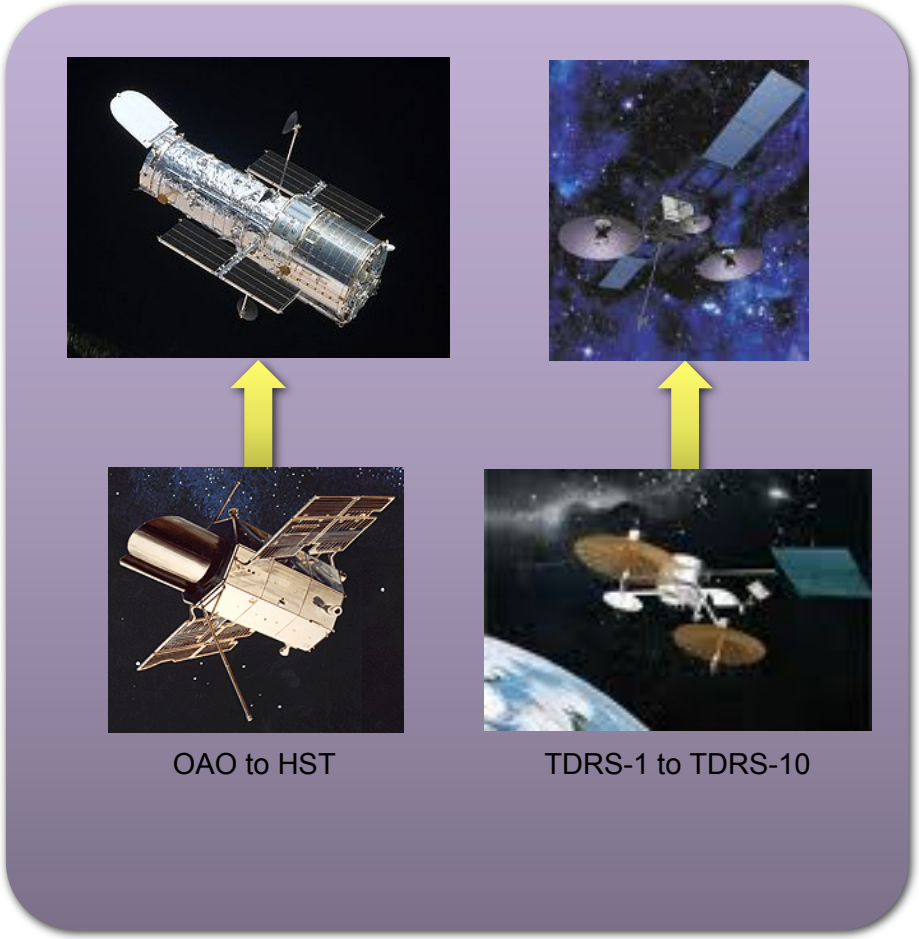




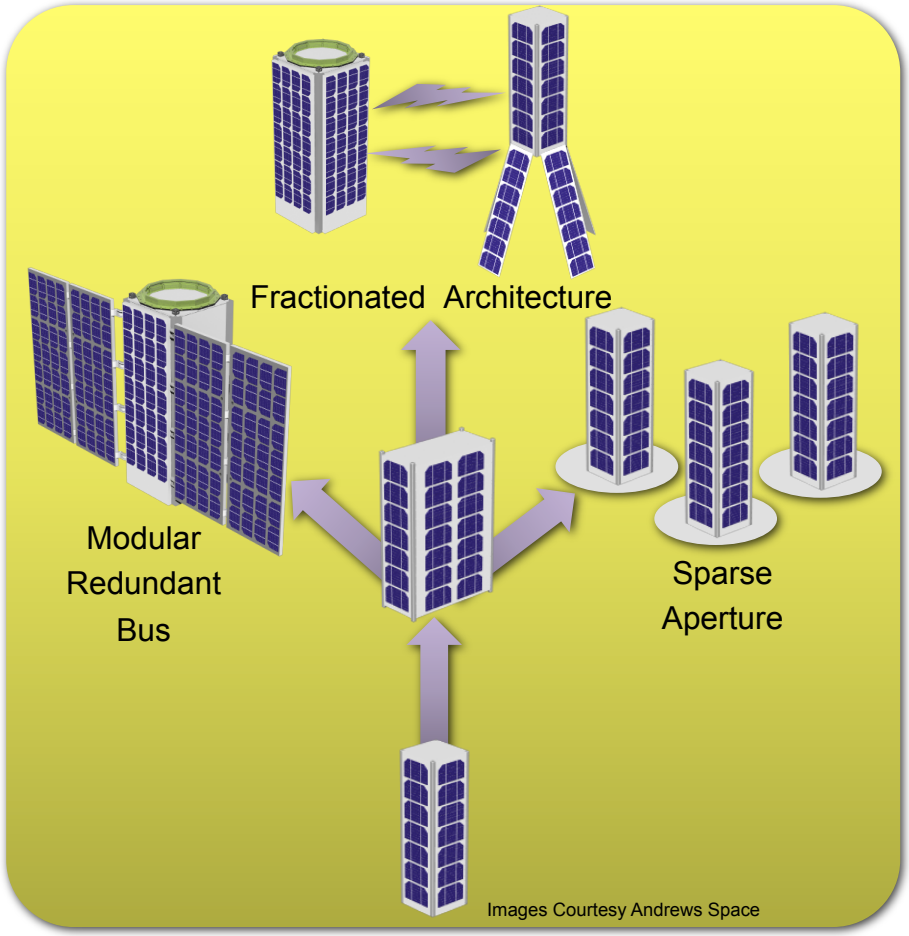
Infuse Technology Faster and Perform Missions Better and More Affordably

OCT Small Spacecraft Programs
Why Small Spacecraft?

Enable New Approaches to Satellite Communications and Remote Observation



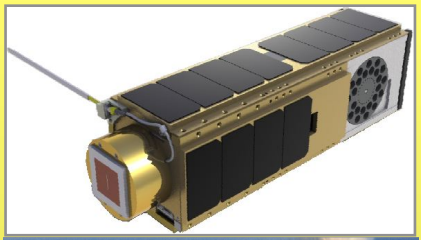
Spacecraft Evolution Usually Starts Large and Gets Larger

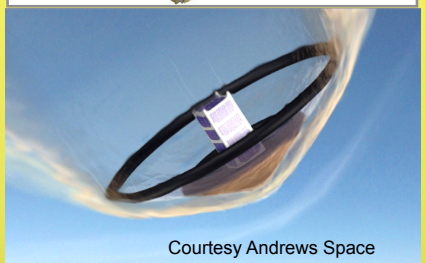


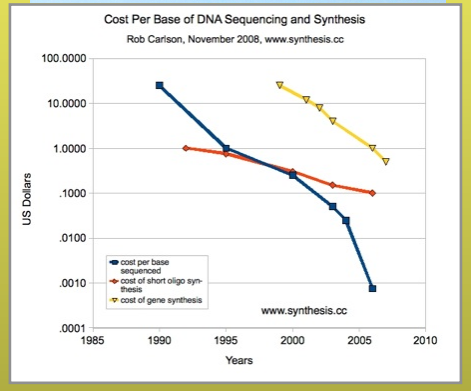
Radically Rethink Design Fundamentals By Starting Small

OCT Small Spacecraft Programs
Why Small Spacecraft?

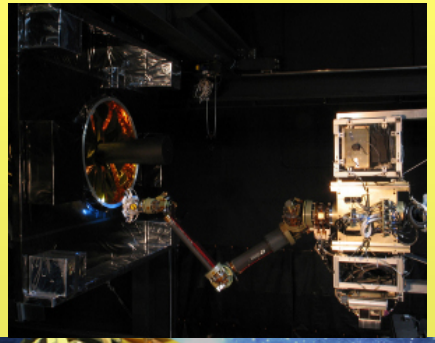
Take Risks on New Applications

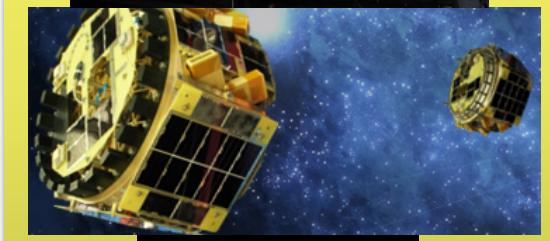




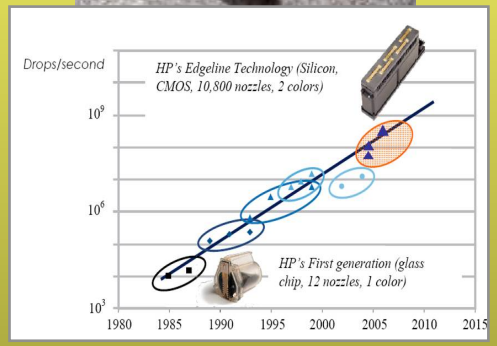


Biological and Physical Research





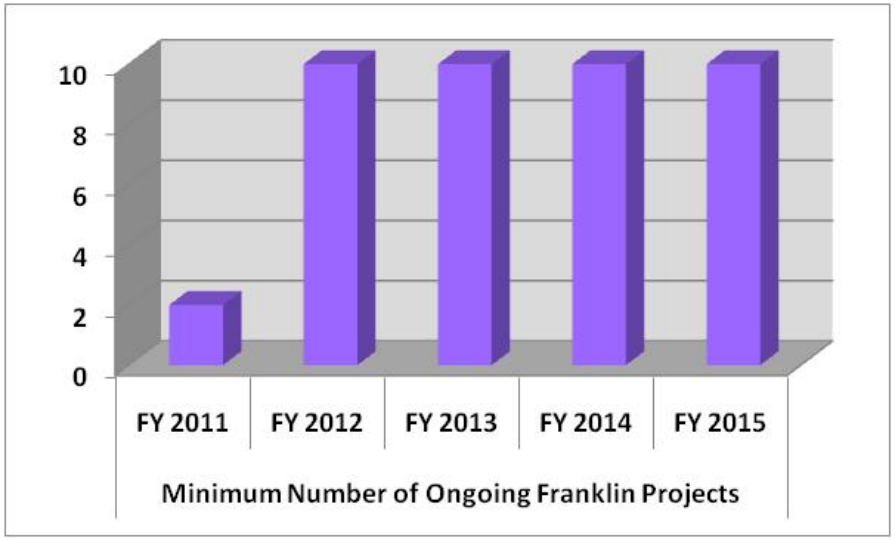
In-Space Servicing And Orbital Debris

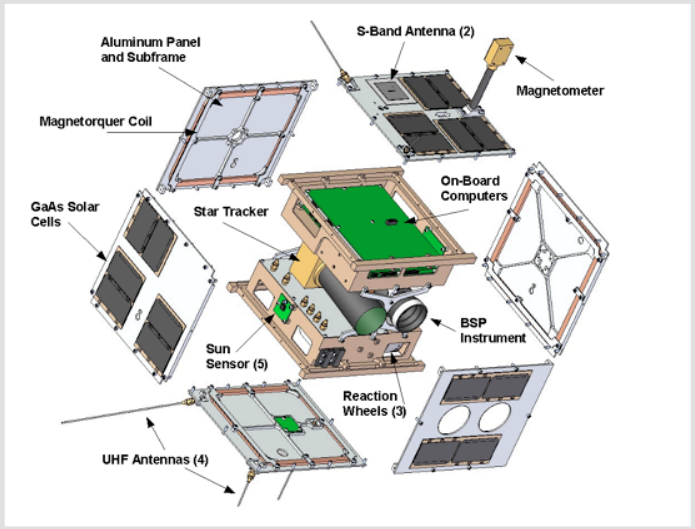


Planetary Research and Resources

OCT Small Spacecraft Programs
Franklin Small Satellite Subsystem Technology Program

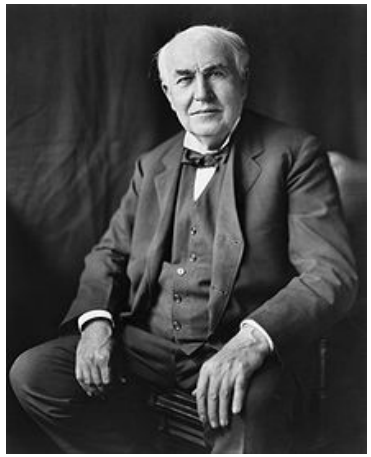
- **Objectives:** The Franklin Program will mature technologies that enable small satellites to provide game changing capabilities for the government and commercial sectors. At completion, the subsystem deliverables should be ready for demonstration in space.
- **TRL Maturation:** From TRL 3-4 to TRL 5-6
- **Solicitation:** Annual BAA. At least 2-8 competitively selected awards.
- **Awards:** One-year base activity with two, one-year options. Estimate $1-3 million per year.
- **Collaboration:** Competitions open to academia, industry, and federal laboratories with partnering strongly encouraged.

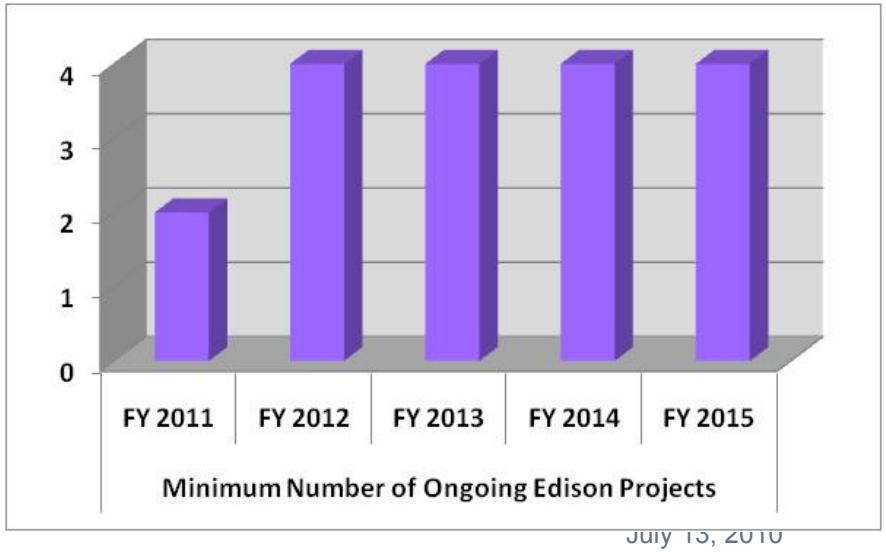




OCT Small Spacecraft Programs
Edison Small Satellite Demonstration Mission Program

- **Objectives:** Develop and operate a series of small satellite technology demonstration missions with game-changing and crosscutting potential for government and commercial sectors. Provide science and educational missions of opportunities as secondary objectives. Improve secondary payload space access.
- **TRL Maturation:** From TRL 5-6 to TRL 6-7
- **Solicitation:** Annual BAA. At least 1-2 competitively selected awards.
- **Awards:** Two years to launch readiness with development and launch gates. Estimate $1-10 million total mission cost range.
- **Collaboration:** Competitions open to academia, industry, and federal laboratories with partnering strongly encouraged.





OCT Small Spacecraft Programs
Joint Management

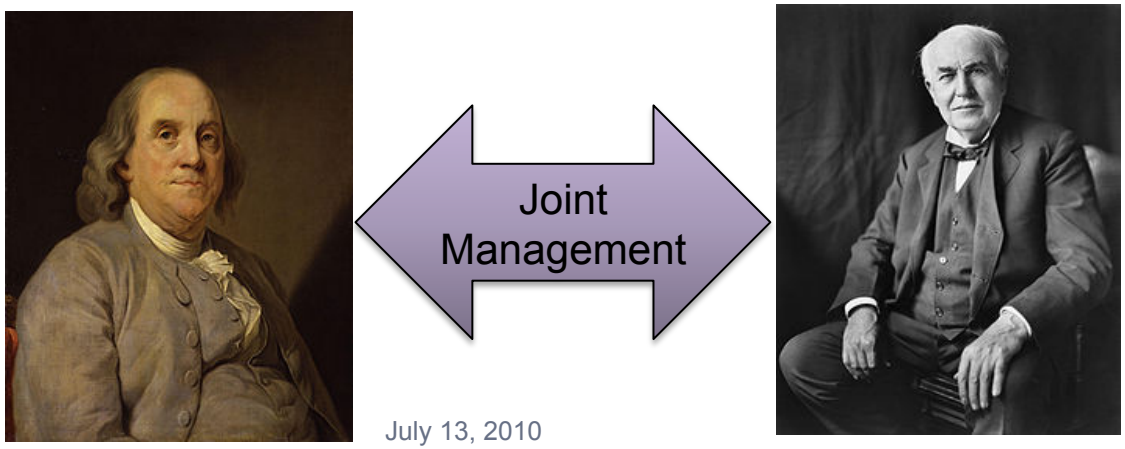
One Joint Program Office for Both Franklin and Edison Programs

- Resides at NASA Ames Research Center
- Firewall with proposing NASA organizations
- Franklin Level II Lead: Kimberly Hines, ARC
- Edison Level II Lead: Bruce Yost, ARC

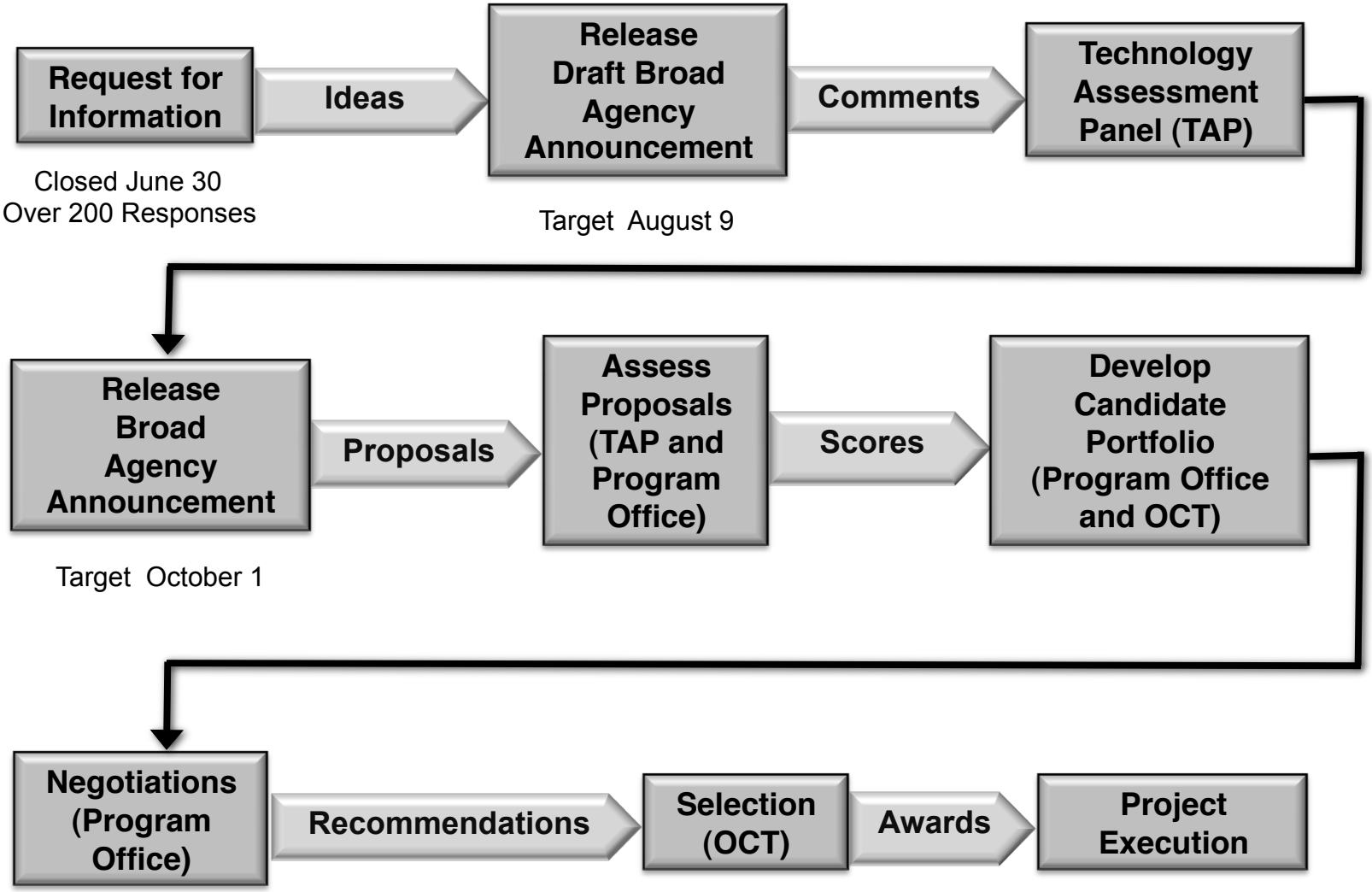
One Program Executive for Both Franklin and Edison Programs

- Resides in NASA Headquarters Office of the Chief Technologist
- Small Spacecraft Acting PE: Brant Sponberg, HQ OCT

One Annual Solicitation for Both Franklin and Edison Programs



OCT Small Spacecraft Programs
Franklin/Edison Annual Solicitation Process



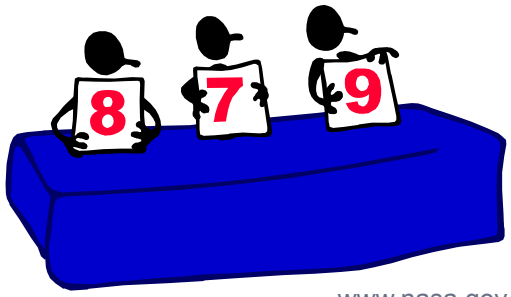
OCT Small Spacecraft Programs
BAA and TAP

Planned Solicitation Is a Broad Agency Announcement (BAA)

- Three Potential Types of Awards
  - Contracts
  - Grants
  - Cooperative Agreements

BAA Process Advised by Technology Assessment Panel (TAP)

- Help define the state-of-the-art in small spacecraft and subsystems
- Help set technology and mission priorities in the BAA
- Provide proposal peer review function
- Avoid duplication of other federal small spacecraft activities
- Membership Will Be ~10 Non-Proposers With Experience From:
  - NASA
  - DOD
  - Academia
  - Industry



OCT Small Spacecraft Programs Likely Key Evaluation Criteria

Technical Concept

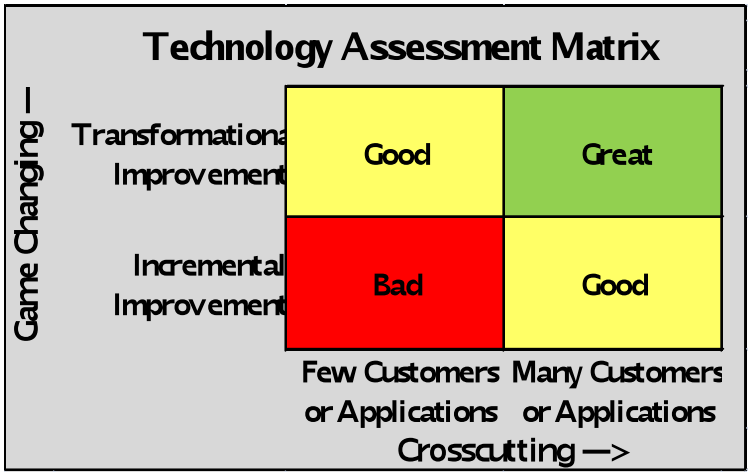
- Game-Changing, Crosscutting or Both
- Relevant TRL and Not Duplicative of Other Efforts

Technical Merit

- Degree of Game-Changing or Crosscutting Potential (or Both)
- Suitability of Approach, Including Criteria for Subsequent Phases and Evaluating Success
- Maturity of Risk Assessment

Project Viability

- SOW
- Proposed Costs
- Key Personnel



Final selection decisions made considering cost, available funding, and the best overall portfolio to meet the program objectives with respect to providing for a broad range of innovative activities and participation

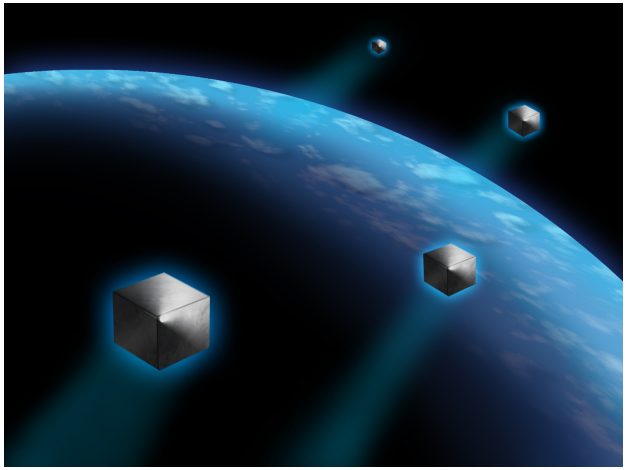
OCT Small Spacecraft Programs
Space Access

Now:

- Government-Furnished Secondary and Hosted Payloads Accommodations
  - BAA will provide orbits, adaptors, and accommodations/interfaces on common Government launches for proposers to design to
  - If selected, mission will be placed in queue for future flight
- Proposer-Furnished Secondary and Hosted Payload Accommodations
  - Can propose own or partner's accommodation

Future:

- Dedicated Small Spacecraft Launch
  - Follow-on launch service procurement to Centennial Challenges Nano-Satellite Launch Challenge or industry developments
- Interplanetary
  - Upper-stage reuse or host spacecraft



OCT Small Spacecraft Programs
Federal, Commercial, Science, and Education Opportunities

Cost Sharing

- Encouraged but not a requirement or selection criterion
- Enables programs to make more awards and develop/demonstrate more technology

Coordinate With, Not Duplicate, Other Federal Small Spacecraft Programs

- USAF ORS, DARPA F6, NSF Cubesats
- Proposals building on funding from other federal programs are welcome

Programs Will Work Flexibilities on Commercially Important Issues

- Intellectual property
- Data rights
- Title to rights and property

Science Opportunities

- Anticipate that scientific investigations will be performed in the course of many Edison demonstrations
- Some Edison missions may also be become platforms for peer-reviewed SMD and ESMD missions of opportunity

Educational Opportunities

- Anticipate hands-on university student involvement in many Edison and Franklin Projects
- Formulating complementary university consortium or institute

OCT Small Spacecraft Programs
Upcoming Events

NASA Town Hall at AIAA Small Satellite Conference

- August 9 in Logan, Utah
- Discussion with small spacecraft community

Draft BAA Release

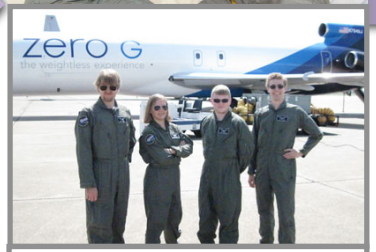
- Targeting August 9
- Seek comments from potential proposers

Final BAA Release

- Targeting October 1

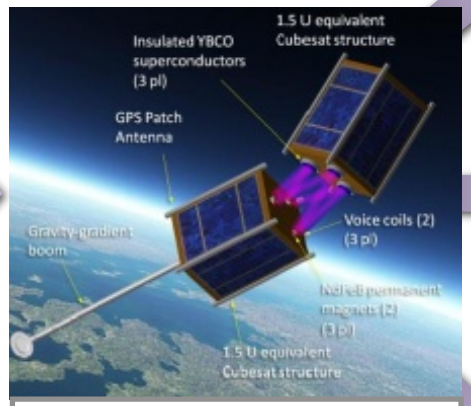
Good Things Come in Small Packages

Example: Flux-Pinned Spacecraft



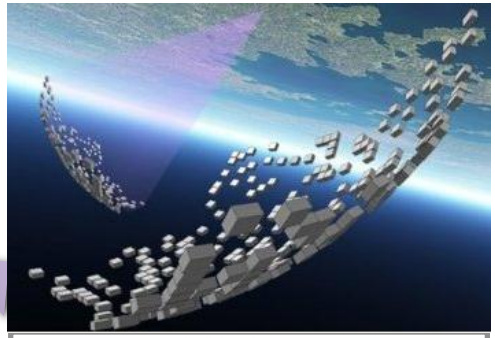
FAST

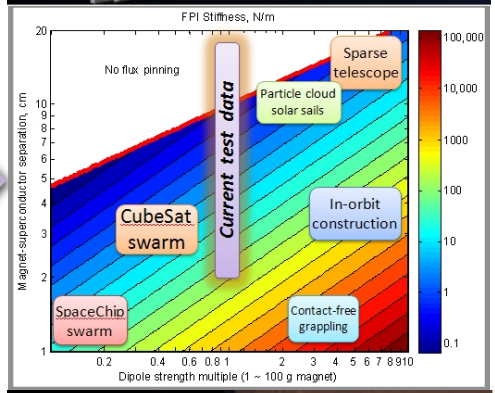
Facilitated Access to the Space Environment for Technology

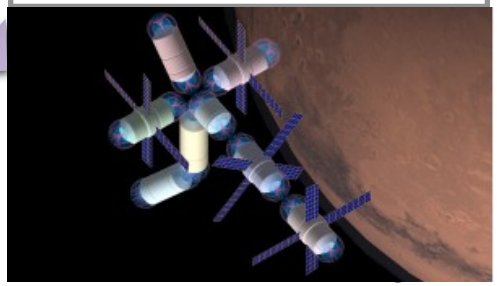


TBD:

Small Spacecraft Demonstration

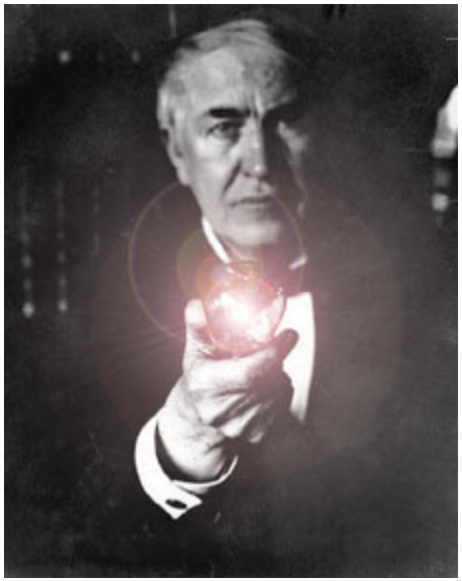






OCT Small Spacecraft Programs

Questions?



OCT Small Spacecraft Programs
Image Sources

Slide 2
http://en.wikipedia.org/wiki/File:Benjamin_Franklin_by_Joseph_Siffred_Duplessis.jpg
http://en.wikipedia.org/wiki/File:Thomas_Edison2.jpg

Slide 3
http://www.kk.org/thetechnium/archives/2009/07/was_moores_law.php

Slide 4
All images NASA or courtesy Andrews Space

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