

Appendix B: SBIR and the Technology Taxonomy

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. 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.

The 2020 NASA Technology Taxonomy is an evolution of the technology roadmaps developed in 2015. The 2020 NASA Technology Taxonomy provides a structure for articulating the technology development disciplines needed to enable future space missions and support commercial air travel. The 2020 revision is composed of 17 distinct technical-discipline-based taxonomies (TX) that provide a breakdown structure for each technology area. The taxonomy uses a three-level hierarchy for grouping and organizing technology types. Level 1 represents the technology area that is the title of that area. Level 2 is a list of the subareas the taxonomy is a foundational element of NASA's technology management process. NASA's mission directorates reference the taxonomy to solicit proposals and to inform decisions on NASA's technology policy, prioritization, and strategic investments.

The 2020 NASA Technology Taxonomy can be found at:

https://www.nasa.gov/sites/default/files/atoms/files/2020_nasa_technology_taxonomy_lowres.pdf.

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.

The table on the following pages relates the current SBIR subtopics to the Technology Taxonomy.

2020 TX Mapping Level 1	2020 TA Mapping Level 2	SBIR Subtopic Number	Subtopic Title
TX01 - Propulsion Systems	TX01.1 - Chemical Space Propulsion	Z8.09	Small Spacecraft Transfer Stage Development
	TX01.2 - Electric Space Propulsion	Z10.04	Materials, Processes, and Technologies for Advancing In-Space Electric Propulsion Thrusters
	TX01.3 - Aero Propulsion	A1.02	Quiet Performance - Aircraft Propulsion Noise
		A1.03	Low Emissions/Clean Power - Environmentally Responsible Propulsion
		A1.04	Electrified Aircraft Propulsion
		A1.06	Vertical Lift Technology for Urban Air Mobility -Electric Motor Fault Mitigation Technology
		A1.08	Aeronautics Ground Test and Measurement Technologies
TX01.4 - Advanced Propulsion	Z10.05	Rotating Detonation Rocket Engines (RDRE)	
TX02 - Flight Computing and Avionics	TX02.1 - Avionics Component Technologies	S16.06	Command, Data Handling, and Electronics
	TX02.2 - Avionics Systems and Subsystems	Z2.03	Human Interfaces for Space Systems
		Z8.10	Modular Systems for Cost-Effective Spacecraft Missions
	TX02.X - Other Flight Computing and Avionics	Z2.02	High-Performance Space Computing Technology
TX03 - Aerospace Power and Energy Storage	TX03.1 - Power Generation and Energy Conservation	S16.01	Photovoltaic Power Generation and Conversion
	TX03.2 - Energy Storage	S13.07	Energy Storage for Extreme Environments
		Z1.08	Space-Rated Fuel Cell Technologies
	TX03.3 - Power Management and Distribution	Z1.05	Lunar and Planetary Surface Power Management and Distribution
		Z1.06	Radiation-Tolerant High-Voltage, High-Power Electronics
TX04 - Robotics Systems	TX04.2 - Mobility	S13.03	Extreme Environments Technology
		S16.04	Unpiloted Aerial Platforms and Technologies for NASA Science Missions
	TX04.3 - Manipulation	S13.01	Robotic Mobility, Manipulation and Sampling
		S13.02	Spacecraft Technology for Sample Return Missions
	TX04.6 - Robotics Integration	H10.02	Autonomous Operations Technologies for Ground and Launch Systems
	TX04.X - Other Robotic Systems	Z5.04	Intravehicular Robot (IVR) Technologies
TX05 - Communications, Navigation, and Orbital Debris	TX05.1 - Optical Communications	H9.01	Long-Range Optical Telecommunications

Tracking and Characterization Systems	TX05.5 - Revolutionary Communications Technologies	H9.07	Cognitive Communication
	TX05.X - Other Communications, Navigation, and Orbital Debris Tracking and Characterization Systems	Z8.02	Communications and Navigation for Distributed Small Spacecraft Beyond Low Earth Orbit (LEO)
TX06 - Human Health, Life Support, and Habitation Systems	TX06.1 - Environmental Control & Life Support Systems (ECLSS) and Habitation Systems	H3.08	Challenges in Carbon Dioxide Removal and Reduction: Carbon Particulate and Thermal Management
		H3.09	Human Accommodations
		Z13.04	Lunar Dust Filtration and Monitoring
	TX06.2 - Extravehicular Activity Systems	H4.06	Low-Power Multi-Gas Sensor for Spacesuits
		H4.07	Low Volume, Power and Mass CO2 and Humidity Control for xEMU
		Z13.03	Technologies for Spacesuits in Extreme Surface Environments
	TX06.3 - Human Health and Performance	H12.07	Protective Pharmaceutical Packaging
TX07 - Exploration Destination Systems	TX07.1 - In-Situ Resource Utilization	Z12.01	Extraction of Oxygen, Metal, and Water from Lunar Regolith
	TX07.2 - Mission Infrastructure, Sustainability, and Supportability	Z13.02	Mechanisms for Extreme Environments
	TX07.3 - Mission Operations and Safety	S13.04	Contamination Control and Planetary Protection
	TX07.X - Other Exploration Destination Systems	Z14.01	Lunar Surface Excavation
TX08 - Sensors and Instruments	TX08.1 - Remote Sensing Instruments/Sensors	S11.01	Lidar Remote-Sensing Technologies
		S11.02	Technologies for Active Microwave Remote Sensing
		S11.03	Technologies for Passive Microwave Remote Sensing
		S11.04	Sensor and Detector Technologies for Visible, Infrared (IR), Far-IR, and Submillimeter
		S12.06	Detector Technologies for Ultraviolet (UV), X-Ray, and Gamma-Ray Instruments
		S14.03	Remote Sensing Instrument Technologies for Heliophysics
		S16.07	Cryogenic Systems for Sensors and Detectors
	TX08.2 - Observatories	S12.01	Exoplanet Detection and Characterization Technologies
		S12.03	Advanced Optical Systems and Fabrication/Testing/Control Technologies for Extended-Ultraviolet/Optical and Infrared Telescope
		S12.04	X-Ray Mirror Systems Technology, Coating Technology for X-Ray-UV-OIR, and Free-Form Optics

	TX08.3 - In-Situ Instruments/Sensor	A2.04	AERONAUTICAL INFORMATION SYSTEM SECURITY (AISS): Aircraft Systems
		S11.05	Suborbital Instruments and Sensor Systems for Earth Science Measurements
		S13.05	In Situ Instruments/Technologies for Lunar and Planetary Science
		S13.06	In Situ Instruments/Technologies and Plume Sampling Systems for Ocean Worlds Life Detection
		S15.01	Plant Research Capabilities in Space
		S16.08	Atomic Quantum Sensor and Clocks
	TX08.X - Other Sensors and Instruments	S14.02	Particle and Field Sensors and Instrument-Enabling Technologies
		Z4.05	Nondestructive Evaluation (NDE) Sensors, Modeling, and Analysis
TX09 - Entry, Descent, and Landing	TX09.1 - Aeroassist and Atmospheric Entry	Z7.03	Entry and Descent System Technologies
	TX09.3 - Landing	Z7.04	Landing Systems Technologies
	TX09.X - Other Entry, Descent, and Landing	Z7.01	Entry, Descent, and Landing Flight Sensors and Instrumentation
		Z8.13	Space Debris Prevention for Small Spacecraft
TX10 - Autonomous Systems	TX10.1 - Situational and Self Awareness	H6.22	Deep Neural Net and Neuromorphic Processors for In-Space Autonomy and Cognition
	TX10.2 - Reasoning and Acting	S17.03	Fault Management Technologies
	TX10.3 - Collaboration and Interaction	H6.23	Spacecraft Autonomous Agent Cognitive Architectures for Human Exploration
	TX10.X - Other Autonomous Systems	A2.02	Enabling Aircraft Autonomy
TX11 - Software, Modeling, Simulation, and Information Processing	TX11.2 - Modeling	S17.04	Application of Artificial Intelligence for Science Modeling and Instrumentation
	TX 11.X Other Software, Modeling, Simulation, and Information Processing	A2.03	Advanced Air Mobility (AAM) Integration
		S11.06	Earth Science Decision Support Tools Focused on the Mitigation of Climate Change Impacts
		S17.02	Integrated Science Mission Modeling
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing	TX12.1 - Materials	H5.02	<i>Hot Structure Technology for Aerospace Vehicles</i>
	TX12.2 - Structures	H5.01	Lunar Surface 50 kW-Class Solar Array Structures
		H5.05	Inflatable Softgoods for Next Generation Habitation Systems
		S12.02	Precision Deployable Optical Structures and Metrology

	TX12.3 - Mechanical Systems	Z13.01	Active and Passive Dust Mitigation Surfaces
	TX12.4 - Manufacturing	H8.01	Low-Earth Orbit Platform and Microgravity Utilization for Terrestrial Applications
	TX12.X - Other Manufacturing, Materials, and Structures	Z4.07	Advanced Materials and Manufacturing for In-Space Operations
		Z14.02	Extraterrestrial Surface Construction
TX13 - Ground, Test, and Surface Systems	TX13.1 - Infrastructure Optimization	H10.01	Advanced Propulsion Systems Ground Test Technology
TX14 - Thermal Management Systems	TX14.1 - Cryogenic Systems	Z10.01	Cryogenic Fluid Management
	TX14.2 - Thermal Control Components and Systems	Z2.01	Spacecraft Thermal Management
	TX14.3 - Thermal Protection Components and Systems	S16.05	Thermal Control Systems
TX15 - Flight Vehicle Systems	TX15.1 - Aerosciences	A1.01	Aeroelasticity and Aeroservoelastic Control
		A1.05	Computational Tools and Methods
	TX15.2 - Flight Mechanics	A2.01	Flight Test and Measurement Technologies
		H9.03	Flight Dynamics and Navigation Technologies
TX16 - Air Traffic Management and Range Tracking Systems	TX16.1 - Safe All Vehicle Access	A3.03	Future Aviation Systems Safety
	TX16.3 - Traffic Management Concepts	A3.01	Advanced Air Traffic Management System Concepts
		A3.02	Increasing Autonomy in the National Airspace System (NAS)
		A3.04	Nontraditional Airspace Operations and Aerial Wildfire Response
TX17 - Guidance, Navigation, and Control (GN&C)	TX17.X - Other Guidance, Navigation, and Control	S16.03	Guidance, Navigation, and Control