

## Appendix B: SBIR/STTR and the Space Technology Roadmaps

NASA’s technology development activities expand the frontiers of knowledge and capabilities in aeronautics, science, and space, creating opportunities, markets, and products for U.S. industry and academia. The 2015 NASA Technology Roadmaps are a set of documents that consider a wide range of needed technology candidates and development pathways for the next 20 years (2015-2035). The roadmaps focus on applied research and development activities. Technologies that support NASA’s missions may also support science and exploration missions conducted by the commercial space industry and other government agencies. In addition, NASA technology development results in applications for the general population including devices that improve health, medicine, transportation, public safety, and consumer goods. For more information, please see: <https://www.nasa.gov/offices/oct/home/roadmaps/index.html>.

The research and technology subtopics for the SBIR Program are identified annually by Mission Directorates and Center Programs. The Directorates identify high priority research and technology needs for respective programs and projects. Research and technology subtopics for the STTR Program are aligned with needs associated with the research interest and core competencies across NASA Centers and aligned with the Space Technology Roadmaps. Both programs support a broad range of technologies defined by a list of subtopics that vary in content within each annual solicitation.

The table below relates the current SBIR/STTR subtopics to Technology Areas in the Space Technology Roadmaps:

TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA02</a>	2.0.0 - In-Space Propulsion Technologies	2.1.0 - Chemical Propulsion	Spacecraft Technology for Sample Return Missions	S4.03
			Chemical Propulsion Systems for Small Satellite Missions	Z8.01
			Small Launch Vehicle Technologies and Demonstrations	Z9.01
		2.2.0 - Non-Chemical Propulsion	Advanced Technologies for In-Space Electric Propulsion (EP)	T2.02
			Nuclear Thermal Propulsion	Z10.03
			In-Space Electric Propulsion Component Technologies	Z10.02
			DragSails for Spacecraft Deorbit	Z8.06
		2.3.0 - Advanced (TRL <3) Propulsion Technologies	Performance Demonstration of High Payoff Propulsion Technology: Rotating Detonation Engine and Dual Mode Ionic Liquid	T2.03
2.4.0 - Supporting Technologies	Cryogenic Fluid Management	Z10.01		
TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA03</a>	3.0.0 - Space Power and Energy Storage	3.1.0 - Power Generation	Power Generation and Conversion	S3.01
			Kilowatt-Class Energy Conversion for Small Fission Reactors	Z1.03
		3.2.0 - Energy Storage	Long Duration Lunar Energy Storage and Discharge	Z1.04
		3.3.0 - Power Management and Distribution	Power Electronics and Management, and Energy Storage	S3.03

TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA04</a>	4.0.0 - Robotics, Telerobotics and Autonomous Systems	4.1.0 - Sensing & Perception	Intelligent Sensor Systems	T13.01
		4.2.0 - Mobility	Extreme Environments Technology	S4.04
			Lunar Rover Technologies for In-situ Resource Utilization and Exploration	Z5.05
		4.3.0 - Manipulation	Robotic Mobility, Manipulation and Sampling	S4.02
			Sample Collection For Life Detection in Outer Solar System Ocean World Plumes	S4.06
		4.5.0 - Autonomy	Flight Test and Measurement Technologies	A2.01
			Spacecraft Autonomous Agent Cognitive Architectures for Human Exploration	H6.03
			Autonomous Control Technologies (ACT) for Ground Operations	H10.02
			Guidance, Navigation and Control	S3.04
			Fault Management Technologies	S5.05
			Information Technologies for Intelligent and Adaptive Space Robotics	T4.01
			Coordination and Control of Swarms of Space Vehicles	T4.03
			Technologies for Intra-Vehicular Activity Robotics	Z5.04
TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA05</a>	5.0.0 - Communication and Navigation	5.1.0 - Optical Comm. And Navigation	Long Range Optical Telecommunications	H9.01
		5.2.0 - Radio Frequency Communications	Transformational Communications Technology	H9.05
			Terrestrial Balloons and Planetary Aerial Vehicles	S3.05
			Electric field mapping and prediction methods within spacecraft enclosures	T5.02
		5.4.0 - Position, Navigation, and Timing	Flight Dynamics and Navigation Technology	H9.03
		5.5.0 - Integrated Technologies	Cognitive Communication	H9.07

TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA06</a>	6.0.0 - Human Health, Life Support and Habitation Systems	6.1.0 - Environmental Control Life Support & Habitation Systems	Microbial Monitoring and Control for Spacecraft Cabins	H3.03
			Spacecraft Solid Waste Management	H3.02
			Integrated Systems Health Management for Sustainable Habitats	H6.01
			Spacecraft Water Sustainability through Nanotechnology	T6.06
		6.2.0 - Extravehicular Activity Systems	Exploration Portable Life Support System (xPLSS) for deep space and surface missions	H4.01
			Exploration Pressure Garment System (xPGS) for deep space and surface missions	H4.04
		6.3.0 - Human Health and Performance	International Space Station (ISS) Utilization and Microgravity Research	H8.01
			Radioprotectors and Mitigators of Space Radiation-induced Health Risks	H12.01
			Reduced Oxygen Usage for Medical Events	H12.05
		6.5.0 - Radiation	Continuous Crew Health Monitoring	H12.06
Testing of COTS Systems in Space Radiation Environments	T6.05			
TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA07</a>	7.0.0 - Human Exploration Destination Systems	7.1.0 - In-Situ Resource Utilization	Extraction of Oxygen from Lunar Regolith	Z12.01
			Payloads for Lunar Resources: Volatiles	Z12.02
TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA08</a>	8.0.0 - Science Instruments, Observatories & Sensor Systems	8.1.0 - Science Instruments	In Situ Instruments/Technologies for Ocean Worlds Life Detection	S1.11
			Particles and Fields Sensors & Instrument Enabling Technologies	S1.06
			Atomic Interferometry	S1.10
			Technologies for Active Microwave Remote Sensing	S1.02
			Precision Deployable Optical Structures and Metrology	S2.02
			Technologies for Passive Microwave Remote Sensing	S1.03
			In Situ Instruments/Technologies for Lunar and Planetary Science	S1.07
			NDE Sensors, Modeling, and Analysis	Z11.01
		8.2.0 - Observations	Proximity Glare Suppression for Astronomical Direct Detection of Exoplanets	S2.01
			Advanced Optical Systems and Fabrication/Testing/Control Technologies for EUV/Optical and IR Telescope	S2.03

			X-Ray Mirror Systems Technology, Coating Technology for X-Ray-UV-OIR, and Free-Form Optics	S2.04
		8.3.0 - Sensor Systems	Lidar Remote Sensing Technologies	S1.01
			Suborbital Instruments and Sensor Systems for Earth Science Measurements	S1.08
			Sensor and Detector Technologies for Visible, IR, Far-IR, and Submillimeter	S1.04
			Detector Technologies for UV, X-Ray, Gamma-Ray Instruments	S1.05
			Cryogenic Systems for Sensors and Detectors	S1.09
			Photonic Integrated Circuits	T8.02
			Metamaterials and Metasurfaces Technology for Remote Sensing Applications	T8.04
			Low Cost Radiation Hardened Integrated Circuit Technology	Z8.03
<b>TA #</b>	<b>Technology Area (TA) Level 1 Title</b>	<b>Technology Area (TA) Level 2 Title</b>	<b>Subtopic Title</b>	<b>Subtopic #</b>
<a href="#">TA09</a>	9.0.0 - Entry, Descent and Landing Systems	9.1.0 - Aeroassist & Entry	Entry Descent & Landing Sensors for Environment Characterization, Vehicle Performance, and Guidance, Navigation and Control	Z7.01
		9.4.0 - Vehicle Systems Technology	Deployable Aerodynamic Decelerator and Weave Diagnostic Technology	Z7.03
			Lander Systems Technologies	Z7.04
<b>TA #</b>	<b>Technology Area (TA) Level 1 Title</b>	<b>Technology Area (TA) Level 2 Title</b>	<b>Subtopic Title</b>	<b>Subtopic #</b>
<a href="#">TA11</a>	11.0.0 - Modeling, Simulation, Information Technology and Processing	11.1.0 - Computing	Deep Neural Net and Neuromorphic Processors for In-Space Autonomy and Cognition	H6.22
			Technologies for Large-Scale Numerical Simulation	S5.01
			Bridging the Gap of Applying Machine Learning to Earth Science	S5.03
			Command, Data Handling, and Electronics	S3.08
			High Performance Space Computing Technology	Z6.01
		11.2.0 - Modeling	Model Based Systems Engineering for Distributed Development	H6.04
			Integrated Science Mission Modeling	S5.04
			Space Weather R2O/O2R Technology Development	S5.06
			Spacecraft Model-Based Systems Engineering	Z8.07
		11.4.0 - Information Processing	Commercial Geospatial Analysis Platforms for Earth Science Applications	S5.02
			Distributed Digital Ledger for Aerospace Applications	T11.03
			Digital Assistants for Science and Engineering	T11.04

TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA12</a>	12.0.0 - Materials, Structures, Mechanical Systems and Manufacturing	12.1.0 - Materials	Unmanned Aircraft Systems (UAS) Technologies	A2.02
			Thin-Ply Composite Technology and Applications	T12.01
		12.2.0 - Structures	Lunar Surface Solar Array Structures	H5.01
			Hot Structure Technology for Aerospace Vehicles	H5.02
			In-Space Sub-Modular Assembly	Z4.02
		12.4.0 - Manufacturing	In-situ Curing of Thermoset Resin Mixtures	T12.05
			Lightweight Conformal Structures	Z4.03
			Advanced Metallic Materials and Processes Innovation	Z3.01
		12.5.0 - Cross-Cutting	Development of Mobile Welding Capabilities for In-Space Manufacturing	Z3.02
			MISSE Experiments	Z4.01
TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA13</a>	13.0.0 - Ground and Launch Systems Processing	13.1.0 - Technologies to Optimize the Operational Life-Cycle	Advanced Propulsion Systems Ground Test Technology	H10.01
TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA14</a>	14.0.0 - Thermal Management Systems	14.2.0 - Thermal Control Systems	Spacecraft Thermal Management	Z2.01
			Thermal Control Systems	S3.06
TA #	Technology Area (TA) Level 1 Title	Technology Area (TA) Level 2 Title	Subtopic Title	Subtopic #
<a href="#">TA15</a>	15.0.0 - Aeronautics	15.1.0 - Safe, Efficient Growth in Global Aviation	Advanced Air Traffic Management System Concepts	A3.01
			Increasing Autonomy in the National Airspace System (NAS)	A3.02
			Non-Traditional Airspace Operations	A3.04
			Hypersonic Technology - Innovative Manufacturing for High Temperature Structures	A1.10
			Distributed Electric Propulsion (DEP) Vehicles toward Urban Air Mobility (UAM) and Regional Airliners	T15.01
		15.2.0 - Innovation in Commercial Supersonic Aircraft	Aeronautics Ground Test and Measurement Technologies	A1.08
			Quiet Performance - Airframe Noise Reduction	A1.02
		15.3.0 - Ultra-Efficient Commercial Vehicles	Vertical Lift Technology and Urban Air Mobility	A1.06
			Propulsion Efficiency - Propulsion Materials and Structures	A1.07
		15.4.0 - Transition to Low-Carbon Propulsion	Electrified Aircraft Propulsion	A1.04
			Electrified Aircraft Propulsion Energy Storage	T15.03

		15.5.0 - Real-Time System-Wide Safety Assurance	Future Aviation Systems Safety	A3.03
		15.6.0 - Enable Assured Machine Autonomy for Aviation	Vehicle Safety - Internal Situational Awareness and Response	A1.09
		15.7.0 - Other	Aerodynamic and Structural Efficiency - Integration of Flight Control with Aircraft Multidisciplinary Design Optimization	A1.01
			Computational Tools and Methods	A1.05
			Low Emissions/Clean Power - Environmentally Responsible Propulsion	A1.03