



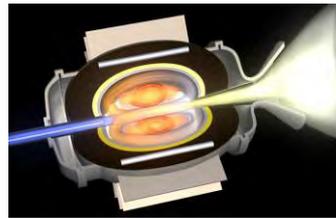
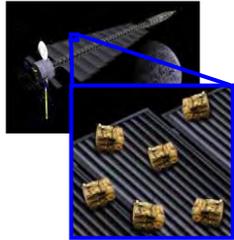
- **Space Technology is a new budget line in the President's FY11 Budget Request for NASA**
 - Consists of 10 technology development and innovation programs that are broadly applicable to the Agency's aeronautics, science and exploration enterprises
 - Managed by Office of the Chief Technologist (OCT)
 - Allows maturation of an innovative idea from concept to flight.
 - Responds to a wide range of external input including 4 NRC reports, associated hearings in the House Science Committee, and March 2010 testimony in the Senate Commerce Committee.
 - Beyond requirements technology focus is distinct from mission-focused technology development traditionally performed within NASA mission directorates.
- **Space Technology builds on the success of NASA's Innovative Partnerships Program (IPP)**
 - In FY11, IPP is integrated into Office of the Chief Technologist and the IPP budget is integrated into the Space Technology Program

BACKUP: Ten Space Technology Programs



- **Early Stage Innovation**
 - Space Technology Research Grants
 - NIAC
 - Centennial Challenges
 - SBIR/STTR
 - Center Innovation Fund
- **Game Changing Technology**
 - Game Changing Development
 - Franklin Small Satellite Subsystem Technology
- **Crosscutting Capability Development**
 - Technology Demonstration Missions
 - Flight Opportunities
 - Edison Small Satellite Missions

Level II Program Office: GRC



Objective: Accelerate the development of push technologies through innovative projects with high risk/high payoff

- **Grants:** Low TRL technology portfolio for foundational research in advanced space systems; *Space Technology equivalent to ARMD Fundamental Aeronautics Program.*
- **Fellowships:** Competitive selection of U.S Citizen / permanent resident graduate student that shows promise for future application toward NASA missions and strategic goals

Acquisition Strategy

- **Grants:** NRA calls anticipated once or twice annually
- **Fellowships:** Selected candidates will perform graduate student research on their respective campuses, at NASA Centers and not-for-profit Research and Development (R&D) labs. Each student matched with a technically relevant and community engaged researcher who will serve as the student's professional advisor.

Awards

- **Grants:** Typical 12 months awards at \$250K. 100+ per year
- **Fellowships:** Building up to 500 active students per year.

Collaboration

- **Grants:** Academia, not-for-profit R&D labs & NASA Centers lead proposals; others team.
- **Fellowships:** Strong collaboration is anticipated between NASA Centers/R&D Labs & Academia

Managed at NASA Headquarters



Studies exploring future space missions



Involve industry, academia & NASA to revolutionize space access, operations & utilization

Objective: NIAC is focused on early studies of visionary, long-term concepts

- Aerospace architecture, system, or mission concepts (TRL 1-2, 10+ years from application)
- OCT is re-establishing this effort as the *NASA Innovative Advanced Concepts* program
 - Guided by NRC findings and recommendations*
 - Run internally from HQ, and allowing internal NASA/JPL participation

Acquisition Strategy

- **Phase 1:** Examine the overall viability of an innovative system or concept
- **Phase 2:** Study major feasibility aspects (cost, performance, development time, key issues) and potential infusion path; competitively selected from successful Phase I
- Selections will be based on independent peer review of all qualified proposals; competition of ideas

Awards

- **Phase 1:** Up to 1 year, \$100K; 15-20 per year
- **Phase 2:** up to 2 years, \$500K; 3-8 per year

Collaboration

- Proposals welcome from all sources, including academia, industry, all US government agencies (including NASA and JPL), and partnerships.

*NRC report, *Fostering Visions for the Future: A Review of the NASA Institute for Advanced Concepts*, 2009

August 16, 2010

Centennial Challenges



Level II Program Office: MSFC



Since 2005, 19 competitions held in six Challenge areas, \$4.5M in prizes awarded to 13 different teams

Objective: Seek innovative solutions to technical problems that can drive progress in aerospace technology of value to NASA's missions in space operations, science, exploration and aeronautics.

- Opportunity for direct public participation in NASA's research and development efforts with cash prizes as incentives
- Achieve breakthrough tech development via prizes & non-traditional aerospace

Acquisition Strategy

- In selecting topics for prize competitions, NASA consults widely within and outside of the Federal Government.
- Awards are only made for successful demonstrations of design solutions
- NASA provides the Prize Purse and the competitions are managed at no cost to NASA by external non-profit organizations.

Awards

- Typical Prize amount is \$1-5M
- 100% of funds identified is for prizes. No funding for labor or travel
- FY 2011 PBR will allow NASA to pursue new and more ambitious prize competitions.

Collaboration

- Proposals welcome from the public for participation in NASA's research and development efforts .

http://www.nasa.gov/offices/ipp/innovation_incubator/centennial_challenges/index.html

NASA Small Business Innovation Research (SBIR) and Small Business technology Transfer Research (STTR) Program



Level II Program Office: ARC



2009 NASA SBIR grant for an advanced Lunar Surface Navigation system



Inflatable Technology to develop a rigidized thin film antenna for large aperture ground-based antenna; i.e. lunar ground station

Objective: To engage and provide opportunity to small businesses to participate in Federal Research activities and encourage cooperative research and development with non-profit research institutions, such as a university; with a primary objective of developing and facilitating the transfer of technology from research institutions through the entrepreneurship of small business contracts that result in technology to meet NASA's needs.

- Provide opportunities to participate in Federal Research activities
- Encourage cooperative research and development with non-profit research institutions

Acquisition Strategy

- Current Authorization provides for SBIR funding at a minimum of 2.5 percent of NASA's extramural research and development expenditures
- Modeled after SBIR, STTR is a separately funded activity; with funding set at a minimum of 0.3 percent of extramural research and development expenditures

Awards

- **Phase 1:** Up to 400 awards per year
- **Phase 2:** up to 200 awards per year

Collaboration

- Proposals welcome from small business concerns, in partnership with non-profit research institutions; such as a university.
- The percentage of new firms participating in NASA's SBIR/STTR programs each year has been in the 30-50% range, yielding new applicants each year. New participants have submitted between 20-35% of the total number of proposals in any given year.

<http://sbir.gsfc.nasa.gov/SBIR/SBIR.html>

Managed at each NASA Center



Objective

To stimulate and encourage creativity and innovation within the NASA Centers. The activities are envisioned to fall within the scope of NASA Space Technology or technology addressing a significant National need.

Acquisition Strategy

- Through the Center Chief Technologist, Centers will conduct competitions to select ideas/projects and provide appropriate oversight. Detailed feedback on these activities will be required before the end of each FY.
- Center activities will be scored and will affect funding distribution in subsequent years

Awards

- The funds will be distributed among the ten NASA centers to allow Centers to support low TRL innovative technology initiatives that leverage Center talent and capability.

Collaboration

- Partners will be sought out by the Centers for the pursuit of innovation that is of common interest to leverage these resources
- Partners will include other NASA Centers, private sector firms, universities, other government agencies and FFRDCs.

Game Changing Development



Level II Program Office: LaRC



Objective: Solicit innovative ideas enabling new capabilities or radically altering current approaches to launch, build, and operate space systems.

- Matures technologies through the mid-TRL regime to enable useful game changing capabilities for scientific discovery, and human and robotic exploration
- Projects are intended to be capability-oriented and to move ideas from discovery to use.
- GCD emulates the outcomes of the DARPA approach at technology development
- Guided by NRC's Findings and Recommendations*

Acquisition Strategy

- Concept Studies will be competed to flesh out idea(s), quantify their challenges and identify approaches to overcome them
- A subject matter expert Project Manager (PM) may recommend the idea for a new project start. If *game changing*, the Chief Technologist may authorize the PM to release a BAA
 - The BAA asks for many ideas to achieve the project goals from the community. The PM and a committee of experts assess and award multiple elements per project.

Awards

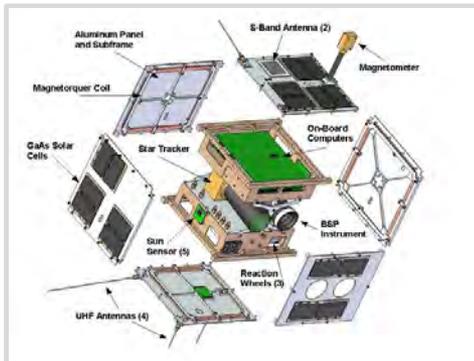
- **Concept Studies:** \$300K-\$500K; ~120/year (~60 in FY11)
- **Small Projects:** 2 - 3 years, ~\$3M/year; ~12 new project starts/ year (~6 in FY11)
- **Large Projects:** 2 - 3 years, ~\$12M/year; ~12 new project starts/ year (~6 in FY11)

Collaboration

- Teams will include Govt Agencies, academia and industry.

* NRC report, America's Future in Space, 2009
August 16, 2010

Level II Program Office: ARC



Objective

- Matures technologies that enable small satellites to provide game changing capabilities for the government and commercial. At completion, the subsystem deliverables should be ready for demonstration in space within the Edison Program under Crosscutting Capability Demonstrations Division.
- TRL Maturation: From TRL 3-4 to TRL 5-6

Acquisition Strategy

- Annual BAAs
- At least 2-8 new competitively selected awards.
- These two year activities with a possible third year will be regularly assessed using planned review gates (possible early cessation of projects due to high risk/high payoff)

Awards

- ~2-8 new awards/year
- One-year base activity with two, one-year options
- Estimate \$1-3 million per year.

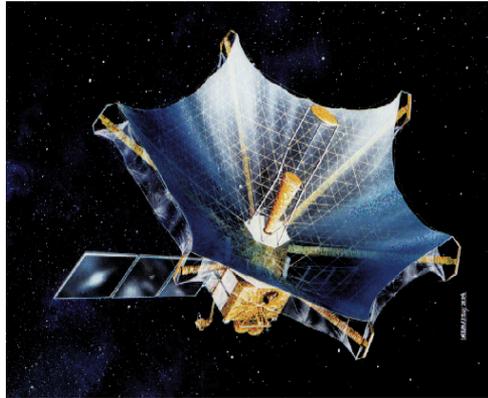
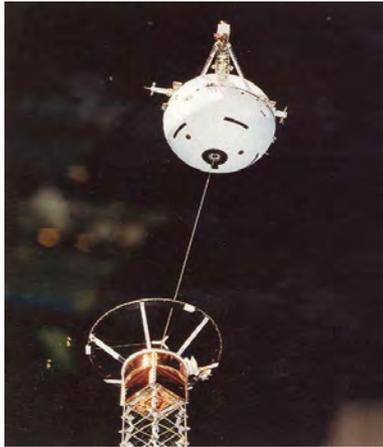
Collaboration

- Competitions for technology maturation will be open to NASA Centers, Govt. Agencies, Industry and Academia, with partnership strongly encouraged

Technology Demonstration Missions



Level II Program Office: MSFC



Objective

- Matures a small number of crosscutting technologies that benefit multiple customers to flight readiness status (TRL 6) through Projects that perform relevant environment testing.
- The primary objective is to help “bridge the gap” by maturing system-level space technologies through flight readiness and mission infusion.

Acquisition Strategy

- Annual BAAs; mandatory 25% cost sharing of Total Life Cycle Mission Cost to facilitate infusion
- **Release BAA - Step One/Screening Proposal**
 - 10 pages or less white paper
 - Two months to formulate team/prepare submit
- **Release BAA - Step Two/Flight Demo Proposal**
 - Full flight demonstration proposal; < 50 pages
 - Three months for full proposal submission
 - Same review panelists as in Step One

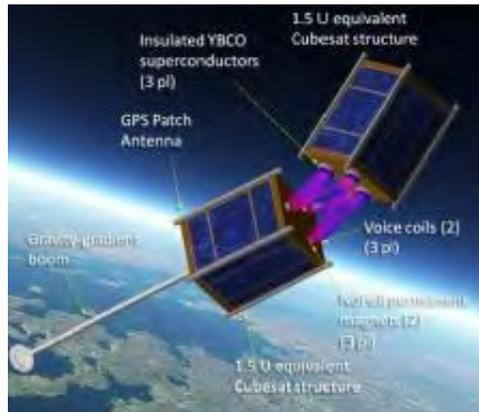
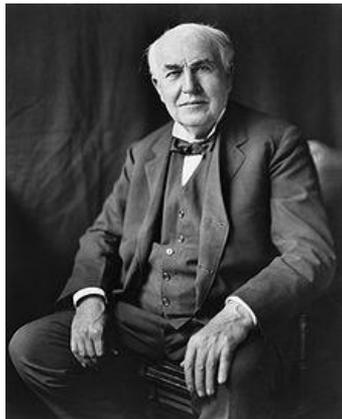
Awards

- Maximum three years development schedule.
Typical project life cycle cost (from OCT): \$150M

Collaboration

- Minimum 25% partner contribution to demonstrate infusion interest. Proposal teams may include NASA Centers, Govt. Agencies, Industry and Academia, with partnerships strongly encouraged

Level II Program Office: ARC



Objective

- Develop and operate a series of small satellite technology demonstration missions with NASA applications. 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

Acquisition Strategy

- Annual BAAs
- At least 1-2 new competitively selected awards.
- Two years to launch readiness with development and launch gates.

Awards

- ~1-2 new awards/year at \$1-10 million per year.

Collaboration

- Competitions for technology maturation will be open to NASA Centers, Govt. Agencies, Industry and Academia, with partnership strongly encouraged
 - Significant emphasis on NASA-university collaborative efforts to enable university students to gain hands-on experience within these project activities.

Level II Program Office: DFRC



Objective: Provide flight opportunities for technology development, science and education efforts in reduced-gravity environments, brief periods of weightlessness, and high-altitude atmospheric research. The Flight Opportunities Program combines the FY10 FAST and CRuSR efforts previously managed by NASA's Innovative Partnership Program. Goal of expanding program to other platforms and test environments in FY12.

- CRuSR will procure sub-orbital space transportation services to provide 3-4 minutes of microgravity environment for tech development, scientific and university research
- The FAST will procure parabolic flights to test technologies in a space environment that could simulate microgravity and the reduced gravity environments of the Moon or Mars

Acquisition Strategy

- CRuSR – RFQ for payload accommodation on operational and developmental suborbital platforms (FY11 is not man-tended)
- FAST – RFQ for payload accommodation on commercial and governmental parabolic flights
- Semi Annual BAA for researchers to gain access to CRuSR and FAST platforms to test technologies in a relevant space environment

Awards

- Parabolic flights: FY11 4 flight weeks/year with 15 payloads/flight week
- Suborbital flights: ~\$11M of flights purchased to multiple vendors.

Collaboration

- Industry, Government labs, and emerging commercial suborbital platform providers for access to simulated space environment
- Industry, Academia, Government researchers encourages to apply to Flight Opportunities platforms

Space Technology: President's Budget Request



Space Technology (Major Elements)	FY 2011 PBR	FY 2012	FY 2013	FY 2014	FY 2015	FY11-15 Total
Partnership Development & Strategic Integration	42.0	46.5	48.2	47.7	55.0	239.4
Early Stage Innovation	298.6	304.4	300.4	305.1	314.7	1523.2
Game Changing Technology	129.6	359.3	349.1	349.1	424.2	1611.3
Crosscutting Capability Demonstrations	102.0	302.0	362.0	362.0	424.0	1552.0
TOTAL	572.2	1012.2	1059.7	1063.9	1217.9	4925.9

Space Technology	FY 2011 PBR	FY 2012	FY 2013	FY 2014	FY 2015	FY11-15 Total
Partnership Development & Strategic Integration						
Partnership Development & Strategic Integration	42.0	46.5	48.2	47.7	55.0	239.4
Early Stage Innovation						
(1) Space Tech Res Grants	70.0	70.0	70.0	70.0	70.0	350.0
(2) NIAC	3.0	6.0	7.0	7.0	8.0	31.0
(3) Center Innovation Fund	50.0	50.0	50.0	50.0	50.0	250.0
(4) SBIR/STTR	165.6	168.4	163.4	168.1	176.7	842.2
(5) Centennial Challenges	10.0	10.0	10.0	10.0	10.0	50.0
Game Changing Technology						
(6) Game Changing Developments	123.6	329.3	319.1	319.1	394.2	1485.3
(7) Small Satellite Subsystems Tech	6.0	30.0	30.0	30.0	30.0	126.0
Crosscutting Capability Demonstrations						
(8) Technology Demonstration	75.0	265.0	325.0	325.0	387.0	1377.0
(9) Edison Small Satellite Demo	10.0	20.0	20.0	20.0	20.0	90.0
(10) Flight Opportunities	17.0	17.0	17.0	17.0	17.0	85.0
TOTAL	572.2	1012.2	1059.7	1063.9	1217.9	4925.9

Approximate Number of Planned Space Technology Awards (President's Budget Request FY 2011)



Award	FY11	FY12
Space Technology Research Grants	100	100
Space Technology Graduate Fellowships	350	500
NIAC Phase I awards	15-20	15-20
NIAC Phase II awards	0	3-5
Center Innovation Fund awards	125	150
SBIR/STTR Phase I awards	400	400
SBIR/STTR Phase II awards	200	200
New Centennial Challenges	5	5
Concept Studies Game Changing Development	60	100
Large Project Game Changing Development	6	12
Small Project Game Changing Development	6	12
Franklin Small Satellite Technologies	2	8
Technology Demonstration Missions	3	7
Edison Small Satellite Missions	1 or 2	1 or 2
FAST awards	40	40
CRuSR awards	4	4