

The background of the slide is a composite image of space. On the left, a large, detailed view of the Moon's surface is shown, with its characteristic grey and white craters and maria. To its upper left, the reddish-orange surface of Mars is visible. A small satellite or probe is shown in the distance, emitting a bright blue beam of light that extends towards the center of the slide. The sky is a deep, dark blue, filled with numerous small white stars. In the bottom right corner, the silhouette of a person's head and shoulders is visible, looking towards the left. The bottom edge of the slide shows a dark, silhouetted horizon line against a lighter, hazy sky.

EXPLORESPACE TECH
TECHNOLOGY DRIVES EXPLORATION

Space Technology Overview

NASA Smallsat Townhall

Walt Engelund | Deputy Associate Administrator for Programs, Space Technology Mission Directorate | 08.03.2020

SPACE TECHNOLOGY PORTFOLIO

EARLY STAGE INNOVATION

- NASA Innovative Advanced Concepts
- Space Tech Research Grants
- Center Innovation Fund/ Early Career Initiative

PARTNERSHIPS AND TECHNOLOGY TRANSFER

- Technology Transfer
- Prizes and Challenges
- iTech

SBIR/STTR PROGRAMS

- Small Business Innovation Research
- Small Business Technology Transfer

TECHNOLOGY MATURATION

- Game Changing Development
- Lunar Surface Innovation Initiative

TECHNOLOGY DEMONSTRATIONS

- Technology Demonstration Missions
- Small Spacecraft Technology
- Flight Opportunities

Technology Drives Exploration

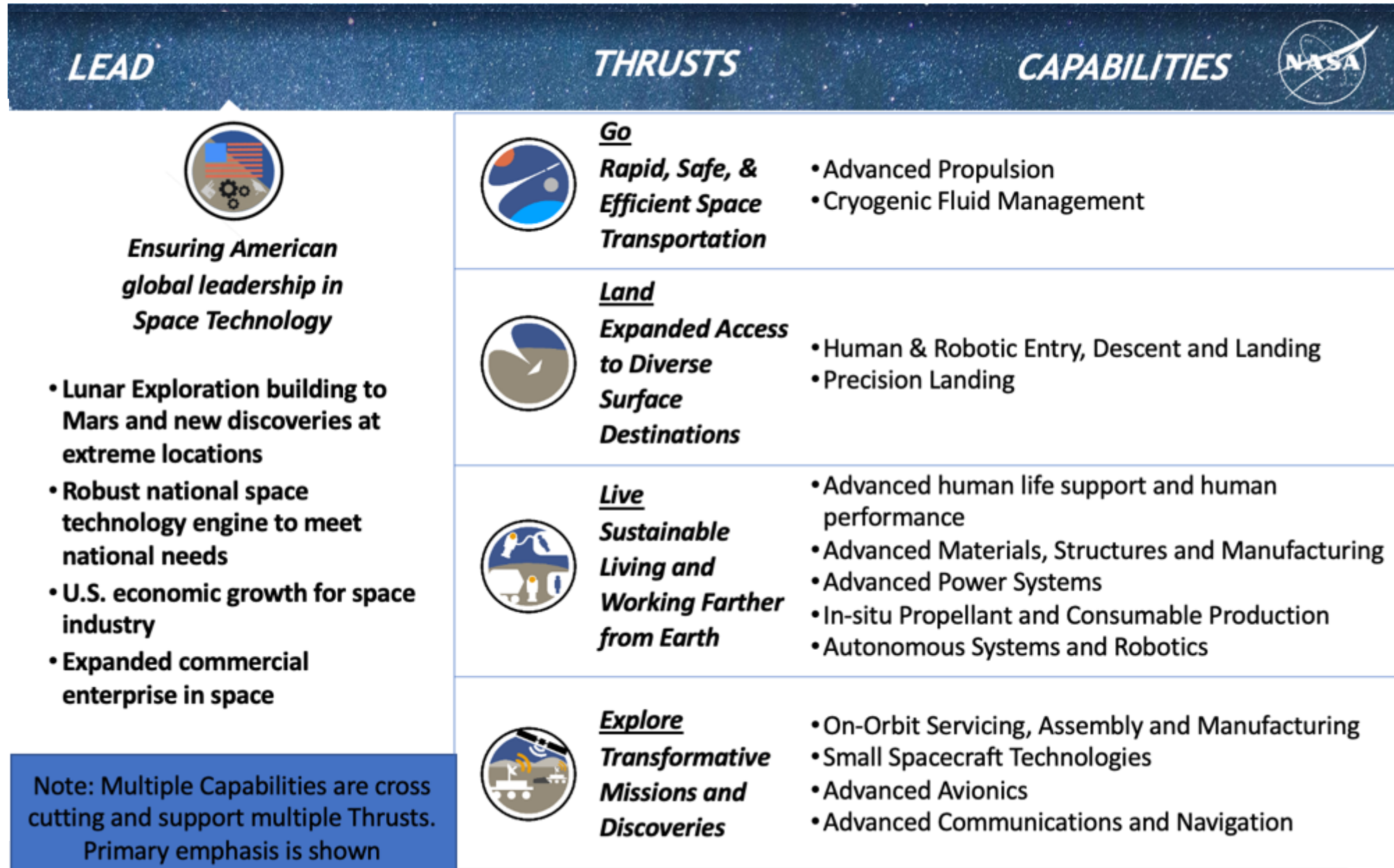
LOW

MID

Technology Readiness Level

HIGH

STMD Strategic Framework



Go

Rapid, Safe, & Efficient Space Transportation



Solar Electric Propulsion (SEP)

Nuclear Propulsion Technologies



Thruster Advancement for Low-temperature Operations in Space (TALOS)



Cryogenic Fluid Management



Green Propellant Infusion Mission (GPIM)



Rapid Analysis and Manufacturing Propulsion Technology

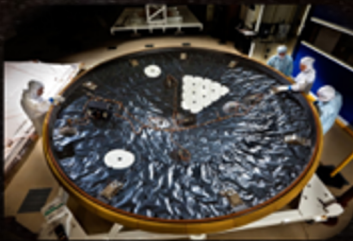


- Enable Human Earth-to-Mars Round Trip mission durations less than 750 days.
- Enable rapid, low cost delivery of robotic payloads to Moon, Mars and beyond.
- Enable reusable, safe launch and in-space propulsion systems that reduce launch and operational costs/complexity and leverage potential destination based ISRU for propellants.



Land

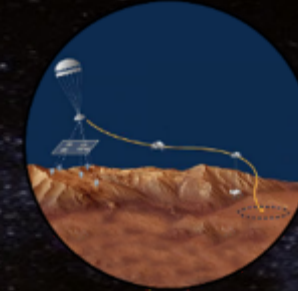
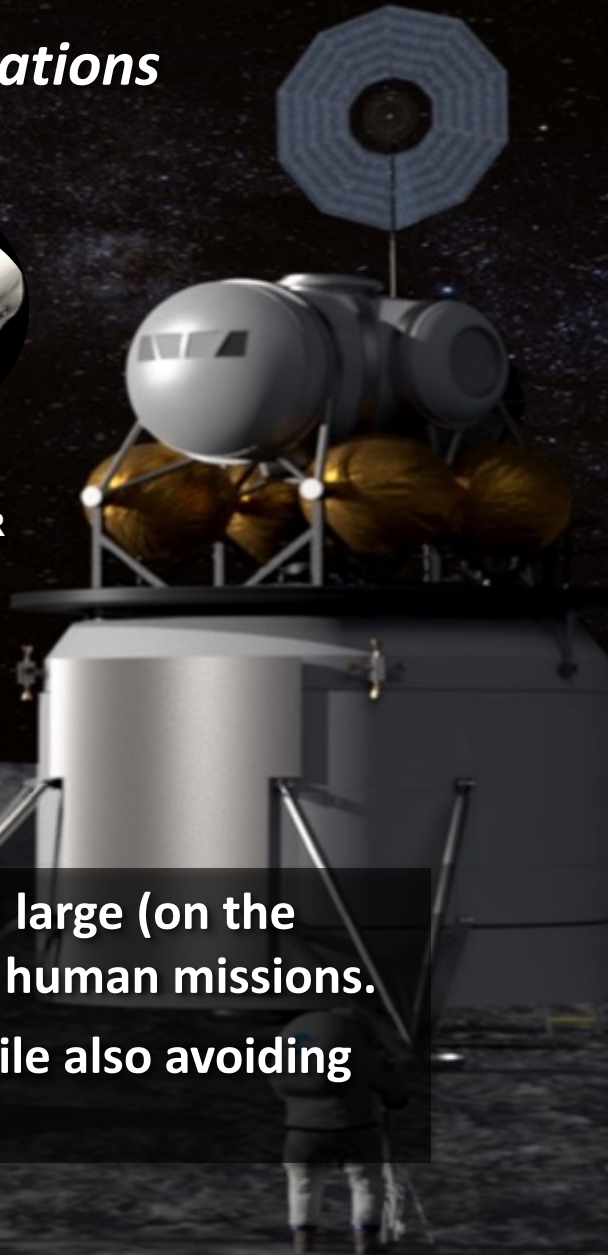
Expanded Access to Diverse Surface Destinations



Mars Science Laboratory Entry Descent and Landing Instrument (MEDLI 2)



Navigation Doppler LIDAR



Terrain Relative Navigation



Mars Entry Descent and Landing



Low-Earth Orbit Flight Test of an Inflatable Decelerator (LOFTID)



Safe and Precise Landing – Integrated Capabilities Evolution (SPLICE)

- Enable Lunar and Mars Global Access to land large (on the order of 20 metric tons) payloads to support human missions.
- Land Payloads within 50 meters accuracy while also avoiding local landing hazards.

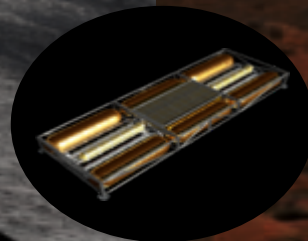
Live

Sustainable Living and Working Farther from Earth

In Space
Manufacturing



Regenerative
Fuel Cells



Astrobee

Surface Power



In-situ Resource
Utilization
(ISRU)



Synthetic
Biology



Integrated Systems
for Autonomous
Adaptive Caretaking



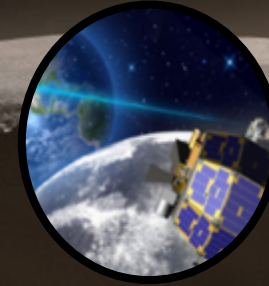
- Conduct Human/Robotic Lunar Surface Missions in excess of 28 days without resupply.
- Conduct Human Mars Missions in excess of 800 days including transit without resupply.
- Provide greater than 75% of propellant and water/air consumables from local resources for Lunar and Mars missions.
- Enable Surface habitats that utilize local construction resources.
- Enable Intelligent robotic systems augmenting operations during crewed and un-crewed mission segments.

Explore

Transformative Missions and Discoveries

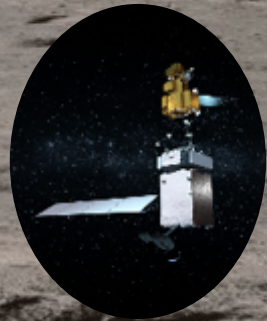
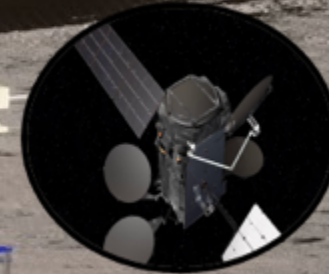
- Enable new discoveries at the Moon, Mars and other extreme locations.
- Enable new architectures that are more rapid, affordable, or capable than previously achievable.
- Enable new approaches for in-space servicing, assembly and manufacturing.
- Enable next generation space data processing with higher performance computing, communications and navigation in harsh deep space environments.

Laser and Optical Communications



CAPSTONE

SPIDER



Restore-L



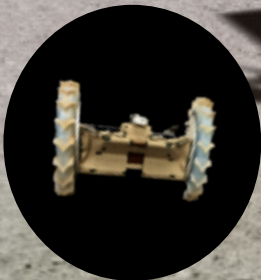
Archinaut



Bulk Metallic Glass Gears



In Space Manufacturing



Surface Robotic Scouts



Atomic Clock

Reaching the Moon and Mars Faster with NASA Technology

Rapid, Safe, and Efficient
Space Transportation

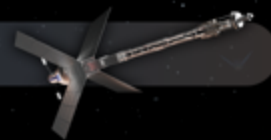
Expanded Access to Diverse
Surface Destinations

Sustainable Living and Working
Farther from Earth

Transformative Missions
and Discoveries



Advanced Propulsion



Advanced
Communication



Landing
Heavy Payloads



Autonomous Operations

In-Space Assembly/Manufacturing
In-Space Refueling

Sustainable Power

Dust Mitigation

Precision Landing

Commercial Lunar Payload Services

In Situ Resource Utilization

Cryogenic Fluid Management

Atmospheric
ISRU

Surface Excavation and Construction

Extreme Access/Extreme Environments

Advanced
Navigation

2020

GO | LAND | LIVE | EXPLORE

203X

SMALL SPACECRAFT REVOLUTION

Small spacecraft and responsive launch capabilities are proving to be disruptive innovations for exploration, discovery, and commercial applications. Agile spacecraft and responsive launch can enable new mission architectures or augment conventional missions, can be developed and deployed on faster timelines, and can achieve NASA's objectives at significantly lower program risk and cost than larger traditional approaches.

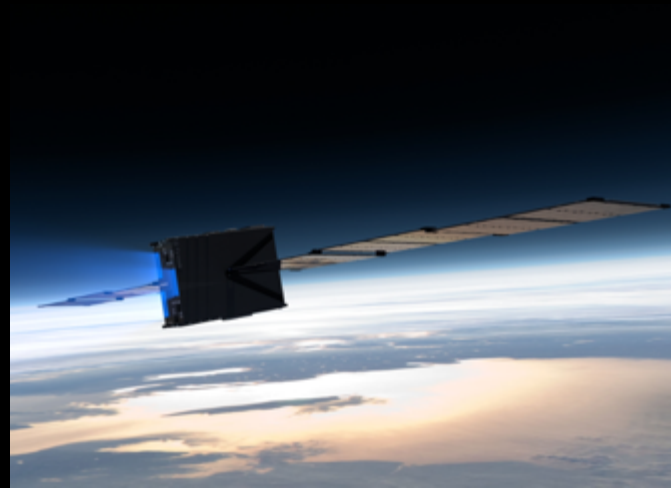


NASA SMALL SPACECRAFT ACTIVITIES



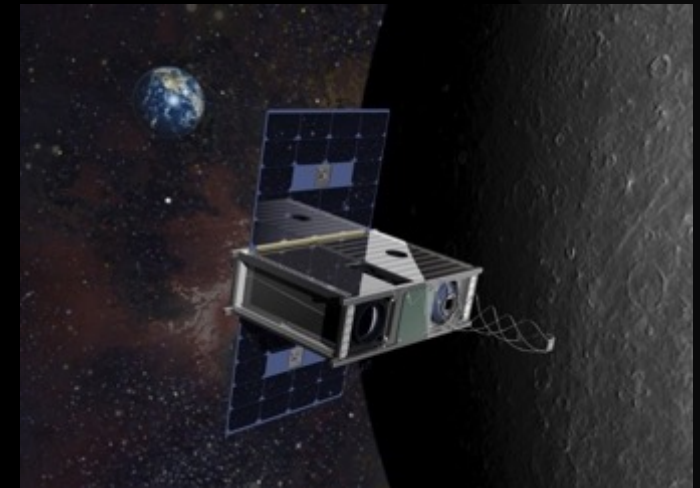
SCIENCE

Conducting scientific investigations and developing precursor instrument technologies for future science measurements. Providing opportunities for secondary payloads in mission opportunities.



SPACE TECHNOLOGY

Developing and demonstrating new small spacecraft technologies and capabilities for NASA's missions while supporting the expansion of U.S. space commerce.



EXPLORATION

Sponsoring missions beyond low-Earth orbit to address key strategic knowledge gaps for exploration. Providing access to space (launch opportunities) to the U.S. CubeSat community (academia, government, and non-profits).



www.nasa.gov/spacetech