



EXPLORE SPACE TECH

QUICK INTRODUCTION TO SMALL SPACECRAFT IN SPACE TECH

NASA Townhall | 35th Annual Small Satellite Conference

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SPACE TECHNOLOGY MISSION DIRECTORATE STRATEGIC THRUSTS

LEAD



Ensuring American global leadership in Space Technology

- Lunar Exploration building to Mars and new discoveries at extreme locations
- Robust national space technology engine to meet national needs
- U.S. economic growth for space industry
- Expanded commercial enterprise in space

THRUSTS



Go

Rapid, Safe, and Efficient Space Transportation



Land

Expanded Access to Diverse Surface Destinations



Live

Sustainable Living and Working Farther from Earth



Explore

Transformative Missions and Discoveries

OUTCOMES

- Develop nuclear technologies enabling fast in space transits.
- Develop cryogenic storage, transport, and fluid management technologies for surface and in space applications.
- Develop advanced propulsion technologies that enable future science/exploration missions.
- Enable Lunar/Mars global access with 20t payloads to support human missions.
- Enable science missions entering/transiting planetary atmospheres and landing on planetary bodies.
- Develop technologies to land payloads within 50 meters accuracy and avoid landing hazards.
- Develop exploration technologies and enable a vibrant space economy with supporting utilities and commodities
 - Sustainable power sources and other surface utilities to enable continuous lunar and Mars surface operations.
 - Scalable ISRU production/utilization capabilities including sustainable commodities on the lunar & Mars surface.
 - Technologies that enable surviving the extreme lunar and Mars environments.
 - Autonomous excavation, construction & outfitting capabilities targeting landing pads/structures/habitable buildings utilizing in situ resources.
- Enable long duration human exploration missions with Advanced Life Support & Human Performance technologies.
- Develop next generation high performance computing, communications, and navigation.
- Develop advanced robotics and spacecraft autonomy technologies to enable and augment science/exploration missions.
- Develop technologies supporting emerging space industries including: Satellite Servicing & Assembly, In Space/Surface Manufacturing, and Small Spacecraft technologies.
- Develop vehicle platform technologies supporting new discoveries.
- Develop transformative technologies that enable future NASA or commercial missions and discoveries

PRIMARY CAPABILITIES

- Nuclear Systems
- Cryogenic Fluid Management
- Advanced Propulsion
- Entry, Descent, Landing, & Precision Landing
- Advanced Power
- In Situ Resource Utilization
- Advanced Thermal
- Advanced Materials, Structures, & Construction
- Advanced Life Support & Human Performance
- Advanced Avionics Systems
- Advanced Communications & Navigation
- Advanced Robotics
- Autonomous Systems
- Satellite Servicing & Assembly
- Advanced Manufacturing
- Small Spacecraft
- Rendezvous, Proximity Operations & Capture

EXPLORE SPACE TECH

CHANGING THE PACE OF SPACE

Leveraging small spacecraft and responsive launch to rapidly expand space capabilities at dramatically lower costs

Rapid Leap from Lab to Orbit

Commercial suborbital and orbital test capabilities de-risking technology for future missions. Technology moves from lab to orbit in <9 months.

Expanded space commerce
On-orbit manufacturing, assembly, and inspection

Responsive deep space access

Sustained deep space presence
Commercial lunar activity
In-situ resource extraction and utilization

On-Demand Missions Beyond Earth

Targeted measurements of Moon, Mars, Venus, and the asteroid belt in response to events and opportunities. Capabilities are competitive with traditional systems but developed for <\$30M in <3 years.

Unprecedented Deep Space Infrastructure

Modular communications, navigation, and mission support that provides full coverage of Moon and Mars. Each node costs <\$20M to build and deliver to space.

Unparalleled Sensing Capabilities

Networked spacecraft providing multi kilometer synthetic apertures and massive sensor webs of 30 to 100 spacecraft. Each node costs <\$10M to build and deliver to space.

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WITH SMALL SPACECRAFT

The Small Spacecraft Technology program expands the ability to execute unique missions through rapid development and demonstration of capabilities for small spacecraft applicable to exploration, science and the commercial space sector.

21 Spacecraft launched since 2015*

11 Spacecraft projected to launch in 2021*

Technologies used operationally for missions in Earth orbit and at Mars

* As of June 30, 2021



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THROUGH SUBORBITAL FLIGHT

The Flight Opportunities program rapidly demonstrates promising technologies for space exploration, discovery, and the expansion of space commerce through suborbital testing with industry flight providers.

225 successful suborbital flights since 2011* enabling 768 tests of payloads

31 suborbital flights projected for 2021*

Technologies used for missions in Earth orbit, at Mars, and soon to be on the Moon

* As of June 30, 2021

