National Aeronautics and Space Administration

NASA

Space Technology FY 2013

Dr. Mason Peck,
Office of the Chief Technologist

ASEB
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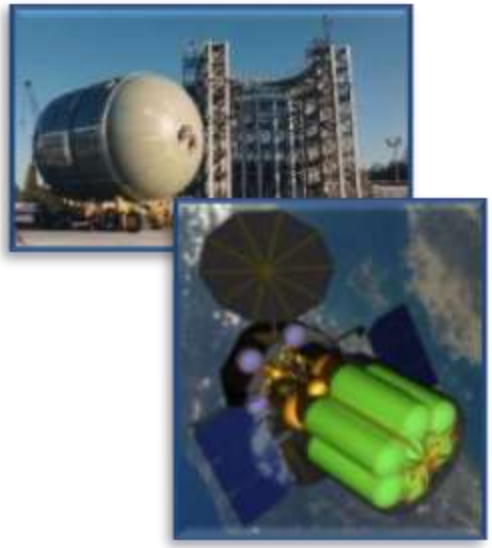
Technology at NASA



- NASA pursues **breakthrough technologies** to expand our frontiers in aeronautics and space
- **Advanced technologies are critical** for accomplishing NASA's current missions, and today's **technology investments are required** for the bold missions of NASA's future
- These same investments **benefit the United States economy** through creation of new industries, products, services, scientific discoveries, and societal benefits
- NASA's basic and applied research programs **span all of NASA's mission areas,** and includes activities benefiting **other government agencies and the Nation's aerospace industry**.
- NASA is implementing a portfolio of broadly applicable Space Technology programs to take the **best ideas** of our nation's innovators **from concept to flight**

Office of the Chief Technologist

Integrates Technology Investment Across the Agency

Serves as Advisor to Administration

Direct Technology Management and Budget Authority for the Space Technology Program

Office of the Chief Technologist

Leads Tech Transfer, Partnerships and Commercialization Activities Across the Agency

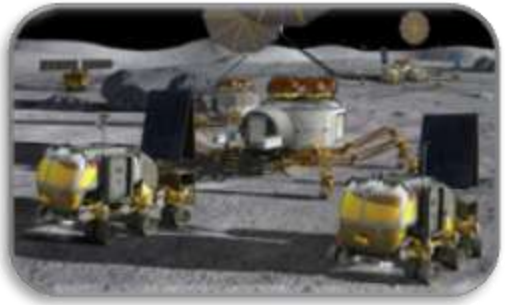
Advocates Externally NASA's R&D Programs

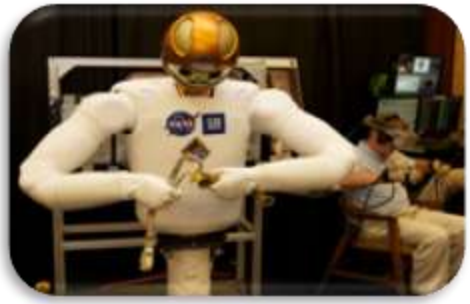
Demonstrates and Communicates Societal Impacts of NASA Technology Investments

Guiding Principles of the Space Technology Program

OCT's Space Technology Program

- Advances broadly applicable technology to infuse solutions into applications for which there are multiple customers.
- Employs portfolio approach to capture the entire spectrum of technology readiness.
- Competitively selects research by academia, industry, and the NASA centers based on technical merit.
- Leverages the technology investments of our international, other government agency, academic and industrial partners.
- Coordinates with internal and external stakeholders, including academia, industry and other government agencies
- Results in new inventions, new capabilities and the creation of a pipeline of innovators aimed at serving future National needs
- Grows the Nation's innovation economy





The Ten Programs of Space Technology

Early Stage Innovation

Space Technology Research Fellowships & Grant Programs

NASA Innovative Advanced Concepts (NIAC) Program

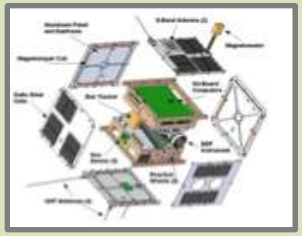
Center Innovation Fund Program

Centennial Challenges Prize Program

Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) Program

Game Changing Technology

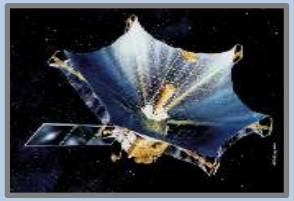
Game Changing Development



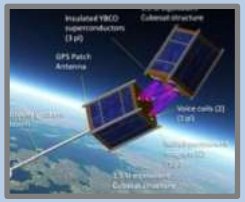
Franklin Small Satellite Subsystem Technology

Technology Capability Demonstrations

Flight Opportunities



Technology Demonstration Missions



Edison Small Satellite Demonstration Missions

Space Technology FY 2013 President's Budget Request

Budget Authority ($M)	FY 2012 Appropriation	FY 2013	Notional FY 2014	FY 2015	FY 2016	FY 2017
FY 2013 President's Budget Request	**573.7**	**699.0**	**699.0**	**699.0**	**699.0**	**699.0**
Partnership Development and Strategic Integration	29.5	29.5	29.5	29.5	29.5	29.5
SBIR/STTR	166.7	173.7	181.9	187.2	195.3	206.0
Crosscutting Space Technology Development	187.7	293.8	272.1	266.6	259.7	247.0
Early Stage Innovation	39.8	59.0	61.0	61.0	61.0	61.0
CSTD Game Changing Technology	61.5	66.7	73.7	69.1	58.4	58.4
CSTD Technology Demonstration Missions	65.3	128.9	103.4	102.5	106.3	93.6
Edison/Franklin Small Satellites	11.2	24.2	19.0	19.0	19.0	19.0
Flight Opportunities	10.0	15.0	15.0	15.0	15.0	15.0
Exploration Technology Development	189.9	202.0	215.5	215.7	214.5	216.5
ETD Game Changing Technology	111.2	104.0	70.5	79.8	85.9	90.9
ETD Technology Demonstration Missions	78.7	98.0	145.0	135.9	128.6	125.6

NRC Report on NASA's Space Technology Roadmaps

- The NRC study was released on February 1. It is a comprehensive report with important observations, analyses and priorities, including
  - Currently, available technology is insufficient to accomplish many upcoming missions in Earth orbit and beyond.
  - Success in executing future NASA space missions will depend on advanced technology developments that should already be underway.
  - NASA's technology base is largely depleted. So, revitalizing technology investment at NASA is required if NASA is to achieve the challenges before it.
  - Technological breakthroughs have been the foundation of virtually every NASA success. In addition, technological advances have yielded benefits far beyond space itself in down-to-Earth applications.
  - Future U.S. leadership in space requires a foundation of sustained technology advances.
  - The NRC concurs with the design of NASA's new Space Technology Program, with its cross cutting technology projects that span a range of technical maturity and include flight demonstrations.
- The NRC study emphasized 16 high-priority technology areas. NASA is currently investing in all 16 at some level.
- This assessment will help guide NASA's technology investment priorities in the years to come, working across the agency to address the findings.

Strategic Perspectives and Process

What NASA could do

Draft ST Roadmaps:

- 140 technical challenges (10 per roadmap)
- 320 technologies
- 20 year horizon

What NASA should do

NRC ST Roadmaps Study:

Gives priority to:

- 100 top technical challenges
- 83 high priority technologies (roadmap-specific)
- 16 highest of high technologies (looking across all roadmaps)
- Immediate 5 year horizon

What NASA is doing

Updated ST Roadmaps:

- Incorporate NRC Study Results
- Update with Mission Plans and Technological Developments

Internal Assessment to create Strategic Plan:

- Compare to Current Investments
- Compare to Current Plans
- Analyze Gaps

What NASA will do

Implement NASA Technology Portfolio Investments

- Technology Developments (across full TRL spectrum)
- Flight Demonstrations

Must reflect:

- Affordability
- Technical Progress and Performance
- Mission Needs and Commitments
- Stakeholder Guidance

Strategic Perspectives and Process

NASA Strategic Plan

Strategic Technology-Investment Plan

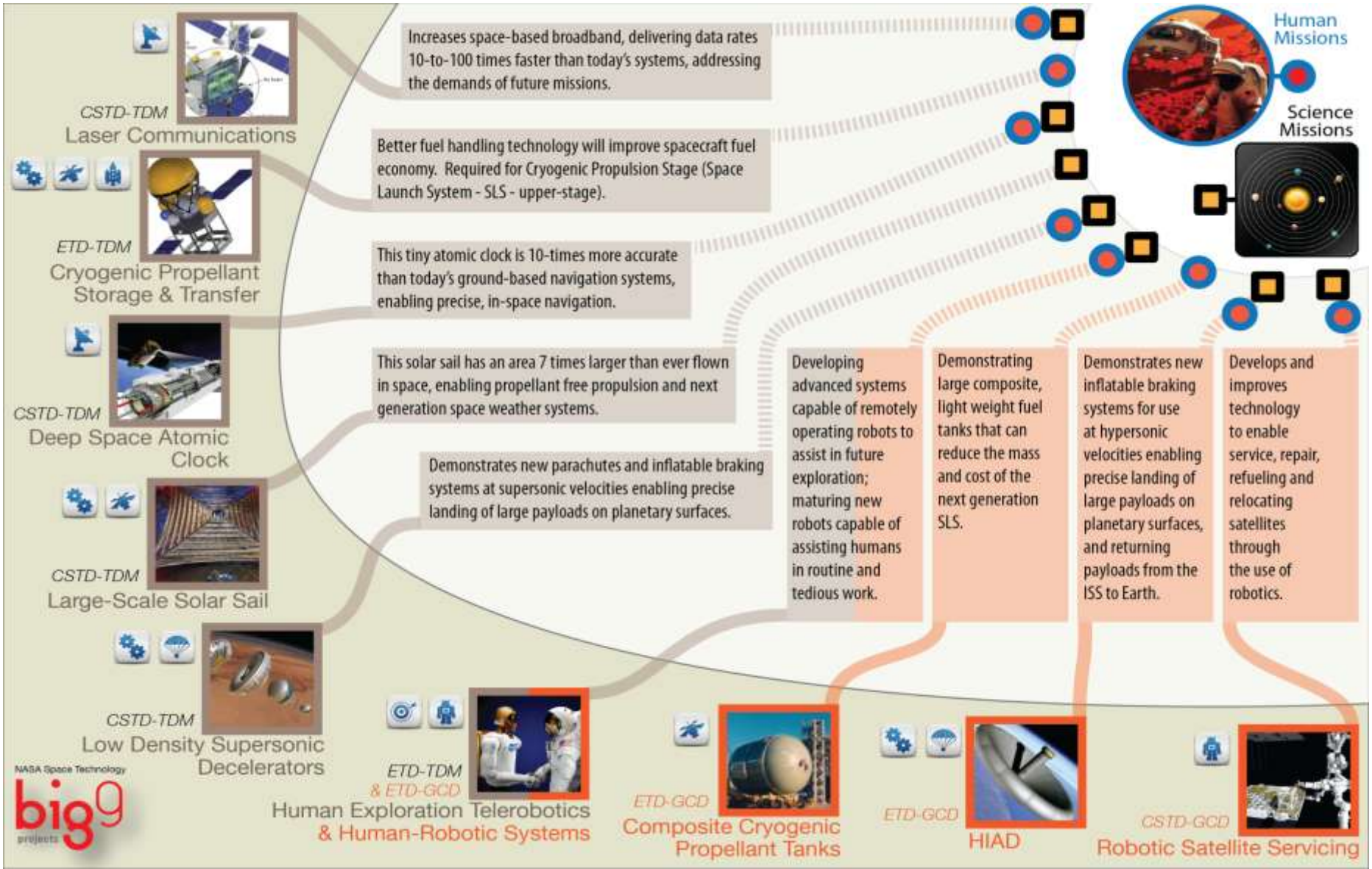
NASA's
- Current Technology Investments
- MD Technology Priorities
- Budget Constraints
- Center Capabilities/Facilities

NASA Space Technology Roadmaps

NRC Roadmap Analysis & Priorities

and Other Govt. Agency Partnership Opportunities

Big Nine Projects



“Big 9” FY 2012 Milestones

FY 2012

Projects	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sept-12
Composite Cryotank Tech and Demo							PDR		Develop 2m-Tank Fab. and Deliver to MSFC		2m Pressure Tank Test	Develop 5m Demo. Unit
Hypersonic Inflatable Aerodynamic Decelerators			IRVE-3 Delta CDR	System Tests		NFAC Tests	MRR	KDP-E Launch	Build-to-Print Fab. Complete	Wind Tunnel Test	LCAT Test	Wind Tunnel Test
Human Robotic Systems					Integrate Software on Rover				Complete Design Drawings	Complete Rover Cannon Assembly		Multiple Tests
Low Density Supersonic Decelerators				SDV 1 Test		PDR	SDV 2 Test	KDP-C	SDV 3 Test		CDR	
Deep Space Atomic Clock					SRR	KDP-B						
Mission Capable Solar Sail			SRR MDR	Tubes Test	Sail Test			Mechanism Test				PDR
Cryogenic Propellant Storage and Transfer							MCR	KDP-A				
Laser Comm. Relay Demo.									MCR			
Robotic Satellite Servicing	RFI Released		RFI Complete			RRM OPS		Workshop				

Key
- KDP
- Launch
- Testing
- Development
- Review
- Critical Event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Office of the Chief Technologist

Acronyms

- CDR – Critical Design Review
- Comm. – Communications
- Demo. – Demonstration
- DVT – Design Verification Test
- Fab. – Fabrication
- KDP – Key Decision Point
- LCAT – Large Core Arc Tunnel
- M – Meter
- MCR – Mission Control Review
- MRR – Mission Readiness Review
- MSFC – Marshall Space Flight Center
- NFAC – National Full-Scale Aerodynamics Complex
- PDR – Preliminary Design Review
- RFI – Request For Information
- RRM – Robotic Refueling Mission
- SRR – Systems Requirements Review
- TBD – To Be Determined
- Tech. – Technologies