



EXPLORESPACE TECH
TECHNOLOGY DRIVES EXPLORATION

Space Technology Industry-Government- University Roundtable (STIGUR)

Mr. James Reuter | Associate Administrator, Space Technology Mission Directorate | December 3, 2021

SPACE TECHNOLOGY PORTFOLIO

EARLY STAGE INNOVATION AND PARTNERSHIPS

- Early Stage Innovation
 - Space Tech Research Grants
 - Center Innovation Fund
 - Early Career Initiative
 - Prizes, Challenges & Crowdsourcing
 - NASA Innovation Advanced Concepts
- Technology Transfer

SBIR/STTR PROGRAMS

- Small Business Innovation Research
- Small Business Technology Transfer

TECHNOLOGY MATURATION

- Game Changing Development
- Lunar Surface Innovation Initiative

TECHNOLOGY DEMONSTRATION






- Technology Demonstration Missions
- Small Spacecraft Technology
- Flight Opportunities

Technology Drives Exploration

LOW MID HIGH

Technology Readiness Level

Strategic Technology Framework

Lead	Thrusts	Outcomes	Primary Capabilities
<div>  <p>Ensuring American global leadership in Space Technology</p> <ul style="list-style-type: none"> • Advance US space technology innovation and competitiveness in a global context • Encourage technology driven economic growth with an emphasis on the expanding space economy • Inspire and develop a diverse and powerful US aerospace technology community </div>	<div>  <p>Go Rapid, Safe, and Efficient Space Transportation</p> </div>	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Nuclear Systems • Cryogenic Fluid Management • Advanced Propulsion
	<div>  <p>Land Expanded Access to Diverse Surface Destinations</p> </div>	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Entry, Descent, Landing, & Precision Landing
	<div>  <p>Live Sustainable Living and Working Farther from Earth</p> </div>	<ul style="list-style-type: none"> • Develop exploration technologies and enable a vibrant space economy with supporting utilities and commodities <ul style="list-style-type: none"> • 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 Habitation System technologies. [Low TRL STMD; Mid-High TRL SOMD/ESDMD] 	<ul style="list-style-type: none"> • Advanced Power • In-Situ Resource Utilization • Advanced Thermal • Advanced Materials, Structures, & Construction • Advanced Habitation Systems
	<div>  <p>Explore Transformative Missions and Discoveries</p> </div>	<ul style="list-style-type: none"> • 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 technologies for science instrumentation supporting new discoveries. [Low TRL STMD/Mid-High TRL SMD. SMD funds mission specific instrumentation (TRL 1-9)] • Develop transformative technologies that enable future NASA or commercial missions and discoveries 	<ul style="list-style-type: none"> • Advanced Avionics Systems • Advanced Communications & Navigation • Advanced Robotics • Autonomous Systems • Satellite Servicing & Assembly • Advanced Manufacturing • Small Spacecraft • Rendezvous, Proximity Operations & Capture • Sensor & Instrumentation

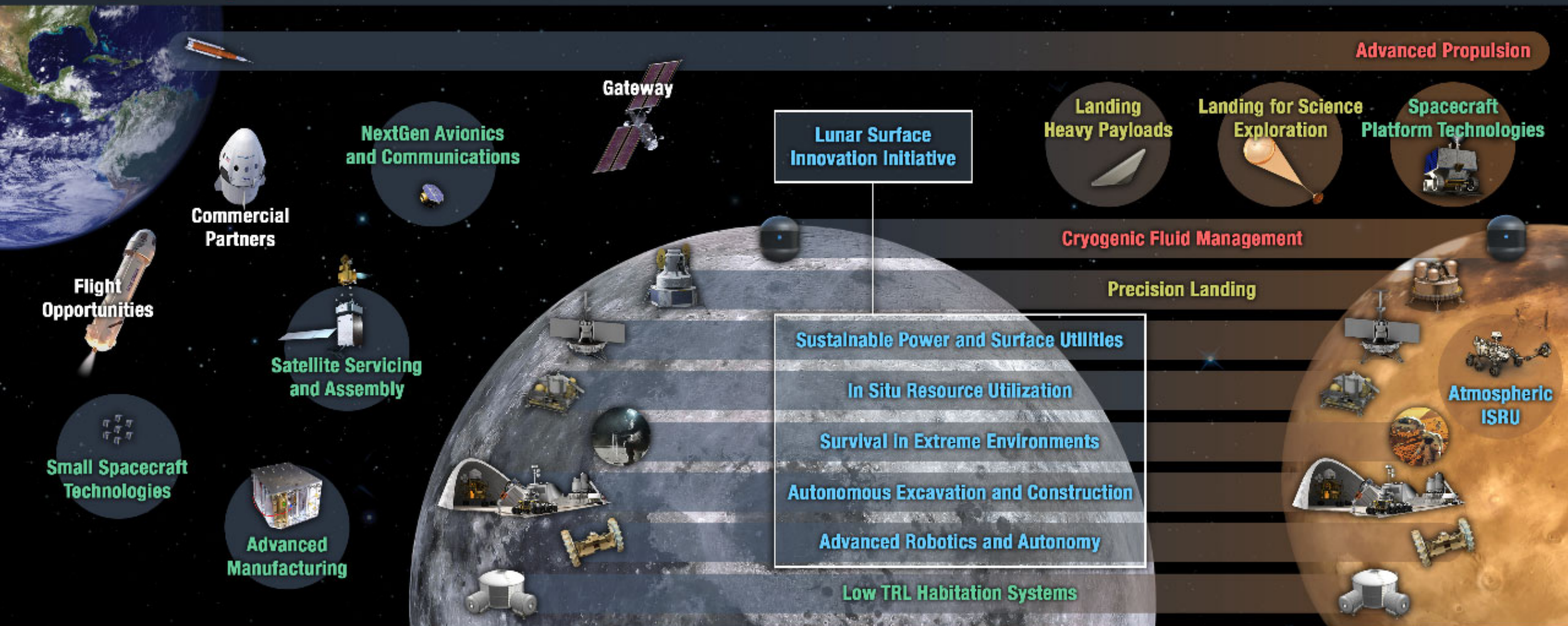
Ensuring American Global Leadership in Space Technology

**Rapid, Safe, and Efficient
Space Transportation**

**Expanded Access to Diverse
Surface Destinations**

**Sustainable Living and Working
Farther from Earth**

**Transformative Missions
and Discoveries**



Technology Drives Exploration

Space Technology Research Grants Program



NASA Space Technology Graduate Research Opportunities (NSTGRO)
236 active awards
Solicitation anticipated September 2022

Early Career Faculty (ECF)
46 active awards
Solicitation anticipated February 2022

Early Stage Innovations (ESI)
51 active awards
Solicitation anticipated April/May 2022

Lunar Surface Technology Research (LuSTR) Opportunities
6 active awards
Solicitation anticipated July 2022

Space Technology Research Institutes (STRI)
6 active awards
Solicitation anticipated May/June 2022



TA01
Launch Propulsion
27 Awards



TA02
In-Space Propulsion
80 Awards



TA03
Space Power & Energy Storage
44 Awards



TA04
Robotics & Autonomous Systems
121 Awards



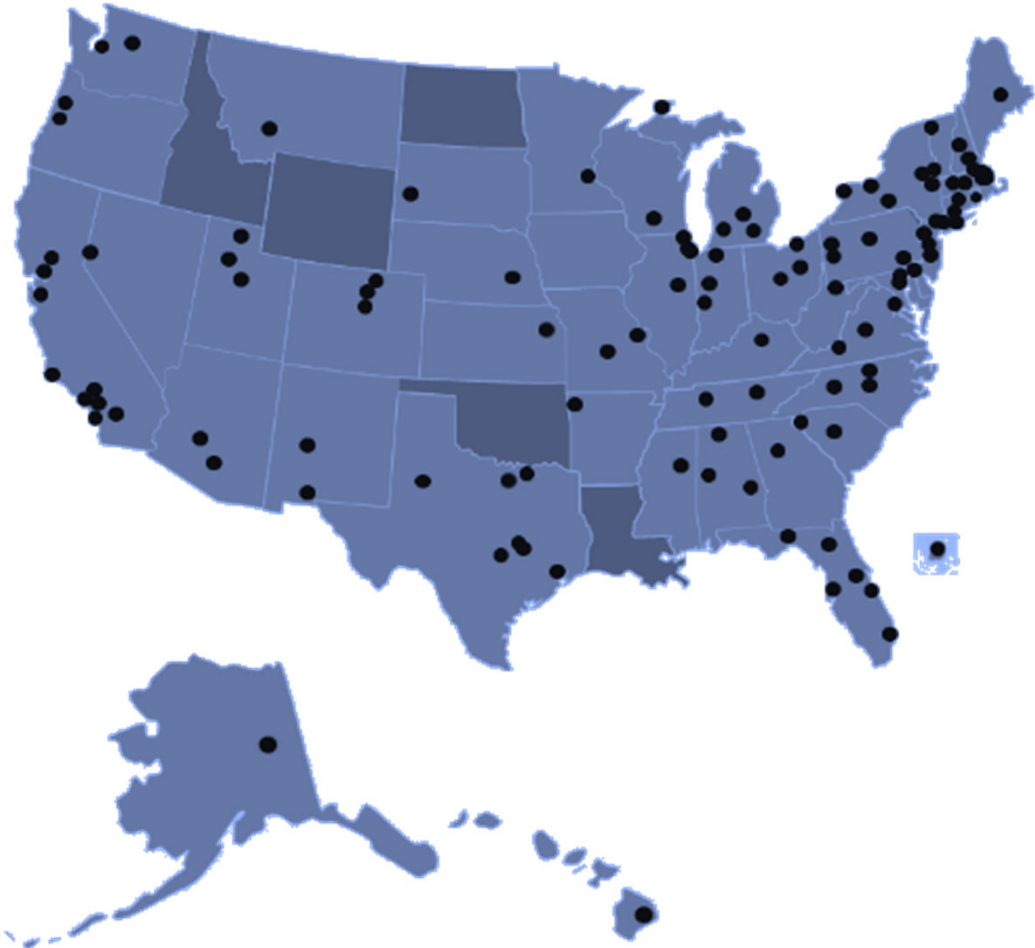
TA05
Communications, Navigation & Orbital Debris Tracking
87 Awards



TA06
Human Health, Life Support & Habitation
61 Awards



TA07
Human Exploration Destination Systems
38 Awards



TA08
Science Instruments, Observatories and Sensor Systems
96 Awards



TA09
Entry, Descent & Landing
90 Awards



TA10
Nanotechnology
42 Awards



TA11
Modeling, Simulation, IT & Processing
41 Awards



TA12
Materials, Structures, Mechanical Systems & Manufacturing
106 Awards

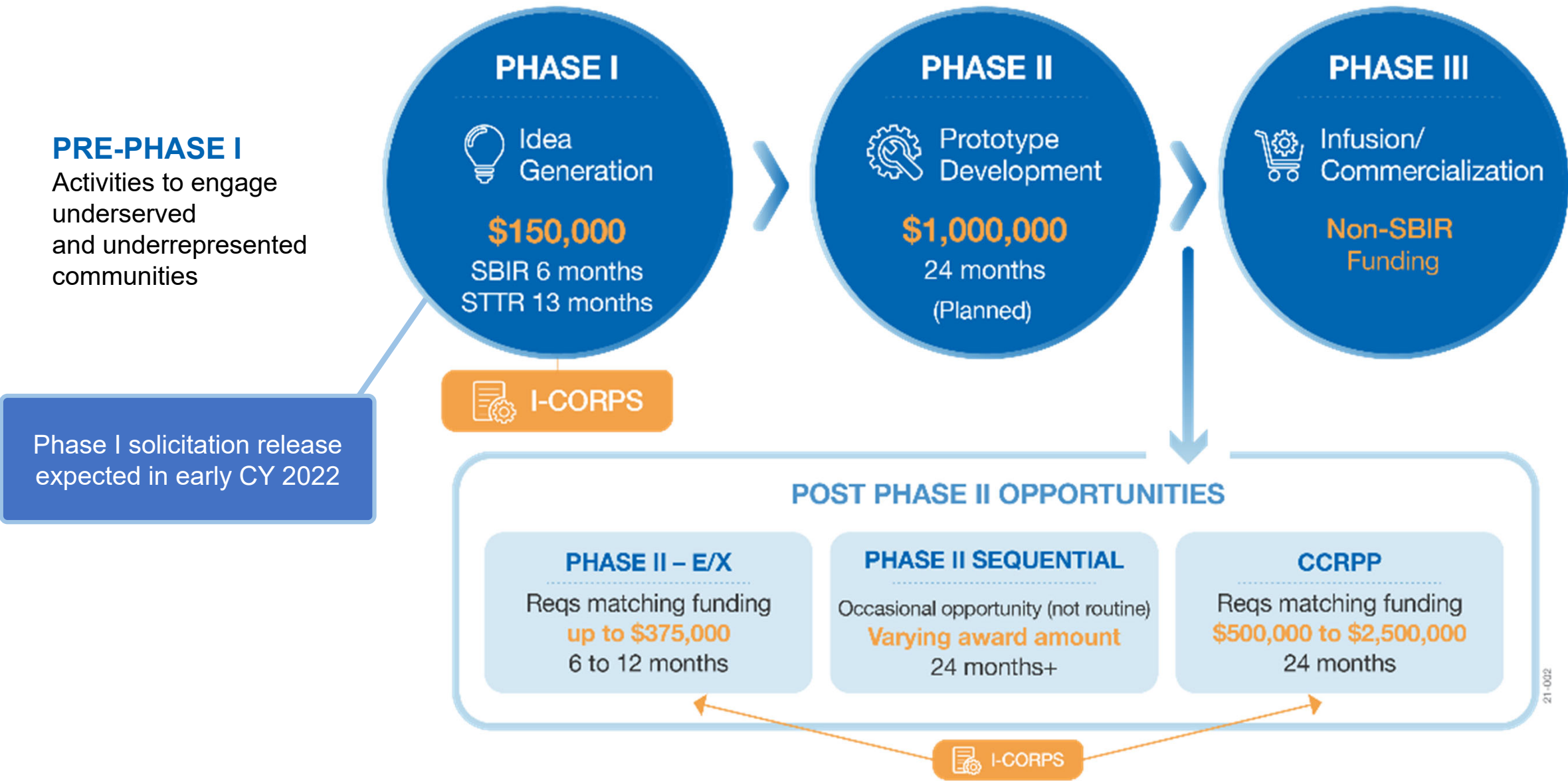


TA13
Ground & Launch Systems
1 Award



TA14
Thermal Management
34 Awards

NASA SBIR/STTR Program



Post Phase II is 25% of awards budget

Flight Opportunities

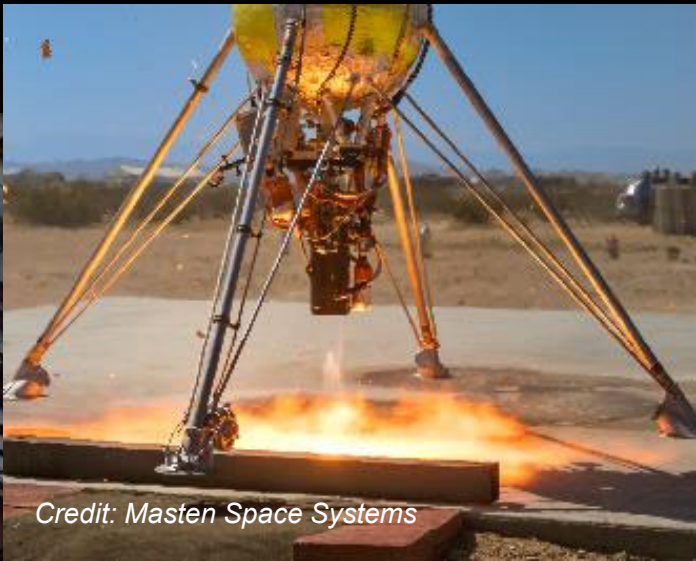


Since 2011*

- 230 successful flights
- 778 payload tests
- 336 total technologies in portfolio



Credit: Blue Origin



Credit: Masten Space Systems

Testing Landing Technologies

FY2021 Activity*

Provider	Flights	Payload Tests
High-Altitude Balloons		
AMOCAL	1	1
Near Space Corp.	1	1
Raven Aerostar	4	4
Stratodynamics	3	3
World View		
Parabolic Flights		
Zero Gravity Corp.	14	43
Rocket-Powered Vehicles		
Blue Origin	2	15
Masten Space Systems	4	12
UP Aerospace	1	1
Virgin Galactic	2	4
TOTALS	32	84

* As of September 30, 2021



Prizes, Challenges, and Crowdsourcing

In fiscal year 2021:

- NASA ran 65+ crowdsourcing projects and competitions
- Prizes totaled more than \$9 million
- Current & future opportunities: nasa.gov/solve



Honey, I Shrunk
the Payload





December 5 Launch: Laser Communications Relay Demonstration



nasa.gov/specials/calliefirst

