

National Aeronautics and  
Space Administration



# Space Technology Mission Directorate

## NASA Exploration Forum

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[www.nasa.gov/spacetech](http://www.nasa.gov/spacetech)





# Space Technology Portfolio



## Transformative & Crosscutting Technology Breakthroughs

### Technology Demonstration Missions

bridges the gap between early proof-of-concept tests and the final infusion of cost-effective, revolutionary technologies into successful NASA, government and commercial space missions.



### Small Spacecraft Technology Program

develops and demonstrates new capabilities employing the unique features of small spacecraft for science, exploration and space operations.

### Game Changing Development

seeks to identify and rapidly mature innovative/high impact capabilities and technologies that may lead to entirely new approaches for the Agency's broad array of future space missions.



## Pioneering Concepts/Developing Innovation Community

### NASA Innovative Advanced Concepts (NIAC)

nurtures visionary ideas that could transform future NASA missions with the creation of breakthroughs—radically better or entirely new aerospace concepts—while engaging America's innovators and entrepreneurs as partners in the journey.

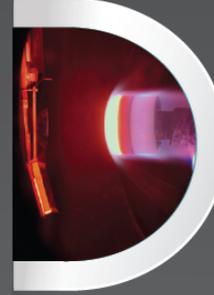


### Space Technology Research Grants

seek to accelerate the development of "push" technologies to support future space science and exploration needs through innovative efforts with high risk/high payoff while developing the next generation of innovators through grants and fellowships.

### Center Innovation Fund

stimulates and encourages creativity and innovation within the NASA Centers by addressing the technology needs of the Agency and the Nation. Funds are invested to each NASA Center to support emerging technologies and creative initiatives that leverage Center talent and capabilities.



## Creating Markets & Growing Innovation Economy

### Centennial Challenges

directly engages nontraditional sources advancing technologies of value to NASA's missions and to the aerospace community. The program offers challenges set up as competitions that award prize money to the individuals or teams that achieve a specified technology challenge.



### Flight Opportunities

facilitates the progress of space technologies toward flight readiness status through testing in space-relevant environments. The program fosters development of the commercial reusable suborbital transportation industry.

### Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR)

Programs provide an opportunity for small, high technology companies and research institutions to develop key technologies addressing the Agency's needs and developing the Nation's innovation economy.





# Deep Space Exploration is Near

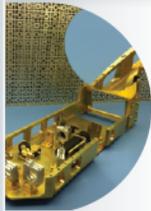


*Space Technology will focus investments in 8 key thrust areas that will enable or substantially enhance future NASA mission capabilities.*



## High Power Solar Electric Propulsion

Deep space human exploration, science missions and commercial applications with investments in advanced solar arrays and advanced electric propulsion systems, high-power Hall thrusters and power processing units.



## Space Optical Comm.

Substantially increase the available bandwidth for near Earth space communications currently limited by power and frequency allocation restrictions, and increase the communications throughput for a deep space mission.



## Advanced Life Support & Resource Utilization

Technologies for human exploration mission including Mars atmospheric In-situ resource utilization, near closed loop air revitalization and water recovery, EVA gloves and radiation protection.



## Mars Entry Descent and Landing Systems

Permits more capable science missions, eventual human missions to Mars including, hypersonic and supersonic aerodynamic decelerators, a new generation of compliant TPS materials, retro-propulsion technologies, instrumentation and modeling capabilities.



## Space Robotic Systems

Creates future humanoid robotics, autonomy and remote operations technologies to substantially augment the capability of future human space flight missions.



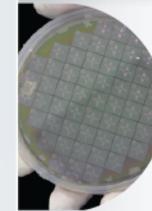
## Lightweight Space Structures

Targets substantial increases in launch mass, and allow for large decreases in needed structural mass for spacecraft and in-space structures.



## Deep Space Navigation

Allows for more capable science and human exploration missions using advanced atomic clocks, x-ray detectors and fast light optical gyroscopes.



## Space Observatory Systems

Allows for significant increases in future science capabilities including, AFTA/WFIRST coronagraph technology to characterize exoplanets by direct observation and advances in the surface materials as well as control systems for large space optics.

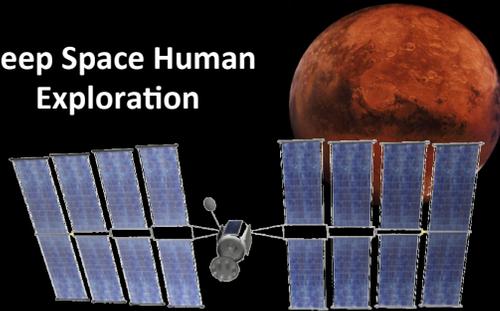
# THRUST AREAS



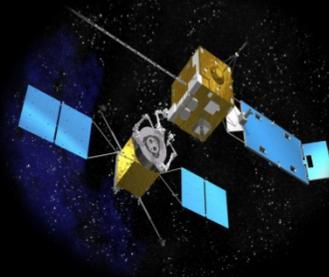
# High-powered SEP Enables Multiple Applications



Deep Space Human Exploration



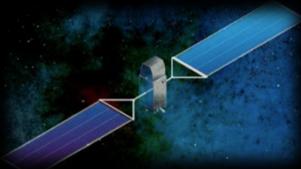
Satellite Servicing



Payload Delivery



Commercial Space Applications



Solar Electric Propulsion

ISS Utilization



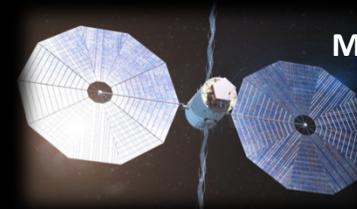
Orbital Debris Removal



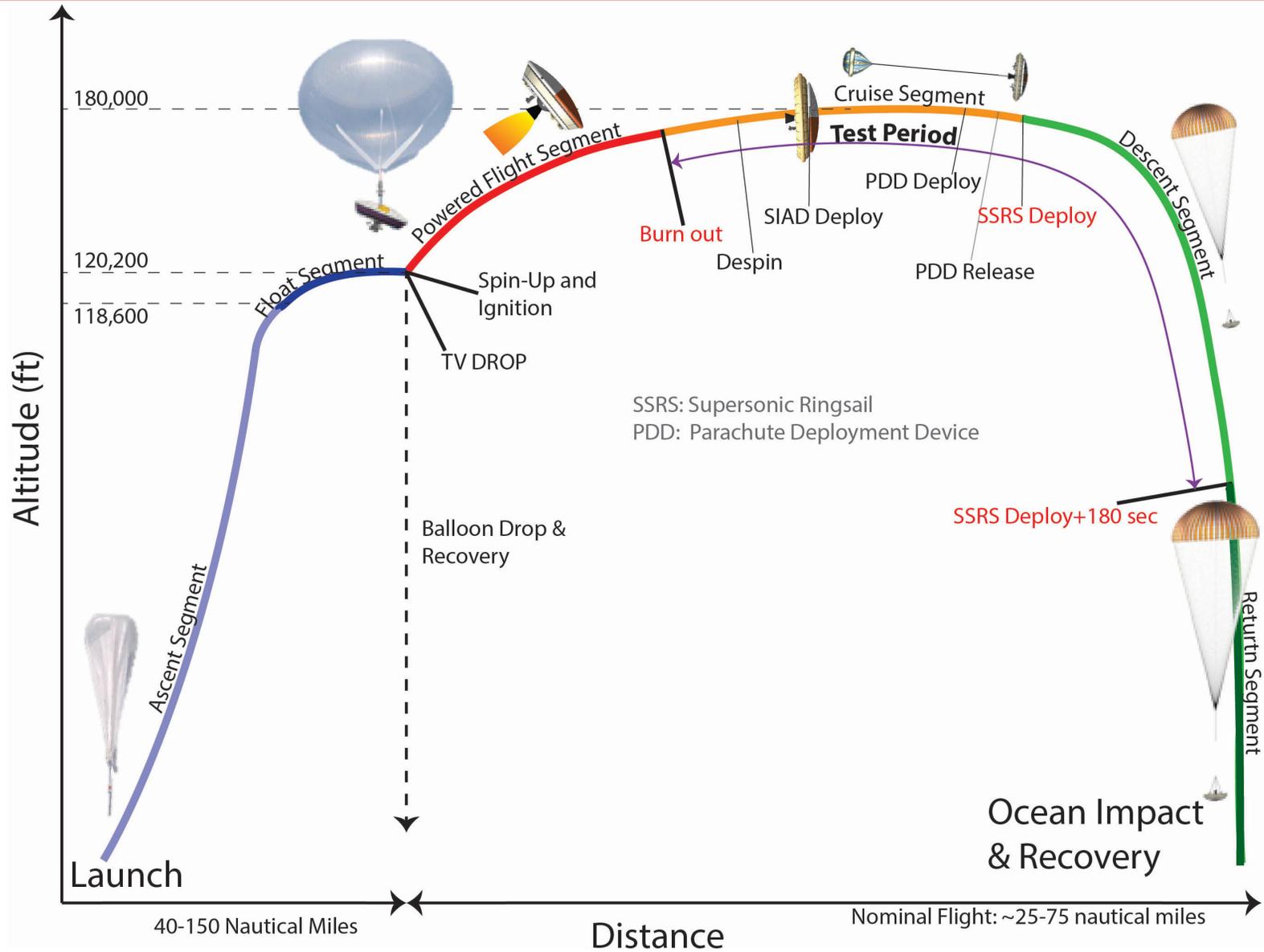
Space Science Missions



OGA Missions



# LDSD Supersonic Flight Plan June 2014

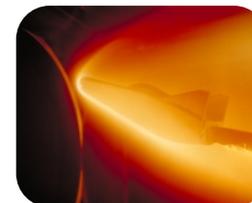
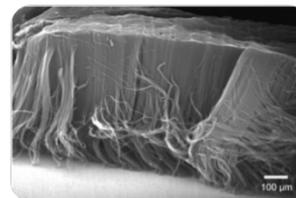
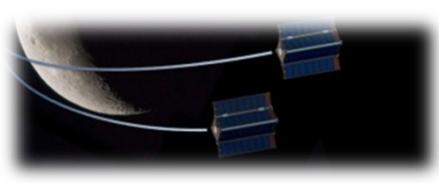
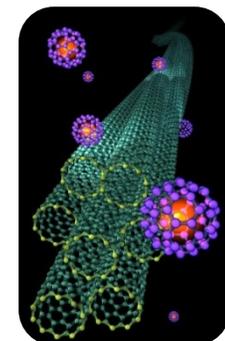


# Space Technology Investments to Advance Future Capabilities



STMD continues to solicit the nation's best and brightest technologists across academia, industry, and government to drive innovative, enabling solutions in such areas as:

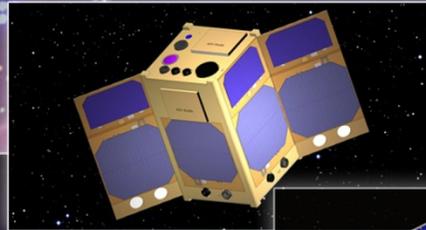
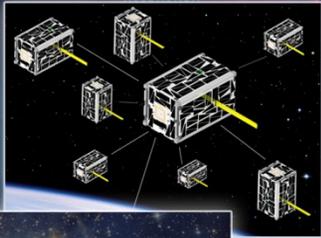
- **Solar Electric Propulsion** – Advanced high-power, low-volume solar arrays and high-power propulsion systems
- **Space Power-** Affordable, High Efficiency Power Generation and Energy Storage Systems
- **Life Support and Resource Utilization** - High Performance Resource Production and Recycling Systems
- **Entry, Descent, and Landing** - Advanced Computational Modeling and Analytical Simulation Tools
- **Space Robotic Systems** – High Reliability Sample Return Robots and low mass deep ice penetration systems
- **Space Optical Communications** – Enhanced Deep Space Optical Communication Capabilities for small space crafts and high efficiency laser systems
- **Lightweight Space Structures** – Ultralight, Ultrastrong Nanomaterials
- **Space Observatory Systems** – Advanced Optical Coating Materials for Space Environments



# space technology



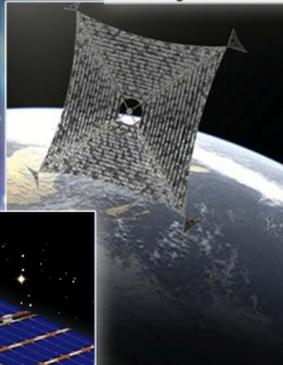
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