

Themes of the President's FY11 NASA Budget Request



- **Technology Development is a strong theme across the President's FY11 NASA budget request**
 - Central principle of new Human Exploration strategy
 - Reverse of past decline and modest increase for Aeronautics (~15% or \$75M/yr)
 - Mission-focused technology investments maintained within the Science Mission Directorate
 - Utilization of ISS for technology development by the Space Operations Mission Directorate
 - New ARPA-like Space Technology Program (\$5B over 5 years)
- **This renewed emphasis balances the long-standing NASA core competencies of R&T, spaceflight hardware development, and mission operations.**
- **Increased emphasis on partnerships and STEM education**
 - Other government agencies, academia, industry and international
 - Theme of National Space Policy
- **Overarching goal is to reposition NASA on the cutting-edge**

External Input Has Driven Formulation of the NASA Space Technology Program



- **NASA Authorization Act of 2008:** *“A robust program of long-term exploration-related research and development will be essential for the success and sustainability of any enduring initiative of human and robotic exploration of the solar system.”*
- **NRC report, A Constrained Space Exploration Technology Program: A Review of NASA’s ETDP, 2008:** *“NASA has created a supporting technology program very closely coupled to the near-term needs of the Constellation Program. This program contains only incremental gains in capability and two programmatic gaps. NASA has effectively suspended research in a number of technology areas traditionally within the agency’s scope. This could have important consequences for those portions of the VSE beyond the initial short-duration lunar missions, including extended human presence on the Moon, human exploration of Mars, and beyond.”*
- **NRC report, America’s Future in Space, 2009:** *“NASA should revitalize its advanced technology development program by establishing a DARPA-like organization within NASA as a priority mission area to support preeminent civil, national security (if dual-use), and commercial space programs.”*
- **NRC report, Fostering Visions for the Future: A Review of the NASA Institute for Advanced Concepts, 2009:** *“To improve the manner in which advanced concepts are infused into its future systems, the committee recommends that NASA consider reestablishing an aeronautics and space systems technology development enterprise. Its purpose would be to provide maturation opportunities and agency expertise for visionary, far-reaching concepts and technologies.”*
- **Augustine Committee, 2009:** *“The Committee strongly believes it is time for NASA to reassume its crucial role of developing new technologies for space. Today, the alternatives available for exploration systems are severely limited because of the lack of a strategic investment in technology development in past decades.”*
- **NRC report, Capabilities for the Future: An Assessment of NASA Laboratories for Basic Research, 2010:** *“To restore the health of the fundamental research laboratories, including their equipment, facilities, and support services, NASA should restore a better funding and leadership balance between long-term fundamental research/technology development and short-term mission-focused applications.”*



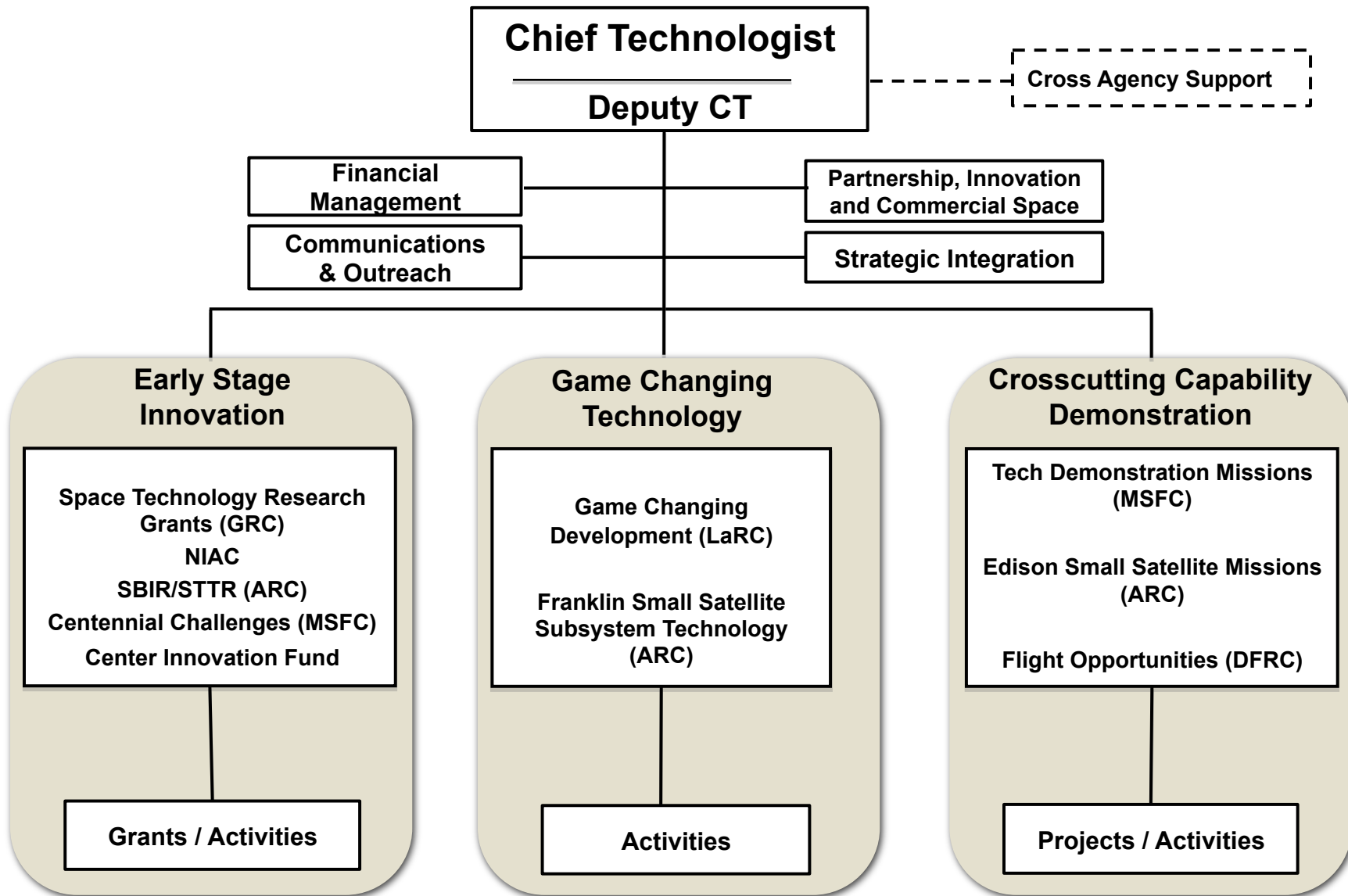
- **Space Technology is a new budget line in the President's FY11 Budget Request for NASA**
 - Consists of 10 technology development and innovation programs that are broadly applicable to the Agency's aeronautics, science and exploration enterprises
 - Managed by Office of the Chief Technologist (OCT)
- **OCT has chosen to manage these 10 programs through the formation of 3 Divisions**
 - Early Stage Innovation
 - Game Changing Technology
 - Crosscutting Capability Demonstrations
- **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

Office of Chief Technologist Roles/Responsibilities



- **OCT established in February 2010**
- **OCT has six main goals and responsibilities:**
 - 1) Principal NASA advisor and advocate on matters concerning Agency-wide technology policy and programs.
 - 2) Up and out advocacy for NASA research and technology programs. Communication and integration with other Agency technology efforts.
 - 3) Direct management of Space Technology Programs.
 - 4) Coordination of technology investments across the Agency, including the mission-focused investments made by the NASA mission directorates. Perform strategic technology integration.
 - 5) Change culture towards creativity and innovation at NASA Centers, particularly in regard to workforce development.
 - 6) Document/demonstrate/communicate societal impact of NASA technology investments. Lead technology transfer and commercialization opportunities across Agency.
- Mission Directorates manage the mission-focused technology programs for directorate missions and future needs
- Beginning in FY 2011, activities associated with the Innovative Partnerships Program are integrated into the Office of the Chief Technologist

Office of the Chief Technologist Organization



Space Technology Formulation Guidance (Passback)



Space Technology shall:

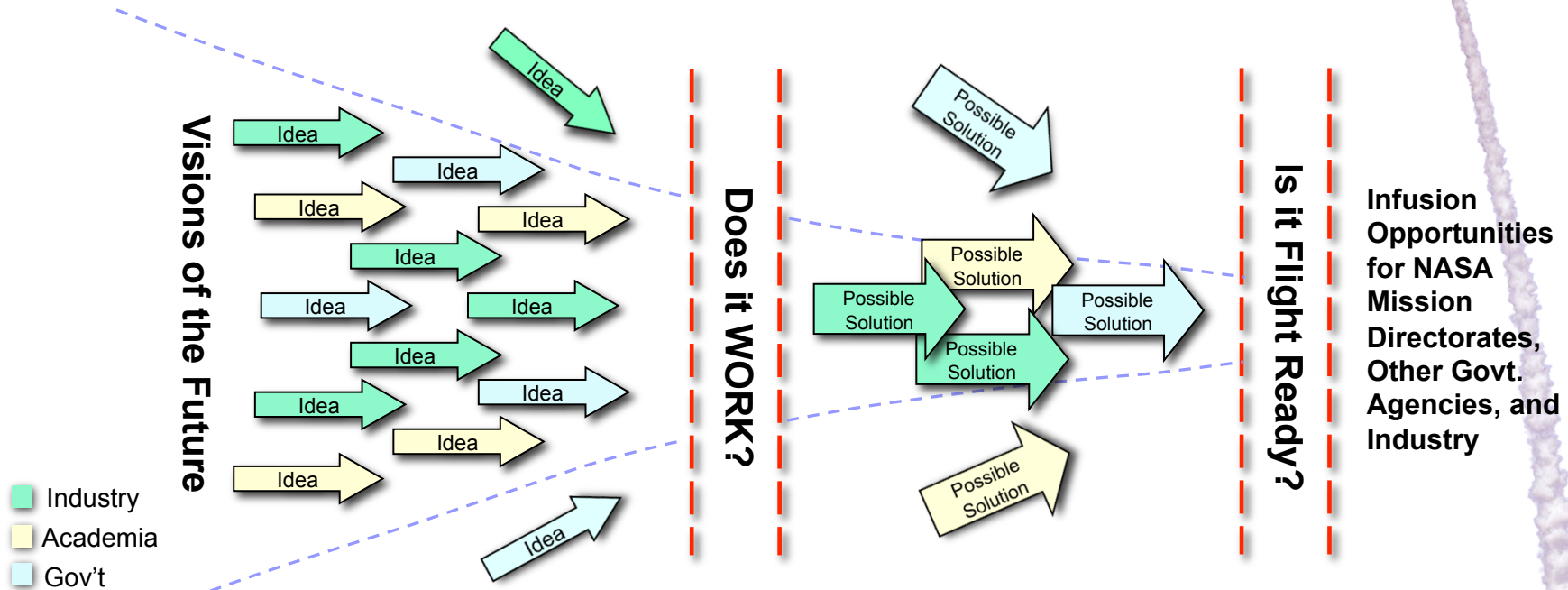
- Advance broadly-applicable technology.
- Produce technology products for which there are multiple customers.
- Meet the Nation's needs for new technologies to support future NASA missions in science and exploration, as well as the needs of other government agencies and the Nation's space industry in a manner similar to the way NACA aided the early aeronautics industry.
- Employ a portfolio approach over the Technology Readiness Level spectrum.
- Competitively select research by academia, industry, and the NASA Centers based on merit.
- Leverage the technology investments of our international, other government agency, academic and industrial partners.
- Establish a deliberative panel of internal and external stakeholders, including industry and other government agencies, to review and advise OCT on technology development priorities through a transparent and balanced process.
- Result in new inventions, new capabilities and the creation of a pipeline of innovators trained to serve future National needs.

Space Technology: A Different Approach



- **Strategic Guidance**
 - Agency Strategic Plan
 - Grand challenges
 - Technology roadmaps
- **Full spectrum of technology programs that provide an infusion path to advance innovative ideas from concept to flight**
- **Competitive peer-review and selection**
 - Competition of ideas building an open community of innovators for the Nation
- **Projectized approach to technology development**
 - Defined start and end dates
 - Project Managers with full authority and responsibility
 - Project focus in selected set of strategically defined capability areas
- **Overarching goal is to reposition NASA on the cutting-edge**
 - Technical rigor
 - Pushing the boundaries
 - Take informed risk and when we fail, fail fast and learn in the process
 - Seek disruptive innovation such that with success the future will no longer be a straight line
 - Foster an emerging commercial space industry

Space Technology Development Approach



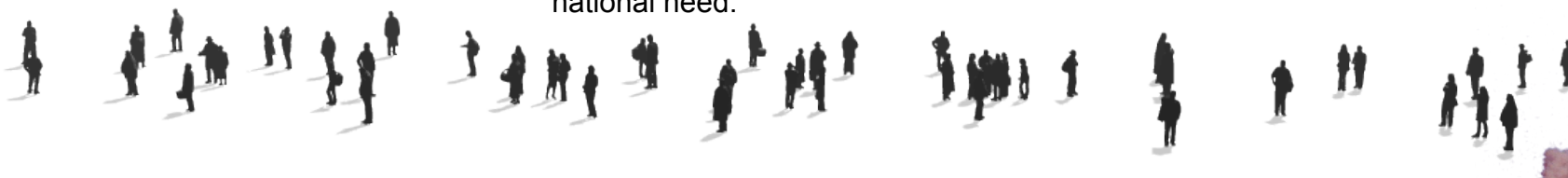
Early Stage Innovation
Creative ideas regarding future NASA systems or solutions to national needs.



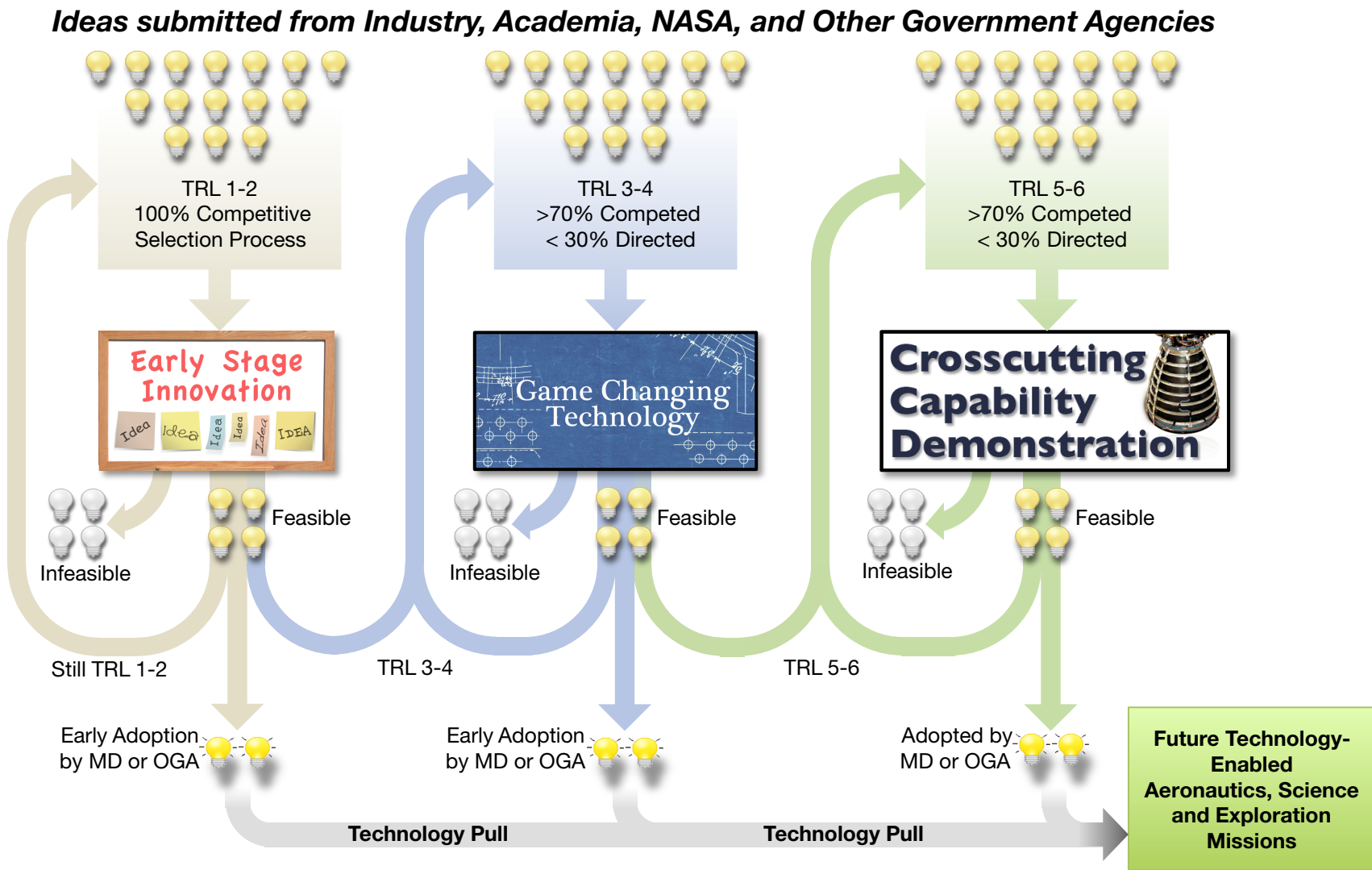
Game Changing Technology
Prove feasibility of novel, early-stage ideas with potential to revolutionize a future NASA mission and/or fulfill national need.



Crosscutting Capability Demonstration
Mature crosscutting capabilities that advance multiple future space missions to flight readiness status



Space Technology Allows for a Range of Technology Development Pathways



Starting Strong



- **Building on the success of NASA's Innovative Partnerships Program (IPP)**
 - 4 of the 10 programs
 - Centennial Challenges
 - SBIR/STTR
 - IPP Seed Fund → Center Innovation Fund
 - FAST and CRuSR → Flight Opportunities
 - Management Structure and Center Leadership
 - IPP Partnerships, Technology Transfer, Commercialization and Commercial Space → Partnerships, Innovation and Commercial Space
 - IPP Center field offices → Center Chief Technologist offices
- **In FY11, 40% of Space Technology line is IPP-related content**
- **Over FY11-FY15, 25% of Space Technology line is IPP-related content**
- **Formulation of the Space Technology programs was initiated in February and has proceeded rapidly and effectively.**
 - Integrated approach
 - Center personnel involved from the start
 - Plan has been stable
 - Broad external support

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

Relevant Federal Government Agency Efforts



Federal Government's objective

DARPA's rich history of success and innovation reflects the Agency's founding mission of preventing and avoiding strategic surprise for the Nation's Defense, but it has also led to the creation of entire new industries and sources of economic growth in the U.S.

Relevant Space Technology Program

- Game Changing Technology
- Technology Demonstration Mission



The objective of ARPA-E is cross-disciplinary research on energy challenges. ARPA-E is intended to fund high-risk, high-reward research that might not otherwise be pursued because there is a relatively high risk of failure

- Game Changing Technology
- Space Technology Research Grants



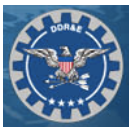
Created by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..."

- Space Technology Research Grants (fellowships and grants)



The Intelligence Advanced Research Projects Activity (IARPA) invests in high-risk/high-payoff research that has the potential to provide our nation with an overwhelming intelligence advantage over future adversaries.

- Game Changing Technology
- Space Technology Research Grants



The goal of DDR&E is to extend the capabilities of current war fighting systems, develop breakthrough capabilities, hedge against an uncertain future through a set of scientific and engineering options and counter strategic surprise.

- Game Changing Technology
- Technology Demonstration Mission



The Air Force Research Laboratory (AFRL) is a scientific research organization dedicated to leading the discovery, development, and integration of affordable, aerospace technologies.

- Small Satellite Programs (Franklin and Edison)

NASA Technology Integration Governance



NASA Technology Executive Council

- The NASA Technology Executive Council (NTEC) is organized and chaired by the NASA Office of the Chief Technologist.
- Council membership includes the Mission Directorate AAs (or their designees), and the NASA Chief Engineer (or designee).
- The function of NTEC is to perform Agency-level technology integration, coordination and strategic planning

Center Technology Council

- The Center Technology Council (CTC) is organized and chaired by the NASA Office of the Chief Technologist.
- Council membership includes the Center Chief Technologist (CCT) from each NASA Center, and a representative from OCE.
- The CTC will focus upon institutionally funded activities and development of OCT programs.

Governance model approved in May 2010

Management of Space Technology Programs



- **The NASA Chief Technologist is the final authority of the Space Technology Programs.**
- **Management of the Space Technology Programs will report through the equivalent of Directorate Program Management Council (DPMC) within the Office of the Chief Technologist.**
- **Agency Reporting and Management:**
 - All Space Technology Programs will be subject to tailored versions of 7120.8 at the Program Level
 - As flight projects, the Technology Demonstration Missions will report through the Baseline Performance Reporting (BPR) and the Agency level PMC. These flight projects will be subject to tailored versions of 7120.5
- **The Space Technology Programs (with exception of NIAC and Center Innovation Fund) have Level 2 Center Program Offices.**
 - The Center Program Offices report to Level 1 Program Executives at HQ who report through the OCT Division Directors to the NASA Chief Technologist.

Space Technology Engagement with External Community To Date



- **Three Space Technology Programs - SBIR/STTR and Centennial Challenges and Flight Opportunities are proceeding with standard cycle of external engagements as part of FY10 NASA IPP activities.**
- **On May 4, 2010, OCT released a NASA Technology Research Fellowship letter to NASA Field Centers and Federal Laboratories requesting research area topics.**
- **OCT issued on May 25, 2010, three RFIs for the Technology Demonstration Missions Program, the Edison Small Satellite Missions Program, and the Small Satellite Subsystem Technology Program.**
- **Space Technology Industry Day on July 13-14, 2010**
- **Internal program formulation process is proceeding on pace to allow release of Space Technology solicitations in early fall pending Congressional approval.**