

Appendix C: SBIR/STTR and the Space Technology Roadmaps

Research and technology topics/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 topics for the STTR Program are aligned with needs associated with the research interest and core competencies across NASA Centers. Both programs support a broad range of technologies defined by a list of topics and subtopics that vary in content within each annual solicitation.

The following table relates these SBIR/STTR topics and subtopics to the Technology Area Breakdown Structure (TABS) in the Space Technology Roadmaps (STR). The table is organized by the OCT Technology Area level one (first column) and level 2 (third column), with the related SBIR Select subtopic description (fourth column) and subtopics ID (fifth column) listed as well. The Aeronautics area is included for completeness, though this is beyond the scope of the STR.

TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA01	1.0.0 Launch Propulsion Systems	1.2.0 Liquid Rocket Propulsion Systems	Cryogenic Purge Gas Recovery and Reclamation	H10.01
			Affordable Nano/Micro Launch Propulsion Stages	T1.01
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA02	2.0.0 In-Space Propulsion Technologies	2.1.0 Chemical Propulsion	In-Space Chemical Propulsion	H2.01
			Spacecraft Technology for Sample Return Missions	S4.03
		2.2.0 Non-Chemical Propulsion	Nuclear Thermal Propulsion (NTP)	H2.02
			High Power Electric Propulsion	H2.03
			Propulsion Systems for Robotic Science Missions	S3.02
2.4.0 Supporting Technologies	Cryogenic Fluid Management for In-Space Transportation	H2.04		

TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
<u>TA03</u>	3.0.0 Space Power and Energy Storage	3.1.0 Power Generation	Space Nuclear Power Systems	H8.01
			Solid Oxide Fuel Cells and Electrolyzers	H8.02
			Advanced Photovoltaic Systems	H8.03
			Power Generation and Conversion	S3.01
			Energy Harvesting Technology Development	T3.01
			Small Spacecraft in Deep Space: Power, Navigation, and Structures	Z4.01
		3.2.0 Energy Storage	Terrestrial and Planetary Balloons	S3.06
		3.4.0 Cross Cutting Technology	Power Electronics and Management, and Energy Storage	S3.03
Solid-State Thermal-to-Electric Power Generation	Z1.02			
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
<u>TA04</u>	4.0.0 Robotics, Telerobotics and Autonomous Systems	4.1.0 Sensing & Perception	Payload Technologies for Assistive Free-Flyers	Z5.01
		4.3.0 Manipulation	Robotic Mobility, Manipulation and Sampling	S4.02
			Regolith Resource Robotic	T4.02
		4.4.0 Human-Systems Integration	Mobility Subsystem, Manipulation Subsystem, and Human System Interaction	H6.01
		4.5.0 Autonomy	Unmanned Aircraft Systems Technology	A2.02
			Fault Management Technologies	S5.05

			Dynamic Servoelastic (DSE) Network Control, Modeling and Optimization	T4.01
			Information Technologies for Intelligent and Adaptive Space Robotics	T11.01
		4.7.0 RTA Systems Engineering	Contamination Control and Planetary Protection	S4.05
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA05	5.0.0 Communication and Navigation	5.1.0 Optical Comm. And Navigation	Long Range Optical Telecommunications	H9.01
			Flight Dynamics and Navigation Technology	H9.03
			Slow and Fast Light	S3.08
		5.4.0 Position, Navigation, and Timing	Guidance, Navigation and Control	S3.05
		5.5.0 Integrated Technologies	Intelligent Communication Systems	H9.02
			Autonomous Communications Systems	T5.01
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA06	6.0.0 Human Health, Life Support and Habitation Systems	6.1.0 Environmental Control Life Support & Habitation Systems	Environmental Monitoring for Spacecraft Cabins	H3.01
			International Space Station (ISS) Demonstration of Improved Exploration Technologies	H14.02
			Bioregenerative Technologies for Life Support	H3.02
			Spacecraft Cabin Atmosphere Quality and Thermal Management	H3.03

		6.2.0 Extravehicular Activity Systems	Space Suit Pressure Garment and Airlock Technologies	H4.01
			EVA Space Suit Pressure Garment Systems	H4.02
			EVA Space Suit Power, Avionics, and Software Systems	H4.03
			Gas Sensing Technology Advancements for Spacesuits	T6.01
		6.3.0 Human Health and Performance	Measurements of Net Ocular Blood Flow	H12.01
			Unobtrusive Workload Measurement	H12.02
			Technology for Monitoring Muscle Protein Synthesis and Breakdown in Spaceflight	H12.03
		6.5.0 Radiation	Radiation Shielding Systems	H11.01
			Space Weather	T6.02
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA07	7.0.0 Human Exploration Destination Systems	7.1.0 In-Situ Resource Utilization	Regolith ISRU for Mission Consumable Production	H1.01
			International Space Station (ISS) Utilization	H14.01
		7.2.0 Sustainability & Supportability	Recycling/Reclamation of 3-D Printer Plastic Including Transformation of Launch Package Solutions into 3-D Printed Parts	H14.03
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA08	8.0.0 Science Instruments, Observatories & Sensor Systems	8.1.0 Science Instruments	Proximity Glare Suppression for Astronomical Coronagraphy	S2.01

			Sensor and Detector Technology for Visible, IR, Far IR and Submillimeter	S1.03
			Advanced Optical Systems and Fabrication/Testing/Control Technologies for EUV/Optical and IR Telescope	S2.03
			Detector Technologies for UV, X-Ray, Gamma-Ray and Cosmic-Ray Instruments	S1.04
			Particles and Field Sensors and Instrument Enabling Technologies	S1.05
			In Situ Sensors and Sensor Systems for Lunar and Planetary Science	S1.06
			Airborne Measurement Systems	S1.07
			Surface & Sub-surface Measurement Systems	S1.08
			Command, Data Handling, and Electronics	S3.09
			Technologies for Planetary Compositional Analysis and Mapping	T8.01
		8.2.0 Observations	Precision Deployable Optical Structures and Metrology	S2.02
			Unmanned Aircraft and Sounding Rocket Technologies	S3.04
			X-Ray Mirror Systems Technology, Coating Technology for X-Ray-UV-OIR, and Free-Form Optics	S2.04
		8.3.0 Sensor Systems	Optical components, sensors, and systems for ISS utilization	H14.04
			Lidar Remote Sensing Technologies	S1.01

			Microwave Technologies for Remote Sensing	S1.02
			Atomic Interferometry	S1.09
			Cryogenic Systems for Sensors and Detectors	S1.10
			Visible to Far-Infrared Absolute Radiance Developments	T8.02
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA09	9.0.0 Entry, Descent and Landing Systems	9.1.0 Aeroassist & Entry	Ablative Thermal Protection Systems Technologies, Sensors and NDE Methods	H7.01
			Diagnostic Tools for High Velocity Testing & Analysis	H7.02
		9.2.0 Descent	Wireless Cameras for Entry, Descent, and Landing Reconstruction	Z3.01
		9.3.0 Landing	Navigation and Hazard Avoidance Sensor Technologies	T9.01
		9.4.0 Vehicle Systems Technology	Planetary Entry, Descent and Landing and Small Body Proximity Operation Technology	S4.01
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA10	10.0.0 Nanotechnology	10.1.0 Engineered Materials and Structures	Structural Efficiency-Hybrid Nanocomposites	A1.01

TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA11	11.0.0 Modeling, Simulation, Information Technology and Processing	11.1.0 Computing	Technologies for Large-Scale Numerical Simulation	S5.01
		11.2.0 Modeling	Quiet Performance	A1.04
			Physics-Based Conceptual Aeronautics Design Tools	A1.05
			Efficient Propulsion & Power	A1.07
			Integrated Science Mission Modeling	S5.04
		11.3.0 Simulation	Modeling and Measurements for Propulsion and Power	Z1.01
			Computational Simulation and Engineering	T11.02
		11.4.0 Information Processing	Earth Science Applied Research and Decision Support	S5.02
			Algorithms and Tools for Science Data Processing, Discovery and Analysis, in State-of-the-Art Data Environments	S5.03

TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA12	12.0.0 Materials, Structures, Mechanical Systems and Manufacturing	12.1.0 Materials	Extreme Temperature Structures	H5.02
			Extreme Environments Technology	S4.04
			Advanced Structural Health Monitoring	T12.01
			High Temperature Materials and Sensors for Propulsion Systems	T12.02
			Advanced Bladder Materials for Inflatable Habitats	T12.03
			Large-Scale Polymer Matrix Composite (PMC) Structures, Materials, and Manufacturing Processes	Z2.01
		12.2.0 Structures	Deployable Structures	H5.01
			Multifunctional Materials and Structures	H5.03
		12.3.0 Mechanical Systems	Vertical Lift	A1.06
			Advanced NDE Modeling and Analysis	H13.01
		12.4.0 Manufacturing	Experimental and Analytical Technologies for Additive Manufacturing	T12.04
		12.5.0 Cross-Cutting	Low Emissions Propulsion and Power	A1.03
			NDE Sensors	H13.02
Advanced Metallic Materials and Processes Innovation	Z6.01			

TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
<u>TA13</u>	13.0.0 Ground and Launch Systems Processing	13.1.0 Technologies to Optimize the Operational Life-Cycle	Advanced Propulsion System Ground Test and Launch Technology	T13.01
		13.3.0 Technologies to Increase Reliability and Mission Availability	Flight Test and Measurements Technologies	A2.01
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
<u>TA14</u>	14.0.0 Thermal Management Systems	14.2.0 Thermal Control Systems	Thermal Control Systems	S3.07