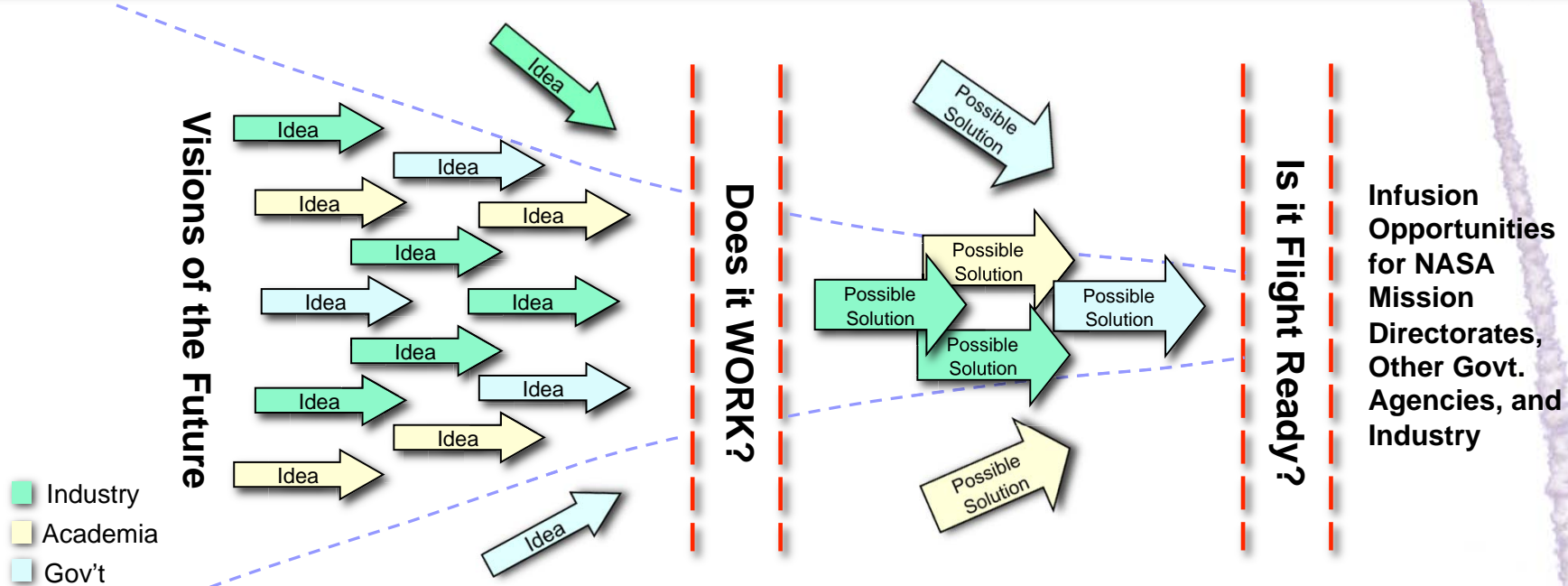


Space Technology Development Approach



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



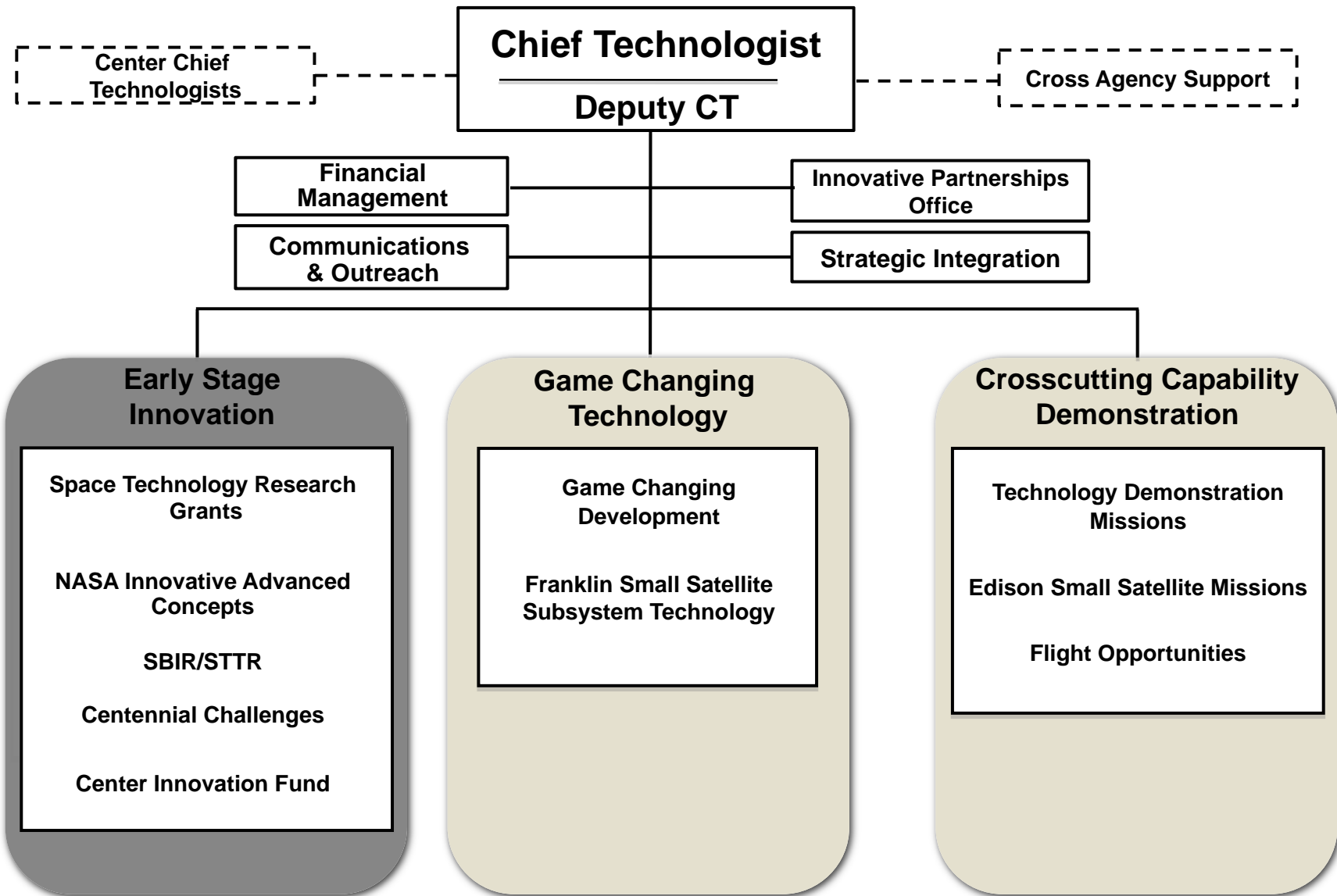
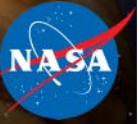
Game Changing Technology
Prove feasibility of novel, early-stage ideas with potential to revolutionize a future NASA mission and/or fulfill national need.



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



Office of the Chief Technologist Organization



Space Technology Grand Challenges



Space Technology Grand Challenges

Expand Human Presence in Space



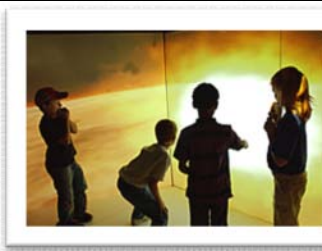
Economical Space Access

Provide economical, reliable and safe access to space, opening the door for robust and frequent space research, exploration and commercialization.



Space Health and Medicine

Eliminate or mitigate the negative effects of the space environments on human physical and behavioral health, optimize human performance in space and expand the scope of space based medical care to match terrestrial care.



Telepresence in Space

Create seamless user-friendly virtual telepresence environments allowing people to have real-time, remote interactive participation in space research and exploration.



Space Colonization

Create self-sustaining and reliable human environments and habitats that enable the permanent colonization of space and other planetary surfaces.

Manage In-Space Resources



Affordable Abundant Power

Provide abundant, reliable and affordable energy generation, storage and distribution for space exploration and scientific discovery.



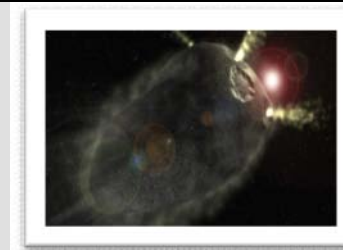
Space Way Station

Develop pre-stationed and in-situ resource capabilities, along with in-space manufacturing, storage and repair to replenish the resources for sustaining life and mobility in space.



Space Debris Hazard Mitigation

Significantly reduce the threat to spacecraft from natural and human-made space debris.




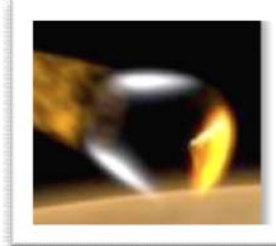


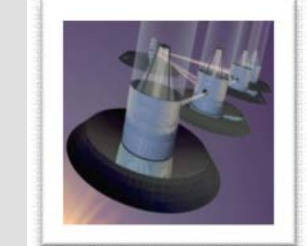
Near-Earth Object Detection and Mitigation

Develop capabilities to detect and mitigate the risk of space objects that pose a catastrophic threat to Earth.

Space Technology Grand Challenges



Enable Transformational Space Exploration and Scientific Discovery

				
<p><u>Efficient In-Space Transportation</u></p> <p>Develop systems that provide rapid, efficient and affordable transportation to, from and around space destinations.</p>	<p><u>High-Mass Planetary Surface Access</u></p> <p>Develop entry, descent and landing systems with the ability to deliver large-mass, human and robotic systems, to planetary surfaces.</p>	<p><u>All Access Mobility</u></p> <p>Create mobility systems that allow humans and robots to travel and explore on, over or under any destination surface.</p>	<p><u>Surviving Extreme Space Environments</u></p> <p>Enable robotic operations and survival, to conduct science research and exploration in the most extreme environments of our solar system.</p>	<p><u>New Tools of Discovery</u></p> <p>Develop novel technologies to investigate the origin, phenomena, structures and processes of all elements of the solar system and of the universe.</p>

The Broad Challenge of Space

The challenges of flying in space are such that a truly radical improvement in nearly any system used to design, build, launch, or operate a spacecraft has the potential to be transformative. In our search for technologies that will radically improve our existing capabilities or deliver altogether new space capabilities, it is likely that any great leap in capability will be the result of several, integrated advances. The Space Technology development portfolio extends across all systems critical to space missions and is not limited to the specific Space Technology Grand Challenges listed above. To meet the broad challenge of maintaining a robust and vibrant space program, investments will be considered in any space technology that has the potential to be transformative.

The future demands active curiosity, open minds, and a determination to resolve challenges as they present themselves. If you have a technology that you believe can answer these challenges, we want to hear about it.

Space Technology Roadmap Technical Areas (TAs)



TA01



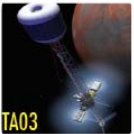
- LAUNCH PROPULSION SYSTEMS

TA02



- IN-SPACE PROPULSION TECHNOLOGIES

TA03



- SPACE POWER & ENERGY STORAGE

TA04



- ROBOTICS, TELE-ROBOTICS & AUTONOMOUS SYSTEMS

TA05



- COMMUNICATION & NAVIGATION

TA06



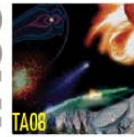
- HUMAN HEALTH, LIFE SUPPORT & HABITATION SYSTEMS

TA07



- HUMAN EXPLORATION DESTINATION SYSTEMS

TA08



- SCIENCE INSTRUMENTS, OBSERVATORIES & SENSOR SYSTEMS

TA09



- ENTRY, DESCENT & LANDING SYSTEMS

TA10



- NANOTECHNOLOGY

TA11



- MODELING, SIMULATION, INFORMATION TECHNOLOGY & PROCESSING

TA12



- MATERIALS, STRUCTURES, MECHANICAL SYSTEMS & MANUFACTURING

TA13



- GROUND & LAUNCH SYSTEMS PROCESSING

TA14



- THERMAL MANAGEMENT SYSTEMS

OCT Space Technology Divisions



	Early-Stage Innovation	Game-Changing Technology	Crosscutting Capability Demos
Development Stage	Concept Validation (TRL 1-3)	Tech Demonstration (TRL 3-5)	System Qualification (TRL 5-6)
Programs	Space Tech Research Grants NIAC Center Innovation Fund SBIR/STTR Centennial Challenges	Game Changing Development Small Satellite Subsystem Technology	Technology Demonstration Missions Edison Small Satellite Missions Flight Opportunities
Number of Projects	1000+	10-20	TDM: 3-8 ESSM: 1-3 FO: 20-40
Typical Project Cost	\$50K-\$800K	GCD: Large: \$25M; Small: \$6M SSST: \$6M	TDM: \$150M from OCT ESSM: \$10M FO: < \$5M
Project Duration	6 months – 2 years	2 yrs w/potential 1 yr extension	TDM: < 3 years ESSM: < 2 years FO: 6 months – 2 years
Performer Selection	100% Competed	> 70% Competed	> 70% Competed
Typical Performers	Academia, NASA, Industry	NASA, Fed Labs, Industry, Academia	Industry, NASA
Acquisition Strategy	Grants, Contracts, Cooperative Agreements, Prize Competitions	BAAs, Contracts	Contracts, Space Act Agreements
Cost-Sharing	Encouraged	Preferred	Required, 25% min for TDM
Partners	Academia Federal: NASA MDs, DARPA, DOD, DOE, NOAA, NSF, Other Industry: Aerospace, Non-Aerospace International Partners		

Early Stage Innovation Division



Major Accomplishments to Date and Plans for Upcoming Year

SBIR/STTR Program

- Implemented several program improvements this year, including Phase 2 award amount increase to \$750K, new Phase 2E funding mechanism, EHB modifications
Awarded 495 Phase 1, 215 Phase 2, 24 Phase 2E projects in late 2010
- Next year, will add several new program improvements, including Phase 1 award increase to \$150K, realigning technology topics to new Space Technology Roadmaps, and Virtual Site Visits by COTRs
Will award ~400-500 Phase 1, ~200 Phase 2, ~25 Phase 2E projects in late 2011

Space Technology Research Grants Program

- Issued call for Space Technology Research Fellowship applications (closed 23 February) — expecting ~150 fellowships to be awarded for Fall 2011 start
- Next year, will Issue call for Space Technology Research Opportunity proposals — expecting ~50 new efforts to be awarded — and will issue 2nd annual call for Space Technology Research Fellowships

Center Innovation Fund Program (previously, NASA Innovation Fund)

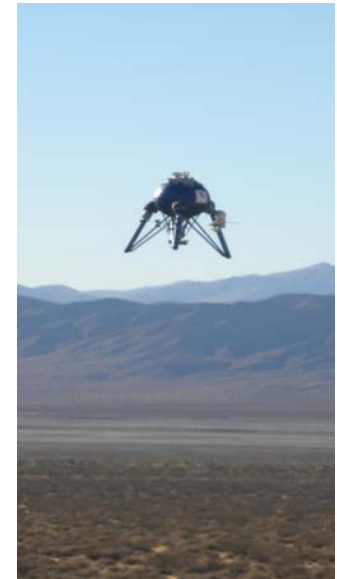
- Completed 43 concept study projects — presented to NASA via Virtual Poster Session
- Next year, will issue \$40M in technology funding across 10 NASA Centers

NIAC Program

- Issued call to restart program with at least 10 new Phase 1 efforts; proposals due on Monday 2 May
- Next year, will issue a new call for ~12 additional Phase 1 efforts and ~5 new Phase 2 efforts

Centennial Challenges Prize Program

- Announced three new prize competitions (Night Rover, Nano-sat Launch, Sample Return Robot)
- Conducted Strong Tether Challenge in August 2010 – three competitors; prize remains to be awarded
- Next year, will conduct competitions for Green Flight, Strong Tether, Power Beaming, Sample Return Robot, and Night Rover. Planning to retire ~3 existing challenges and announce ~3 new challenges



The role of Early Stage Innovation



- Per FY12 President's budget request, ESI will have approximately \$300M budget and will fund over 1000 new projects
- Key OCT themes relevant to ESI programs
 - Increasing alignment to Grand Challenges and Roadmap Technical Areas
 - Creative mechanisms to accommodate all players – across technology areas, TRL levels, organizational type
 - NASA Centers
 - Small and Large Businesses
 - Research Institutions
 - NASA Mission Directorates
 - International Partners
 - Other Government Agencies (DARPA, ARPA-E, NRL, NRO, AFOSR)
 - Balance our need for innovation (base, long-term, push) with our needs for missions (focused, near-term, pull)

***We are the seed-stage venture capitalists for
NASA technology development***