Next Page

OMB Control Number: 0694-0119
Expiration Date: September 30, 2025

U.S. CIVIL SPACE INDUSTRIAL BASE ASSESSMENT

SCOPE OF ASSESSMENT

The U.S. Department of Commerce, Bureau of Industry and Security (BIS), Office of Technology Evaluation, in coordination with the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA) is conducting a survey and assessment of organizations affiliated with NASA, NOAA, and the broader U.S. Civil Space Industrial Base (CSIB). The resulting data will help identify the structure and interdependencies of organizations that participate in the CSIB and identify their associated supply chains. This effort will also aid NASA and NOAA's ability to understand and respond to supply chain deficiencies, such as supply chain disruptions and diminishing manufacturing sources and material shortages (DMSMS), foreign sourcing and dependency, financial performance, cyber security incidents, use of critical minerals and materials, COVID-19 pandemic impacts, and other challenges facing the CSIB.

RESPONSE TO THIS SURVEY IS REQUIRED BY LAW

A response to this survey is required by law under the authority and provisions of the Defense Production Act of 1950 (DPA), as amended, and Executive Order 13603. Failure to respond can result in a maximum fine of $10,000, imprisonment of up to one year, or both (50 U.S.C. § 4555). Information furnished herein is deemed confidential and will not be published or disclosed except in accordance with Section 705(d) of the DPA (50 U.S.C. § 4555). Section 705(d) prohibits the publication or disclosure of this information unless the President determines that its withholding is contrary to the national defense (50 U.S.C. § 4555). Information will not be shared with any non-government entity, other than in aggregate form. The information will be protected pursuant to the appropriate exemptions from disclosure under the Freedom of Information Act (FOIA), should it be the subject of a FOIA request.

Notwithstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number.

BURDEN ESTIMATE AND REQUEST FOR COMMENT

Public reporting burden for this collection of information is estimated to average 16 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information to BIS Information Collection Officer, Room 6883, Bureau of Industry and Security, U.S. Department of Commerce, Washington, D.C. 20230, and to the Office of Management and Budget, Paperwork Reduction Project (OMB Control No. 0694-0119), Washington, D.C. 20503.

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

TABLE OF CONTENTS

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

GENERAL INSTRUCTIONS	
A.	Your organization is required by law to complete this survey of the civil space industrial base supply chain, affiliated systems and subsystems, including related products and services. This effort will aid NASA, NOAA, and the USG in understanding and responding to supply chain deficiencies, such as supply chain disruptions and diminishing manufacturing sources and material shortages (DMSMS), foreign sourcing and dependency, financial performance, cyber security incidents, use of critical minerals and materials, COVID-19 pandemic impacts, and other challenges facing the CSIB. Your organization has been identified as a direct or indirect supplier to NASA, NOAA,or the civil space industrial base meaning as a prime contractor, subcontractor or as part of their multi-tiered supply chain network as a raw or intermediate material provider, distributor, reseller, integrator, software developer, quality or test providers, manufacturer, small business, non-profit, laboratory, university, FFRDC, etc. Complete the survey using the Microsoft Excel file downloaded from the secure Census Bureau portal: https://respond.census.gov/csib To improve internal coordination and overall reporting, a PDF version of the survey is available on the portal to aid internal data collection. The portal will only accept Excel submissions.
B.	Respond to every question. Surveys that are not fully completed will be returned for completion. Use the comment boxes at the bottom of every section to provide any supplemental information. Make sure to record a complete answer in the cell provided, even if the cell does not appear to expand to fit all the information. Refer to the "Definitions" section while completing the survey. **Sections 2a-2g must be completed** before proceeding to subsequent parts of the survey as answers inform menu options in later survey sections. **DO NOT CUT AND PASTE RESPONSES WITHIN THIS SURVEY.** Inputs to the survey are made by keyboard responses or use of a drop-down menu. The use of cut and paste can corrupt the file. If your submittal is corrupted due to cut and paste your organization will be required to download an additional survey from the portal and resubmit.
C.	**Do not disclose any classified information in this survey form.**
D.	Submit your survey only through the secure Census Bureau portal: https://respond.census.gov/csib Do not email surveys to BIS.
E.	Questions related to the survey content should be directed to BIS survey support staff at CSIBsurvey@bis.doc.gov Email is the preferred method of contact.
F.	For questions related to the overall scope of the industrial base survey and assessment, contact CSIBsurvey@bis.doc.gov or: Jason Bolton, Director DOC/BIS/EA/OTE/Defense Industrial Base Division Room 1093, 1401 Constitution Avenue, NW Washington, DC 20230 DO NOT submit completed surveys to Mr. Bolton.

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DEFINITIONS

Term	Definition
Additive Manufacturing	A process of joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing technologies.
Advanced Materials	Materials with engineered properties created through the development of specialized processing and synthesis technology, including ceramics, high value-added metals, electronic materials, composites, polymers, and biomaterials.
Applied Research	A systematic study to gain the knowledge or understanding necessary to determine the means by which a recognized and specific need may be met. This activity includes work leading to the production of useful materials, devices and systems or methods, including design development and improvement of prototypes and new processes.
Approved Item	A DMSMS resolution in which the obsolescence issue is resolved by the use of items already approved on the drawing and still in production.
Artificial Intelligence (AI)	The ability of machines to perform tasks that normally require human intelligence.
Authorizing Official	Executive officer of the organization or business unit or other individual who has the authority to execute this survey on behalf of the organization.
Basic Research	Systematic, scientific study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts.
Blockchain	A decentralized, distributed ledger that records the provenance of a digital asset.
Brute Force cyberattack	A method of accessing an obstructed device through attempting multiple combinations of numeric/alphanumeric passwords.
Capability	The ability to provide the product or service within 12 months in typical business conditions.
Civil Space	Non-military/DOD space related work supporting primarily NASA and NOAA and to a lesser extent Federal Aviation Administration, Federal Communications Commission, and the Department of Energy. For instance, the civil space industrial base goes beyond prime contractors and commercial companies to include federally-funded research and development centers (FFRDCs), universities, and laboratories.
Cloud Computing	The delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet (“the cloud”).
Code/SQL Injection	A type of cyberattack that looks for web sites that pass insufficiently-processed user input to database back-ends.
Commercial and Government Entity (CAGE) Code	An alphanumeric CAGE code identifies companies doing or wishing to do business with the U.S. Federal Government. The code is used to support mechanized government systems and provides a standardized method of identifying a given facility at a specific organization. Find CAGE codes at https://cage.dla.mil
Commercialization	The process of developing products, processes, technologies, or services and the production and delivery (whether by the originating party or others) of the products, processes, technologies, or services for sale to or use by the federal government or commercial markets.
Commercially Sensitive Information	Privileged or proprietary information which, if compromised through alteration, corruption, loss, misuse, or unauthorized disclosure, could cause serious harm to the information's owners.
Complex Substitute	A DMSMS resolution in which the replacement item that has different specifications but requires no modification of the source product or the NHA, is researched and validated. The substitute may be the result of a redefined military requirement.
Component	Any raw material, substance, piece, part, software, firmware, labeling, or assembly which is intended to be included as part of the finished, packaged, and labeled device.
Contract	A legal instrument providing for the purchase, lease, or barter of property or services for the direct benefit of the U.S. Government. (SOURCE - DOS/USAID, FAH, 14 FAH-2 H-124.1) Note that for the purposes of this survey, purchase orders should not be considered contracts.
Cost Plus Contract	A cost-reimbursement contract that provides for payment to the contractor of a negotiated fee that is fixed at the inception of the contract. The fixed fee does not vary with actual cost, but may be adjusted as a result of changes in the work to be performed under the contract.
Counterfeit	A part that is not genuine because it 1) is an unauthorized copy; 2) does not conform to original manufacturer design, model, and/or performance standards; 3) is not produced by the original manufacturer or is produced by unauthorized contractors; 4) is an off-specification, defective, or used OEM product sold as "new" or working; or 5) has incorrect or false markings and/or documentation.
Critical Minerals	For the purposes of this survey, critical minerals are the 35 minerals identified by the U.S. Geological Survey as a non-fuel mineral or mineral material that is essential to the economic and national security of the United States, has a supply chain vulnerable to disruption, and serves an essential function in the manufacturing of a product, the absence of which would have significant consequences for the economy or national security. For more information, visit https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals
Critical Technology	In terms of this survey, critical technology are "at risk" industrially-supplied building block items used for a variety of NASA ground and space systems.
Customer	An entity to which an organization directly delivers the product or service that it produces. A customer may be another organization or another facility owned by the same parent organization. The Customer may be the end user for the item but often can be the immediate link in the supply chain, adding additional value before transferring the item to yet another customer.
Cyber Incident	Actions taken through the use of an information system or network that result in an actual or potentially adverse effect on an information system, network, and/or the information residing therein.
Cybersecurity	The body of technologies, processes, and practices designed to protect networks, computers, programs, and data from attack, damage, or unauthorized access.
Data Universal Numbering System (DUNS)	A nine-digit numbering system that uniquely identifies an individual businesses. Find DUNS numbers at http://fedgov.dnb.com/webform
DD Form 254	The intention of a DD Form 254 is to convey security requirements, classification guidance and provide handling procedures for classified material received and/or generated on a classified contract. The Federal Acquisition Regulation (FAR) requires that a DD Form 254, Contract Security Classification Specification, be integrated in each classified contract. The DD Form 254 provides the contractor (or a subcontractor) security requirements and the classification guidance that is necessary to execute a classified contract.
Deemed Export	The release of controlled technology or information to a foreign person in the U.S. This includes technology made available to foreign nationals for visual inspection, exchanged orally, and made available by practice or application under the guidance of persons with knowledge of the technology.
Defense-Related	Any activity/component/subsystem/test/product/service that contributes to a government defense program, whether directly or indirectly, or is used to provide any such item that contributes to a government defense program.
Denial of Service (DoS/DDoS)	The prevention of authorized access to resources or the delaying of time-critical operations (Time-critical may be milliseconds or it may be hours, depending upon the service provided).
Development of a New Item or Source	A DMSMS resolution in which a replacement product is developed that meets the requirements of the original product without affecting the NHA. The new product may be developed by emulating, reverse engineering, designing a replacement based on the original manufacturing designs and processes, or designing a different product based on the original or new requirements. The manufacturing source for the new item may be the original manufacturer or a new source.
Digital Engineering	The use of models and computer resources together to do engineering tasks, such as design, analysis, prototyping and experimentation.
Direct Support	Selling to or engaging in a direct contract with the entity in question.
Distributed Ledger Technology	Refers to the technological infrastructure and protocols that allows simultaneous access, validation, and record updating in an immutable manner across a network that's spread across multiple entities or locations.
Diversity, Equity, Inclusion, and Accessibility (DEIA)	1) Diversity encompasses the full variety of communities, identities, races, ethnicities, backgrounds, abilities, cultures, and beliefs of all people, including those from underserved communities. 2) Equity defined means the consistent and systematic provision of fair, just, and impartial treatment to all individuals, including individuals who belong to underserved communities that have been denied such treatment. 3) Inclusion involves the recognition, appreciation, and use of the talents and skills of employees of all backgrounds. 4) Accessibility denotes the capability for full and independent use by all people, including people with disabilities, of technology, programs, and services through inclusive design, construction, development, and maintenance of facilities.
Edge Computing	Computing and processing that can occur at the edge of the IT enterprise, often at the data collection source itself.
Encryption Technologies	Technology that converts information to ciphertext that can only be deciphered by authorized users that have the key. Types of encryptions include, but are not limited to, Symmetric Encryption, Asymmetric Encryption, Data Encryption Standard (DES), Triple Data Encryption Standard (3DES), Rivest-Shamir-Adleman (RSA), Advanced Encryption Standard (AES), Encryption in the Cloud, and End-to-End Encryption.
Export Administration Regulation (EAR)	U.S. Government regulation designed to control the export of “dual-use” goods, that is, those that have both commercial and military applications, administered by the U.S. Department of Commerce.
Extension of Product Support	A DMSMS resolution in which the supplier is incentivized to continue providing the obsolete items. This may involve long-term agreements to procure specific quantities of items. One-time costs may be associated with setting up this resolution. Those costs should be included in any cost and cost avoidance by being proactive calculations. For software, long-term licensing and/or support agreements are obtained.
External Funding	Funding being sourced external to or outside the organization; capital or funds (e.g., loans, grants, etc.) to support research and development that are derived from a federal, state, or local agency, a foundation, industry, or another external source.
Facility	For the purpose of this survey, a facility is an area within an organization defined by a single CAGE code. An organization's physical organization may contain multiple facilities.
Federal Acquisition Regulation (FAR)	The Federal Acquisition Regulations System is established for the codification and publication of uniform policies and procedures for acquisition by all executive agencies. The Federal Acquisition Regulations System consists of the Federal Acquisition Regulation (FAR), which is the primary document, and agency acquisition regulations that implement or supplement the FAR.
Full Time Equivalent (FTE) Employees	Employees who work for 40 hours in a normal work week. Convert part-time employees into "full time equivalents" by taking their work hours as a fraction of 40 hours.
Hypersonics	Vehicles or weapons that travel faster than Mach 5 (~3,800mph) and have the capability to maneuver during the entire flight.
Indefinite-Delivery, Indefinite Quantity (IDIQ) Contract	This type of contract provides for an indefinite quantity of services for a fixed time. They are used when the government can't determine, above a specified minimum, the precise quantities of supplies or services that it will require during the contract period.
Innovation	Applying technology, tools, or processes in a new or different way that helps perform the mission better, cheaper, or faster. That is, it saves resources, time or money, or enables the user to perform their mission better.
Internal Funding	Capital or funds to support research and development that are derived from retained earnings, profits, or other existing financial resources
International Traffic in Arms Regulation (ITAR)	Regulation designed to control the export of defense and military-related technologies, administered by the U.S. Department of State.
Internet of Things (IoT)	A system of objects, as well as even people and animals, who carry unique identifiers and can transfer data over the internet without any human-to-human or human-to-computer interaction.
Joint Venture	A joint commercial enterprise taken by two or more distinct business entities.
Labor-Hour Contract	A labor-hour contract is a variation of the time-and-materials contract, differing only in that materials are not supplied by the contractor.
Life of Need (LON) Buy	A DMSMS resolution in which a sufficient quantity of the item is purchased to sustain the product until its next technology refreshment or the discontinuance of the host assembly. Because this resolution uses an approved item, no testing or drawing changes are required. The source of supply can be residual stock from the original manufacturer, shelf stock from distributors, sponsor-owned material, and so forth.
Long Range Deep Space Communication	Communication technology with the ability to communicate with spacecraft, send commands or software updates, track location and receive telemetry, images and scientific data across large distances from earth. According to NASA, deep space is considered any distance further than the moon, roughly 384,000km.
Malware	Hardware, firmware, or software that is intentionally included or inserted in a system for a harmful purpose.
Man in the Middle (MitM)	A cyberattack where the adversary positions himself in between the user and the system so that he can intercept and alter data traveling between them.
North American Industry Classification System (NAICS) Code	The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.
NATO Commercial and Government Entity (NCAGE) Code	CAGE codes for entities located outside the United States. NCAGE codes are assigned internationally as part of the NATO Codification System (NCS), and are required for all foreign entities or the registration will be considered incomplete. Find NCAGE codes at: https://eportal.nspa.nato.int/AC135Public/CageTool/home
Organization	For the purpose of this survey, an organization can include a company, university, federally-funded research and development center (FFRDC), laboratory, or other government entity. Organizations may, and often will, contain multiple facilities. Additionally, all off-work site activities associated with a organization should be reported as part of that organization. For instance, employees who work at a client site should be considered as part of their employing organization.
Other Transaction Agreements (OTA)	Legally binding instruments that may be used to engage industry and academia for a broad range of research and prototyping activities. OTAs are typically defined by what they are not: they are not standard procurement contracts, grants, or cooperative agreements. As such, they are generally not subject to the federal laws and regulations that apply to government procurement contracts (e.g., FAR/DFARS)
Phishing	A technique for attempting to acquire sensitive data, such as bank account numbers, through a fraudulent solicitation in email or on a web site, in which the perpetrator masquerades as a legitimate business or reputable person.
Product/Process Development	Conceptualization and development of a product prior to the production of the product for customers.
Qualified Research Expense (QRE)	The R&D credit comprises the following types of Qualified Research Expenses (QRE): • Wages paid to employees for qualified services (including amounts considered to be wages for federal income tax withholding purposes) • Supplies (defined as any tangible property other than land or improvements to land, and property subject to depreciation) used and consumed in the R&D process • Contract research expenses paid to a third party for performing QREs on behalf of the taxpayer, regardless of the success of the research, allowed at 65% of the actual cost incurred • Basic research payments made to qualified educational institutions and various scientific research organizations, allowed at 75% of the actual cost incurred.
Quantum Computing	An area of advanced theoretical research in computer science and physics, with the theory behind quantum computing being that the principles of quantum mechanics can be used to replace the binary one and zero bits of digital computing with multidimensional quantum bits known as qubits.
Ransomware	A type of malicious software designed to block access to a computer system until a sum of money is paid.
Redesign - Complex/Systems Replacement	A DMSMS resolution in which major assembly redesign affects assemblies beyond the obsolete item's NHA and may require that higher level assemblies, software, and interfaces be changed.
Redesign - Next Higher Assembly (NHA)	A DMSMS resolution in which he affected item's NHA must be modified. Only the NHA is affected, and the new design will not affect anything at a higher level in the system.
Repair, Refurbishment, or Reclamation	A DMSMS resolution type in which the obsolescence issue is resolved by doing one of the following: instituting a repair or refurbishment program for the existing item or assembly; instituting a reclamation program to reclaim items from marginal, out-of service, or surplus materiel; or obtaining access to the software source code, development tools, and the human resource skills necessary to change it to ensure continued support.
Requirements Contract	A requirements contract provides for filling all actual purchase requirements of designated Government activities for supplies or services during a specified contract period (from one contractor), with deliveries or performance to be scheduled by placing orders with the contractor.
Research & Development (R&D)	All efforts of scientific study and experimentation, theoretical work, and original investigation undertaken primarily to acquire new knowledge or understanding of the underlying foundations of phenomena and observable facts, including the creative and systematic application of knowledge with specific practical aim or objective or the production of useful materials, devices, and systems or methods. Comprises such efforts at all levels (basic, applied, design, etc.), including the design, development, and improvement of prototypes and new processes to meet specific requirements.

Robotics	The technology behind machines that are programmable by a computer and which can carry out a complex series of actions automatically.
Service	An intangible product (contrasted to a good, which is a tangible product). Services typically cannot be stored or transported, even though other sources with equivalent technical know-how and production capability may exist.
Simple Substitute	A DAIMMS resolution in which the item is replaced with an existing item that meets all requirements without modification to either the item or its NHA and requires only minimal qualification. Associated costs are largely administrative. This is sometimes referred to as an "alternate."
Single Source	An organization that is designated as the only accepted source for the supply of parts, components, materials, or services, even though other sources with equivalent technical know-how and production capability may exist.
Small Business Innovation Research (SBIR) Contracts	A highly competitive program that encourages domestic small businesses to engage in Federal Research/Research and Development (R/R&D) that has the potential for commercialization. Through a competitive awards-based program, SBIR enables small businesses to explore their technological potential and provides the incentive to profit from its commercialization. By including qualified small businesses in the nation's R&D arena, high-tech innovation is stimulated and the United States gains entrepreneurial spirit as it meets its specific research and development needs. Find more information about SBIR at: https://www.sbir.gov/about/about-sbir
Small Business Technology Transfer (STTR) Contracts	A program that expands funding opportunities in the federal innovation research and development (R&D) arena. Central to the program is expansion of the public/private-sector partnership to include the joint venture opportunities for small businesses and nonprofit research institutions. The unique feature of the STTR program is the requirement for the small business to formally collaborate with a research institution in Phase I and Phase II. STTR's most important role is to bridge the gap between performance of basic science and commercialization of resulting innovations. Find more information about STTR at: https://www.sbir.gov/about/about-sttr#what
Sole Source	An organization that is the only source for the supply of parts, components, materials, or services. No alternative U.S. or non-U.S. based suppliers exist other than the current supplier.
Space Related	Any product, service, or object that can be a) used in or launched into space, b) used to directly or indirectly support space applications from Earth, and/or c) used to manufacture any product that is used in space or directly supports space applications. The product, service, or object does not have to be specifically intended to support space applications.
STEM Workforce	STEM is the acronym for Science, Technology, Engineering, and Mathematics. The STEM workforce not only includes occupations that are historically known to require science and engineering skills and expertise (e.g., life sciences, physical sciences, engineering, mathematics and computer sciences, social sciences, and health care) but also occupations that require STEM skills but are not historically considered STEM occupations (e.g., installation, maintenance, and repair; construction trades; and production occupations).
Supercomputing	A class of extremely powerful computers used primarily for scientific and engineering work requiring exceedingly high-speed computations. The performance of a supercomputer is commonly measured in floating-point operations per second (FLOPS) instead of million instructions per second (MIPS). Common applications for supercomputers include testing mathematical models for complex physical phenomena or designs, such as climate and weather, evolution of the cosmos, nuclear weapons and reactors, new chemical compounds (especially for pharmaceutical purposes), and cryptology.
Supplier	An entity from which your organization obtains inputs. A supplier may be another firm with which you have a contractual relationship, or it may be another facility owned by the same parent organization. The inputs may be goods or services.
Supply Chain Risk Management (SCRM) Program	A coordinated effort within an organization to help identify, monitor, detect and mitigate threats to the supply chain.
Technology Taxonomy	NASA's system that identifies, organizes, and communicates technology areas into 17 distinct technical discipline-based taxonomies relevant to advancing the agency's mission.
Time-and-Materials Contracts	A time-and-materials contract provides for acquiring supplies or services on the basis of either direct labor hours at specified fixed hourly rates that include wages, overhead, general and administrative expenses, and profit; or the actual cost for materials.
Unique Entity Identifier (UEI)	The Unique Entity ID or UEI is a 12-character alphanumeric ID assigned to an entity by SAM.gov. Find UEIs at https://sam.gov/content/home
Zero-day Exploit	A cyberattack that exploits a previously unknown hardware, firmware, or software vulnerability.

Previous Page

Next Page

Section 1a: Organization Information

This survey has been distributed on a Corporate/Whole Organization or Business Unit/Division basis. Provide the following information for your organization:

A.

Submission Type	Business Unit/ Divison, Corporate/Whole Organization
Legal Entity Name	
Street Address	
City	
State/Territory	
ZIP or Postal Code	
Website	
Phone Number	
In 2-3 sentences, provide a general description of this organization's activities.	

Indicate if your organization qualifies as any of the following types of business. **Only affirmative "Yes" responses are required**.					
	A small business enterprise (as defined by the Small Business Administration)	Yes	A minority-owned business	Yes
	8(a) firm (as defined by the Small Business Administration)	Yes	A woman-owned business	Yes
	A historically underutilized business zone (HUBZone)	Yes	A veteran-owned or service-disabled veteran-owned business	Yes

Does your organization have a Unique Entity Identifier (UEI)?	Yes/No	Does your organization have a Commercial and Government Entity (CAGE) Code?	Yes/No	Does your organization have a North American Industry Classification System (NAICS) code? Yes/No	Yes/No
Find UEIs at: https://sam.gov/content/home		Find CAGE codes at: https://cage.dla.mil/		Find NAICS codes at: https://www.census.gov/naics/	
If yes, enter your organization's primary UEI.		If yes, enter your organization's primary CAGE code.		If yes, enter your organization's primary NAICS code.	

Identify your organization's primary and additional business types and indicate whether they are space related, non-space related, or both. Select only one "primary" business type; all others should be "additional." **Only affirmative responses are required**.

Business Type	Participation	Space Related	Explain Activities for the Business Type (required)
Manufacturer	Primary	Space-Related	
Service Provider	Additional	Non-Space Related	
University		Both	
Research and Development			
Laboratory			
Federally Funded Research and Development Center			
Testing Facility			
Prototype Manufacturer			
Non-Government Organization (NGO)			
Distributor			
Holding Company			
Other (specify) (Specify Here)			

B.

Is your organization publicly traded or privately held?	Privatley Held, Publicly Traded, Not Applicable		If your organization is publicly traded, identify its stock ticker symbol:

Does your organization have any foreign beneficial ownership (5% ownership or more) either by individuals or entities? If no, select "No" and move on to the Parent Organization questions.	Yes/No

C.

If your organization has any foreign beneficial ownership (5% ownership or more), indicate the name of the entity, the entity type, the percentage of ownership held, and the entity country. Then, provide the percentage of foreign government ownership (if applicable) and identify the country of foreign government ownership (if applicable). If there are more than five entities, provide the five which have the highest percentage of ownership held.

	Entity Name	Entity Type	Percentage of Ownership Held	Entity Country	Percentage of Ownership of Entity by Foreign Government (if applicable)	Country of Foreign Government Ownership (if applicable)
Entity 1		Individual Foreign Company Foreign Government Foreign NGO Foreign Non-Profit Foreign University Research Insititution		Country List		
Entity 2						
Entity 3						
Entity 4						
Entity 5						

Does your organization have a parent company? If not, select "No" and advance to Part D.	Yes/No

If yes, provide the following information on your organization's parent organization(s).

	Parent Organization 1	Parent Organization 2 (if applicable)
Organization Name		
Street Address		
City		
State/Province		
Country		
ZIP/Postal Code		
In 2-3 sentences, provide a general description of the parent organization's activities.		

D.

Mergers, Acquisitions, Divestitures, and Joint Venture Activities

Record the total number of **space related** mergers, acquisitions, and divestitures (both U.S.-based, and non-U.S. based) in which your organization has been involved from **2019-2022**, including any current or ongoing joint venture activities. If none, insert "0" in the provided box and move to Part E.	

Based on their strategic importance to the organization's support of NASA, NOAA, and the broader CSIB, identify your organization's five most recent **space related** mergers, acquisitions, and divestitures, as well as any ongoing joint venture activities.

	Organization Name	Primary CAGE, UEI, or Full Address (including Street and Zip or Postal Code)	Type of Activity	Country	Year Activity Executed	Activity Completed, Ongoing, or Terminated (ended)?	Primary Objective of Activity
1			Merger Aquisition Divesture Joint Venture	Country List		Completed Ongoing Terminated	
2							
3							
4							
5							

Access to financial resources
Access to government contracts
Access to intellectual property
Access to suppliers
Access to technological resources
Bankruptcy restructuring
Broaden customer base
Creation of new technologies
Develop new capabilities
Improved access to foreign markets
Improved access to U.S. markets
Other Objective (Explain)
Overcome Market entry barrier/Geopolitical concerns
R&D access/Coordination
Reduced costs
Reduced lead times
Risk sharing
Shared/improved technology or skills
Tax-related
Vertical integration

E.

Point of Contact regarding this survey:

Name	Title	Phone Number	Email Address	State
				State List

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

Section 1b: Facility Information

U.S. Facilities

A.

Identify the total number of in-scope facilities (e.g., facilities with capabilities listed in Section 2a) that your organization operates in the United States.	

List your organization's top 10 most critical in-scope facilities (which provide inputs, products, services, etc. to support your organization's capabilities listed in Section 2a) that are located in the United States. Identify each facility's name, CAGE/UEI, primary NAICS, zip code, state, primary function, and its DD Form 254 status.

	Facility Name	CAGE/UEI	Primary NAICS	Zip Code	State	Primary Function	Primary Function - Explain	Tech Taxonomy Area (*see Section* 2a)	Conducts Classified Work? (DD Form 254)
1					State List	Distributor Manufacturing R&D Reseller Servicing/Engineering Other (specify in "Explain" section)		Taxonomy List (Tab 2a)	Facility is DD Form 254-approved and conducts classified work Facility is DD Form 254-approved but does not conduct classified work Facility is working on DD Form 254 approval Facility is not DD Form 254-approved and does not conduct classified work
2									
3									
4									
5									
6									
7									
8									
9									
10									

Non-U.S. Facilities

B.

Identify the total number of in-scope facilities (e.g., facilities with capabilities listed in Section 2a) that your organization operates outside the United States. If none, enter "0" if none and proceed to Section 2a.	

List your organization's top 10 most critical in-scope facilities (which provide inputs, products, services, etc. to support your organization's capabilities listed in Section 2a) that are located outside the United States. Identify each facility's name, NCAGE/UEI, primary NAICS, postal code, country, primary function, and its DD Form 254 status.

	Facility Name	NCAGE/UEI	Primary NAICS	Postal Code	Country	Primary Function	Primary Function - Explain	Tech Taxonomy Area (*see Section* 2a)	Conducts Classified Work? (DD Form 254)
1					Country List	Distributor Manufacturing R&D Reseller Servicing/Engineering Other (specify in "Explain" section)		Taxonomy List (Tab 2a)	Facility is DD Form 254-approved and conducts classified work Facility is DD Form 254-approved but does not conduct classified work Facility is working on DD Form 254 approval Facility is not DD Form 254-approved and does not conduct classified work
2									
3									
4									
5									
6									
7									
8									
9									
10									

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Section 2a: Technology Taxonomy: Products and Services

For Section 2a, identify **all** products and/or services that your organization manufactures, distributes, performs research and development, and/or otherwise provides or has the capability of providing, regardless of use by or in support for the USG. For the purpose of this survey, "capability" is defined as having the ability to provide a product or service. Identify each Technology Taxonomy subarea in which your organization has capabilities (only affirmative responses required). **NOTE:** If you selected "Manufacturer" as a Bussiness Type in Section 1a, review TX12.4 - Manufacturing in Section 2f.

For more information on the NASA-created Technology Taxonomy: https://www.nasa.gov/offices/oct/taxonomy/index.html

For Sections 2b-2g, provide information on the individual type of products or services within each indicated subarea for which your organization has capabilities. For descriptions of the technology taxonomy subareas, select the corresponding hyperlink. Complete the subareas were you indicate capability whether that is the current ability to produce products and/or provide services, products and/or services currently in development (available within 3 years), or if your organization is planning to develop products and/or services (available in 3 years or more). Subareas where you do not indicate capability will automatically grey out. Review all sections to ensure you do not omit any required information. **NOTE:** For Sections 2b-g and 3, if your organization has more than 50 capabilities, please prioritize your top 50 capabilities using these questions: is the capability space related? Do you currently have the ability (vs. in development)? Does the capability support the USG?
If you do not reach 50 capabilities with the above criteria, please prioritize your remaining capabilities using criteria of your own choosing (e.g., revenue, current supplier and/or customer info, criticality, technology maturity, etc.), and explain why you selected said criteria in the comment box at the bottom of the tab. Section 2a should list every capability. Only Sections 2b-g and 3 should be limited to your organization's top 50 capabilities.

Technology Taxonomy Area	Capability	Technology Taxonomy Area	Capability	Technology Taxonomy Area	Capability
TX01 - Propulsion Systems		TX06.3 - Human Health and Performance		TX12.2 - Structures	
TX01.1 - Chemical Propulsion Systems	Space Related	TX06.4 - Environmental Monitoring, Safety, and Emergency Response		TX12.3 - Mechanical Systems	
TX01.2 - Electric Space Propulsion	Non-Space Related	TX06.5 - Radiation		TX12.4 - Manufacturing	
TX01.3 - Aero Propulsion	Both	TX06.6 - Human Systems Integration		TX12.5 - Structural Dynamics	
TX01.4 - Advanced Propulsion		**TX07 - Exploration Destination Systems**		**TX13 - Ground, Test, and Surface Systems**	
TX02 - Flight Computing and Avionics		TX07.1 - In-Situ Resource Utilization		TX13.1 - Infrastructure Optimization	
TX02.1 - Avionics Component Technologies		TX07.2 - Mission Infrastructure, Sustainability, and Supportability		TX13.2 - Test and Qualification	
TX02.2 - Avionics Systems and Subsystems		TX07.3 - Mission Operations and Safety		TX13.3 - Assembly, Integration, and Launch	
TX02.3 - Avionics Tools, Models, and Analysis		**TX08 - Sensors and Instruments**		TX13.4 - Mission Success Technologies	
TX03 - Aerospace Power and Energy Storage		TX08.1 - Remote Sensing Instruments and Sensors		**TX14 - Thermal Management Systems**	
TX03.1 - Power Generation and Energy Conversion		TX08.2 - Observatories		TX14.1 - Cryogenic Systems	
TX03.2 - Energy Storage		TX08.3 - In-Situ Instruments and Sensors		TX14.2 - Thermal Control Components and Systems	
TX03.3 - Power Management and Distribution		**TX09 - Entry, Descent, and Landing**		TX14.3 - Thermal Protection Components and Systems	
TX04 - Robotic Systems		TX09.1 - Aeroassist and Atmospheric Entry		**TX15 - Flight Vehicle Systems**	
TX04.1 - Sensing and Perception		TX09.2 - Descent		TX15.1 - Aerosciences	
TX04.2 - Mobility		TX09.3 - Landing		TX15.2 - Flight Mechanics	
TX04.3 - Manipulation		TX09.4 - Vehicle Systems		**TX16 - Air Traffic Management and Range Tracking Systems**	
TX04.4 - Human-Robot Interaction		**TX10 - Autonomous Systems**		TX16.1 - Safe All Vehicle Access	
TX04.5 - Autonomous Rendezvous and Docking		TX10.1 - Situational and Self Awareness		TX16.2 - Weather/Environment	
TX04.6 - Robotics Integration		TX10.2 - Reasoning and Acting		TX16.3 - Traffic Management Concepts	
TX05 - Communications, Navigation, and Orbital Debris Tracking/Characterization Systems		TX10.3 - Collaboration and Interaction		TX16.4 - Architecture and Infrastructure	
TX05.1 - Optical Communications		TX10.4 - Engineering and Integrity		TX16.5 - Range Tracking, Surveillance, and Flight Safety Technologies	
TX05.2 - Radio Frequency		**TX11 - Software, Modeling, Simulation, and Information Processing**		TX16.6 - Integrated Modeling, Simulation, and Testing	
TX05.3 - Internetworking		TX11.1 - Software Development, Engineering, and Integrity		**TX17 - Guidance, Navigation, and Control (GN&C)**	
TX05.4 - Network Provided Position, Navigation, and Timing		TX11.2 - Modeling		TX17.1 - Guidance and Targeting Algorithms	
TX05.5 - Revolutionary Communications Technologies		TX11.3 - Simulation		TX17.2 - Navigation Technologies	
TX05.6 - Networking and Ground Based Orbital Debris Tracking and Management		TX11.4 - Information Processing		TX17.3 - Control Technologies	
TX05.7 - Acoustic Communications		TX11.5 - Mission Architecture, Systems Analysis, and Concept Development		TX17.4 - Altitude Estimation Technologies	
TX06 - Human Health, Life Support, and Habitation Systems		TX11.6 - Ground Computing		TX17.5 - GN&C Systems Engineering Technologies	
TX06.1 - Environmental Control and Life Support Systems and Habitation Systems		**TX12 - Materials, Structures, Mechanical Systems, and Manufacturing**		TX17.6 - Technologies for Aircraft Trajectory Generation, Management, and Optimization for Airspace Operations	
TX06.2 - Extravehicular Activity Systems		TX12.1 - Materials			
Comments:					

Section 2b: Technology Taxonomy Areas 1 - 3: Propulsion Systems; Flight Computing and Avionics; Aerospace Power and Energy Storage

For each Technology Taxonomy subarea identified in Section 2a, specify your organization's capabilities by selecting an option from the "Product/Service Capability" drop-downs. Next, indicate the type of support your organization provides to NASA and/or NOAA. Then, provide a description of the product/service within that Technology Taxonomy subarea for which your organization has capabilities and indicate whether your organization carries out Research & Development (R&D) for the given product/service. **NOTE, internal R&D is performed in-house by the organization, while external R&D is contracted out or otherwise out-sourced to another company or organization**. If the product contains any critical minerals, identify the primary critical mineral used (based on estimated level of criticality to the product/service). Lastly, for each Technology Taxonomy subarea line, provide the primary HTSUS 10-digit code if the product is imported. If your organization does not import, select "My organization does not import." in the cell to the right.

My organization does not import

TX01 - Propulsion Systems

TX01.1 - Chemical Propulsion Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX01.1.1 - Integrated Systems and Ancillary Technologies (ex: Thrust Vector Control, Separation motors, CubeSat propulsion, propellant thermal control systems, etc.)	Currently produce/service and is available for procurement	Direct Contract or Purchase Order with NASA	Direct Contract or Purchase Order with NOAA		Yes, internal R&D		
TX01.1.2 - Earth Storable (ex: Kerosene, Green propellants, Ionic liquids, etc.)	Currently in development (available within 3 years)	Sub-tier supplier to NASA	Sub-tier supplier to NOAA		Yes, external R&D		
TX01.1.3 - Cryogenic (ex: Liquid Oxygen, Methane, etc.)	Planned development (greater than 3 years)	Space Act Agreement with NASA	Other Transactional Authority with NOAA		Yes, both internal and external		
TX01.1.4 - Solids (ex: Hydroxyl Terminated Poly Butadiene (HTPB))		Contractual relationship to NASA unknown	Contractual relationship to NOAA unknown		Neither/No R&D		
TX01.1.5 - Hybrids (ex: Acrylonitrile butadiene styrene thermoplastic)		None	None				
TX01.1.6 - Gels (ex: Gelled oxygen (O2)/hydrogen (H2), Nanogelled propellants, etc.)							
TX01.1.7 - Cold Gas							
TX01.1.8 - Warm Gas							
TX01.1.XX - (Other)				(Other)			
TX01.2 - Electric Space Propulsion	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D		Primary HTSUS 10-Digit Code
TX01.2.1 - Integrated Systems and Ancillary Technologies (ex: Engine health monitoring, Materials and manufacturing, etc.)							
TX01.2.2 - Electrostatic (ex: Ion engines, Hall thrusters, Electrospray propulsion, etc.)							
TX01.2.3 - Electromagnetic (ex: Magnetoplasmadynamic (MPD) thruster, Pulsed inductive thruster, Electrodynamic launch, etc.)							
TX01.2.4 - Electrothermal (ex: Resistojets, Arcjets, etc.)							
TX01.2.XX - (Other)				(Other)			
TX01.3 - Aero Propulsion	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D		Primary HTSUS 10-Digit Code
TX01.3.1 - Integrated Systems and Ancillary Technologies (ex: Engine health monitoring, Emissions control, etc.)							
TX01.3.2 - Turbine Based Combined Cycle (ex: Dual mode scramjet)							
TX01.3.3 - Rocket Based Combined Cycle (ex: Ejector ramjet)							
TX01.3.4 - Pressure Gain Combustion (ex: Pulse Detonation Engines (PDE), Rotating Detonation Engines (RDE), Pulsejets, Wave rotors)							
TX01.3.5 - Turbine Based Jet Engines							
TX01.3.6 - Ramjet/Scramjet							
TX01.3.7 - Reciprocating Internal Combustion (ex: Air-cooled four- and six-cylinder piston engines)							
TX01.3.8 - All Electric Propulsion (ex: Permanent magnet synchronous motor, Distributed electronic propulsion, etc.)							
TX01.3.9 - Hybrid Electric Systems							
TX01.3.10 - Turboelectric Propulsion							
TX01.3.11 - Engine Icing (ex: Electro-expulsive deicing, Thermal anti-icing systems, etc.)							
TX01.3.12 - Alternative Low Carbon Jet Fuel (ex: Biojet fuels, Hydrogen-based fuels, etc.)							
TX01.3.XX - (Other)				(Other)			
TX01.4 - Advanced Propulsion	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D		Primary HTSUS 10-Digit Code
TX01.4.1 - Solar Sails							
TX01.4.2 - Electromagnetic Tethers							
TX01.4.3 - Nuclear Thermal Propulsion							
TX01.4.4 - Other Advanced Propulsion Approaches							
TX01.4.XX - (Other)				(Other)			

TX02 - Flight Computing and Avionics

TX02.1 - Avionics Component Technologies	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D		Primary HTSUS 10-Digit Code
TX02.1.1 - Radiation Hardened Extreme Environment Components and Implementations (ex: Radiation mitigation devices, Rad-hard/tolerant data processing, Nanoelectronics based memory devices, etc.)							
TX02.1.2 - Electronic Packaging and Implementations (ex: Additively manufactured electronic packaging, Chip-on-board technologies, etc.)							
TX02.1.3 - High Performance Processors (ex: Scalable, multi-core processors, Digital signal processors (DSP), Graphics processing units (GPU), etc.)							
TX02.1.4 - High Performance Memories (ex: Rad-hard high-density on-board memory, Double Data Rate (DDR3/4), Magnetoresistive Random Access Memory (MRAM), etc.)							
TX02.1.5 - High Performance Field Programmable Gate Arrays (FGPA) (ex: Rad-hard/tolerant FPGAs, Techniques for FPGA radiation hardening, etc.)							
TX02.1.6 - Radiation Hardened ASIC Technologies (ex: System-on-a-chip (SoC) devices, Intellectual property (IP) cores, Network interface ASICs, etc.)							
TX02.1.7 - Point-of-Load Power Converters (ex: Fault-tolerant point-of-load converters, Multi-output point-of-load converters, etc.)							
TX02.1.8 - Wireless Avionics Technologies (ex: RFID-based sensors, Wi-Fi-based sensors, Wireless wearable sensors for monitoring astronauts, etc.)							
TX02.1.XX - (Other)				(Other)			
TX02.2 - Avionics Systems and Subsystems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX02.2.1 - Spacecraft Command and Data Handling Systems (C&DH) (ex: Data recorders and storage systems, Health management systems, Crew input and display systems, etc.)							
TX02.2.2 - Aircraft Avionics Systems (ex: Autopilots, Flight deck management systems, Terrain awareness/warning systems, Collision avoidance systems, etc.)							
TX02.2.3 - Vision and Virtual/Augmented Reality Avionics (ex: External visions systems for safe take-off/landing, Integrated data and real-time imaging into heads-up displays, etc.)							
TX02.2.4 - Low Power Embedded Computer Systems (ex: Real-time processor boards/systems, Instrument or peripheral embedded processing systems, etc.)							
TX02.2.5 - High Speed Onboard Interconnects and Networks (ex: Gigabit Ethernet, Fiber optic network waveguide, etc.)							
TX02.2.6 - Data Acquisition Systems (ex: Structural Health m=Monitoring and Thermal Health Monitoring (SHM/THM) system integration, Sensor webs, High analog-bandwidth/sampling rate, etc.)							
TX02.2.7 - Data Reduction Hardware Systems (ex: Data duplication software, Radio frequency (RF) compression, etc.)							
TX02.2.8 - Use of Advanced Commercial-off-the-Shelf (COTS) Technologies (ex: Uses of advanced commercial microcircuits, semiconductors, and passives; Implementation of commercial processors, FPGAs, memories, Analog-to-Digital/Digital-to-Analog Converters (ADC/DAC), etc.)							
TX02.2.XX - (Other)				(Other)			
TX02.3 - Avionics Tools, Models, and Analysis	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX02.3.1 - Electronics Development Tools (ex: Automated hardware development toolsets, Printed circuit board (PCB) design tools, etc.)							
TX02.3.2 - Space Radiation Analysis and Modeling (ex: IRENE, ESP, and PSYCHIC environmental models, MULASSIS, Monte Carlo N-Particle/ Monte Carlo N-Particle eXtended (MCNP/MCNPX), NOVICE transport codes, etc.)							
TX02.3.3 - Avionics Reliability and Fault-Tolerance Analysis and Modeling (ex: Fault tolerance modeling and coverage estimation, Fault Injectors, etc.)							
TX02.3.4 - Electromagnetic Environment Effects (ex: E3 2D and 3D modeling capability, including Finite Difference Time Domain (FDTD) and integral electromagnetic solvers, with aerodynamic and thermal environment interfaces)							
TX02.3.XX - (Other)				(Other)			

TX03 - Aerospace Power and Energy Storage

TX03.1 - Power Generation and Energy Conversion	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX03.1.1 - Photovoltaic (ex: 25-150 kW-class solar arrays, Reliably retractable solar arrays, etc.)							
TX03.1.2 - Heat Sources (ex: Conventional radioisotope, fission, or solar-thermal heat sources linked with novel aspects of heat collection such as heat pipes, heat pumps, etc.)							
TX03.1.3 - Static Energy Conversion (ex: Enhanced multi-mission radioisotope thermoelectric generators, Thermionic generators)							
TX03.1.4 - Dynamic Energy Conversion (ex: Advanced Stirling radioisotope generator, Brayton and Rankine cycle generators with solar, fission, or chemical energy sources, etc.)							
TX03.1.5 - Electrical Machines (ex: High-efficiency, high-power motors/generators for electric aircraft, Wind turbines, etc.)							
TX03.1.6 - Other Advanced Concepts for Generating/Converting Power (ex: Electrodynamic tether energy harvesting, Nuclear thermionic avalanche cells, Alpha/beta voltaics, etc.)							
TX03.1.XX - (Other)				(Other)			
TX03.2 - Energy Storage	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX03.2.1 - Electrochemical: Batteries (ex: High-specific-energy, Extreme environment energy storage, Flow batteries, etc.)							
TX03.2.2 - Electrochemical: Fuel Cells (ex: Hydrogen/oxygen-based regenerative fuel cells, Solid oxide fuel cells, etc.)							
TX03.2.3 - Electrochemical: Advanced Concepts for Energy Storage (ex: Superconducting bearings, Solar energy stored as high-energy-density chemical fuels, etc.)							
TX03.2.XX - (Other)				(Other)			
TX03.3 - Power Management and Distribution	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX03.3.1 - Management and Control (ex: Autonomous fault detection, isolation, and recovery (FDIR) algorithms and technologies for complex power systems, Heirarchical and distributed control of a power system, etc.)							
TX03.3.2 - Distribution and Transmission (ex: High-conductivity carbon nanotube wire, All forms of wireless power transmission (magnetic, radio frequency, and optical), etc.)							
TX03.3.3 - Electrical Power Conversion and Regulation (ex: Modular power converters, Electrical propulsion power processing units (power electronics related to electric propulsion), etc.)							
TX03.3.4 - Advanced Electronic Parts (ex: High-voltage semiconductors and passive components, Extreme radiation-hardened power distribution, etc.)							
TX03.3.XX - (Other)				(Other)			

Comments:

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- None
- Aluminum (bauxite)
- Antimony
- Arsenic
- Barite
- Beryllium
- Bismuth
- Cerium
- Chromium
- Cobalt
- Dysprosium
- Eribium
- Europium
- Fluorspar
- Gadolinium
- Gallium
- Germanium
- Graphite (Natural)
- Hafnium
- Holmium
- Helium
- Indium
- Lanthanum
- Lithium
- Lutetium
- Magnesium
- Manganese
- Neodymium
- Nickel
- Niobium
- Palladium
- Platinum
- Praseodymium
- Rhodium
- Rubidium
- Ruthenium
- Samarium
- Scandium
- Tantalum
- Tellurium
- Terbium
- Thulium
- Tin
- Titanium
- Tungsten
- Vanadium
- Ytterbium
- Yttrium
- Zinc
- Zirconium

Section 2c: Technology Taxonomy Areas 4 - 5: Robotic Systems; Communications, Navigation, and Orbital Debris Tracking and Characterization Systems

For each Technology Taxonomy subarea identified in Section 2a, specify your organization's capabilities by selecting an option from the "Product/Service Capability" drop-downs. Next, indicate the type of support your organization provides to NASA and/or NOAA. Then, provide a description of the product/service within that Technology Taxonomy subarea for which your organization has capabilities and indicate whether your organization carries out Research & Development (R&D) for the given product/service. **NOTE, internal R&D is performed in-house by the organization, while external R&D is contracted out or otherwise out-sourced to another company or organization**. If the product contains any critical minerals, identify the primary critical mineral used (based on estimated level of criticality to the product/service). Lastly, for each Technology Taxonomy subarea line, provide the primary HTSUS 10-digit code if the product is imported. If your organization does not import,select "My organization does not import." in the cell to the right.

TX04 - Robotic Systems							
TX04.1 - Sensing and Perception	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX04.1.1 - Sensing for Robotic Systems (ex: Space-qualifiable force and torque sensors, Space-qualifiable tactile sensors, etc.)							
TX04.1.2 - State Estimation (ex: Vision-based aiding of dead reckoning for navigation of surface vehicles, Altimeter for small above-surface vehicles, etc.)							
TX04.1.3 - Onboard Mapping and Data Analysis (ex: Terrain mapping and classification, Three dimensional (3D) modeling from multiple observations, etc.)							
TX04.1.4 - Object, Event, and Activity Recognition							
TX04.1.XX - (Other)				(Other)			
TX04.2 - Mobility	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX04.2.1 - Below-Surface Mobility (ex: Subsurface access through natural cavities, Burrowing mobility, etc.)							
TX04.2.2 - Above-Surface Mobility (ex: Ballistic systems, Static lift systems, etc.)							
TX04.2.3 - Small-Body and Microgravity Mobility (ex: Free-floating robots, Anchoring robots, etc.)							
TX04.2.4 - Surface Mobility (ex: Mobility subsystem for crewed surface transport, Rappelling mobility systems, etc.)							
TX04.2.5 - Robot Navigation and Path Planning (ex: Adaptive autonomous surface navigation, Onboard real-time planning and scheduling, etc.)							
TX04.2.6 - Collaborative Mobility							
TX04.2.XX - (Other)				(Other)			
TX04.3 - Manipulation	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX04.3.1 - Dexterous Manipulation (ex: Dexterous manipulator arms, Dexterous manipulator end effectors, etc.)							
TX04.3.2 - Grappling Technologies							
TX04.3.3 - Contact Dynamics Modeling (ex: End-to-end systems modeling, Dynamic simulation, etc.)							
TX04.3.4 - Sample Acquisition and Handling (ex: Robotic and deep robotic drilling, Robotic excavation, Biobarriers for drilling equipment to maintain sterile condition, etc.)							
TX04.3.XX - (Other)				(Other)			
TX04.4 - Human-Robot Interaction	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX04.4.1 - Multi-Modal and Proximate Interaction (ex: Virtual environment (VE), Multi-modal dialogue, Robot-to-suit interfaces, etc.)							
TX04.4.2 - Distributed Collaboration and Coordination (ex: Interaction architecture, In-line performance metrics, Notification and summarization)							
TX04.4.3 - Remote Interaction							
TX04.4.XX - (Other)				(Other)			
TX04.5 - Autonomous Rendezvous and Docking	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX04.5.1 - Relative Navigation Sensors (ex: Three dimensional (3D) imaging sensor, Long-wave infrared (LWIR) camera, etc.)							
TX04.5.2 - Rendezvous and Docking Algorithms (ex: Rendezvous targeting, Proximity operations/capture/docking guidance)							
TX04.5.3 - Rendezvous, Proximity Operations, and Capture (RPOC) Flight and Ground Systems (ex: Orbit debris remediation, Precision formation flying architecture, etc.)							
TX04.5.4 - Capture Sensors (ex: Robot arm force moment sensor, Robotic tool contact sensors, etc.)							
TX04.5.5 - Capture Mechanisms and Fixtures (ex: Dexterous / long reach robotics, Sample canister retrieval mechanism, etc.)							
TX04.5.6 - Robot Control for Vehicle Capture and Berthing (ex: Robotic manipulator capture of free-flying spacecraft)							
TX04.5.7 - Modeling, Simulation, Analysis, and Test of Rendezvous, Proximity Operations, and Capture (ex: Multi-vehicle closed loop hi-fidelity Altitude and orbit simulation, Flexible modes analysis, etc.)							
TX04.5.XX - (Other)				(Other)			
TX04.6 - Robotics Integration	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX04.6.1 - Modularity, Commonality, and Interfaces (ex: Refueling Interfaces, Marsupial robot interfaces, Self-configuring robots, etc.)							
TX04.6.2 - Modeling and Simulation for Robots (ex: End-to-end system modeling, Modeling of contact dynamics, etc.)							
TX04.6.3 - Robot Software (ex: Robotic architectures and frameworks, Standardized messaging protocols, etc.)							
TX04.6.XX - (Other)				(Other)			
TX05 - Communications, Navigation, and Orbital Debris Tracking and Characterization Systems							
TX05.1 - Optical Communications	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX05.1.1 - Detector Development (ex: Tungsten silicide (WSi) superconducting arrays, High T superconducting arrays (e.g., MgB2), Indium gallium arsenide (InGaAs) flight arrays)							
TX05.1.2 - Large Apertures (ex: Virtual, large, ground-based apertures, Space-based optical arrays, etc.)							
TX05.1.3 - Lasers (ex: High direct current-optical efficiency greater than 10W, Space-qualified pulse-position modulation (PPM) laser transmitter)							
TX05.1.4 - Pointing, Acquisition, and Tracking (PAT) (ex: Disturbance-free platform, Autonomous high-accuracy star tracker, etc.)							
TX05.1.5 - Atmospheric Mitigation (ex: Solar differential image motion monitor (DIMM), Daytime adaptive optics for uplink and downlink, etc.)							
TX05.1.6 - Optimetrics (ex: Embedded optical tracking for spacecraft navigation)							
TX05.1.7 - Innovative Signal Modulations (ex: Coherent modulation/demodulation systems, Modulating retro-reflectors)							
TX05.1.XX - (Other)				(Other)			
TX05.2 - Radio Frequency	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX05.2.1 - Spectrum-Efficiency (ex: Data recorders and storage systems, Health management systems, Crew input and display systems, etc.)							
TX05.2.2 - Power-Efficiency (ex: Traveling wave tube amplifiers (TWTAs), Solid-state power amplifiers (SSPAs))							
TX05.2.3 - Atmospheric Characterization and Mitigation (ex: LEO Ka-band propagation studies)							
TX05.2.4 - Flight and Ground Systems (ex: Ultra wideband systems, Intelligent, multipurpose software defined radio)							
TX05.2.5 - Launch and Re-Entry Communications (ex: Mitigation of reentry plasma effects)							
TX05.2.6 - Innovative Antennas (ex: Deployable antennas, Phased array antennas, etc.)							
TX05.2.7 - Innovative RF Technologies (ex: GaN on diamond, Advanced printed wiring board (PWB) materials, Advanced interconnects, etc.)							
TX05.2.XX - (Other)				(Other)			
TX05.3 - Internetworking	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX05.3.1 - Disruption Tolerant Networking (DTN) (ex: DTN basic services)							
TX05.3.2 - Adaptive Network Topology (ex: Ad hoc and mesh networking of mobile elements, Disruption tolerant networking routing, etc.)							
TX05.3.3 - Information Assurance (ex: Security and key Management protocols and techniques for DTN networks, bundle security protocol, etc.)							
TX05.3.4 - Integrated Network Management							
TX05.3.XX - (Other)				(Other)			
TX05.4 - Network Provided Position, Navigation, and Timing (PNT)	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX05.4.1 - Timekeeping and Time Distribution (ex: Atomic clocks, Ultra-high performance crystal oscillators)							
TX05.4.2 - Revolutionary Position, Navigation, and Timing Technologies (ex: X-Ray navigation, Neutrino-based navigation and tracking technologies)							
TX05.4.XX - (Other)				(Other)			
TX05.5 - Revolutionary Communications Technologies	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX05.5.1 - Cognitive Networking (ex: Cognitive radios, Cognitive antennas)							
TX05.5.2 - Quantum Communications (ex: High efficiency photon entangled sources, Quantum cryptography, etc.)							
TX05.5.3 - Hybrid Radio and Optical Technologies (ex: Teletenna, Vibration isolation platforms, Cognitive control systems, etc.)							
TX05.5.XX - (Other)				(Other)			
TX05.6 - Networking and Ground Based Orbital Debris Tracking and Management	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX05.6.1 - Orbital Debris Tracking (ex: Radars, Optical sensors, Laser ranging)							
TX05.6.2 - Orbital Debris Characterization (ex: Environment modeling, Autonomous telescope and sensor technologies, etc.)							
TX05.6.3 - Orbital Debris Mitigation (ex: Robotics, Space tubs, Drag augmentation devices, etc.)							
TX05.6.4 - Orbital Debris Monitoring Software Platforms							
TX05.6.XX - (Other)				(Other)			
TX05.7 Acoustic Communication	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX05.7 - Acoustic Communications (ex: Sonar, acoustic sensors, Active and passive sensors including geophones and seismic receivers)							
TX05.7.XX - (Other)				(Other)			
Comments:							

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Section 2d: Technology Taxonomy Areas 6 - 8: Human Health, Life Support, and Habitation Systems; Exploration Destination Systems; Sensors and Instruments

For each Technology Taxonomy subarea identified in Section 2a, specify your organization's capabilities by selecting an option from the "Product/Service Capability" drop-downs. Next, indicate the type of support your organization provides to NASA and/or NOAA. Then, provide a description of the product/service within that Technology Taxonomy subarea for which your organization has capabilities and indicate whether your organization carries out Research & Development (R&D) for the given product/service. **NOTE, Internal R&D is performed in-house by the organization, while external R&D is contracted out or otherwise out-sourced to another company or organization.** If the product contains any critical minerals, identify the primary critical mineral used (based on estimated level of criticality to the product/service). Lastly, for each Technology Taxonomy subarea line, provide the primary HTSUS 10-digit code if the product is imported. If your organization does not import,select "My organization does not import." in the cell to the right.

TX06 - Human Health, Life Support, and Habitation Systems

TX06.1 - Environmental Control and Life Support Systems (ECLSS) and Habitation Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX06.1.1 - Atmosphere Revitalization (ex: CO2 removal (closed loop), oxygen recovery, Cabin ventilation, etc.)							
TX06.1.2 - Water Recovery and Management (ex: Wastewater collection, Brine processing, etc.)							
TX06.1.3 - Waste Management (ex: Metabolic waste management, Trash/waste removal systems, etc.)							
TX06.1.4 - Habitation Systems (ex: Long-wear clothing or clothes cleaning, Lightweight crew quarters with minimal CO2 accumulation, etc.)							
TX06.1.5 - ECLSS Modeling and Simulation Tools (ex: Chemical process modeling (e.g. complex fluid precipitation thresholds) and biological system modeling (higher plant metabolisms))							
TX06.1.XX - (Other)				(Other)			
TX06.2 - Extravehicular Activity Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX06.2.1 - Pressure Garment (ex: LEA arm mobility via soft constant volume joints and enhanced patterning, LEA in-suit waste containment, Mars PGS Layup, etc.)							
TX06.2.2 - Portable Life Support System (PLSS) (ex: Heat pump radiator hybrid, PLSS pressure sensor, etc.)							
TX06.2.3 - Informatics and Decision Support Systems (ex: Suit-integrated personal locating technologies, Graphical displays, etc.)							
TX06.2.4 - Decompression Sickness (DSCS) Mitigation (ex: Probabilistic DCS risk models, Reduced ppN2 vehicle atmospheres, etc.)							
TX06.2.XX - (Other)				(Other)			
TX06.3 - Human Health and Performance	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX06.3.1 - Medical Diagnosis and Prognosis (ex: Emerging screening technologies, Preventative countermeasures, Sterile fluid generation, etc.)							
TX06.3.2 - Prevention and Countermeasures (ex: Cell/tissue culture, animal models, Water control standards for microbes, probiotic delivery, antimicrobial medications, etc.)							
TX06.3.3 - Behavioral Health and Performance (ex: Psychomotor Vigilance Task (PVT), Objective sleep measures for spaceflight operations, Scheduling software, etc.)							
TX06.3.4 - Contact-less/Wearable Human Health and Performance Monitoring (ex: Biometric wireless sensors)							
TX06.3.5 - Food Production, Processing, and Preservation (ex: Bioregenerative food system, Packaged food mass reduction, Vegetable cleaning and safety verification, etc.)							
TX06.3.6 - Long Duration Health (ex: Defining metrics for long-term health, Technologies to enable occupational surveillance, etc.)							
TX06.3.7 - System Transformative Health and Performance Concepts (ex: Autonomous clinical care, Artificial gravity, Bioengineering)							
TX06.3.XX - (Other)				(Other)			
TX06.4 - Environmental Monitoring, Safety, and Emergency Response	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX06.4.1 - Sensors: Air, Water, Microbial, and Acoustic (ex: Atmosphere quality sensors, Water quality sensor, etc.)							
TX06.4.2 - Fire: Detection, Suppression, and Recovery (ex: Combustion model in low and partial gravity, Cabin fire: detection system, cabin fire extinguisher)							
TX06.4.3 - Protective Clothing and Breathing (ex: Advanced respirator, Common filtering cartridge mask, etc.)							
TX06.4.4 - Remediation (ex: Contingency air scrubber, Contingency microbial remediation, etc.)							
TX06.4.XX - (Other)				(Other)			
TX06.5 - Radiation	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX06.5.1 - Radiation Transport and Risk Modeling (ex: Cancer risk projection model, Degenerative risk projection model, Digital twin, etc.)							
TX06.5.2 - Radiation Mitigation and Biological Countermeasures (ex: Countermeasures for in-flight acute radiation syndrome, Combined pharmaceutical interaction tool, etc.)							
TX06.5.3 - Protection Systems (ex: In-situ passive shielding from and in the spacecraft, Cooling systems for active shielding, etc.)							
TX06.5.4 - Space Weather Prediction (ex: Tool for all-clear forecasting of Solar Particle Event (SPE) onset, Ensemble coronal mass ejection forecasting for mission impact assessment, etc.)							
TX06.5.5 - Monitoring Technology (ex: Compact biological dosimetry (biodosimetry), Active personal dosimetry for intravehicular activities and extravehicular activities, etc.)							
TX06.5.XX - (Other)				(Other)			
TX06.6 - Human Systems Integration	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX06.6.1 - Human Factors Engineering (ex: Human physical and cognitive performance models, Integrated human-system verification and validation (V&V) methods, etc.)							
TX06.6.2 - Training (ex: Framework for an integrated training design that supports skill acquisition, retention, and transfer, Just-in-time training capabilities for in-mission or on-the-job initial and refresher training, etc.)							
TX06.6.3 - Habitability and Environment (ex: Integrated habitat support system, Long-duration microgravity workstation and habitat tools, etc.)							
TX06.6.4 - Operations Effectiveness (ex: Operations design for multiple communications time-delay regimes, Control and display design to maximize situational awareness and reduce distraction, etc.)							
TX06.6.5 - Integrated Systems Safety (ex: Integrated risk and hazard analysis tools, System safety taxonomies, etc.)							
TX06.6.6 - Maintainability and Supportability (ex: Integrated electronic technical manuals, Tool management system, Onboard logistics and stowage management system, etc.)							
TX06.6.XX - (Other)				(Other)			

TX07 - Exploration Destination Systems

TX07.1 - In-Situ Resource Utilization	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX07.1.1 - Destination Reconnaissance and Resource Assessment (ex: Instruments and devices to: detect, locate, and quantify specific surface and subsurface chemical species (such as water or other high-value elements or minerals)							
TX07.1.2 - Resource Acquisition, Isolation, and Preparation (ex: Instruments and devices functioning in the relevant gravity environment to: penetrate, cut, drill, extract, or excavate surface and subsurface regolith that is either resource-bearing or inert overburden)							
TX07.1.3 - Resource Processing for Production of Mission Consumables (ex: Chemical, electrochemical, and biological materials, catalysts, components, and reactors to extract and combine resources to produce end-products (e.g. catalytic reactors to produce methane, electrolysis devices to produce oxygen, etc.)							
TX07.1.4 - Resource Processing for Production of Manufacturing, Construction, and Energy Storage Feedstock Materials (ex: Instruments and devices functioning in the relevant gravity environment, including: production of granular material by grinding, crushing, sorting, and mixing)							
TX07.1.XX - (Other)				(Other)			
TX07.2 - Mission Infrastructure, Sustainability, and Supportability	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX07.2.1 - Logistics Management (ex: Propellant scavenging, Power scavenged wireless sensor tag systems, Packaging foam, etc.)							
TX07.2.2 - In-Situ Manufacturing, Maintenance, and Repair (ex: Design tools configured to accommodate broad-specification feedstock properties into design safety factors and manufacturing tolerances)							
TX07.2.3 - Surface Construction and Assembly (ex: Manufacturing of structural elements using feedstock derived from locally-produced and recycled materials, Assembly of structural and environmental barrier systems from terrestrially-delivered and/or locally-derived elements, etc.)							
TX07.2.4 - Micro-Gravity Construction and Assembly (ex: On-orbit three dimensional (3D) manufacturing, In-space truss manufacturing, etc.)							
TX07.2.5 - Particulate Contamination Prevention and Mitigation (ex: Passive cleaning, "Tunnels" to minimize regolith transfer during extravehicular activities (EVAs), Failure Isolation, Detection, and Recovery (FIDR), etc.)							
TX07.2.XX - (Other)				(Other)			
TX07.3 - Mission Operations and Safety	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX07.3.1 - Mission Planning and Design (ex: Software for rapid mission development and analysis, Toolsets for spacecraft design and mission simulation, etc.)							
TX07.3.2 - Integrated Flight Operations Systems (ex: Autonomous crew operations, Advanced ground launch operations for ascent vehicles, etc.)							
TX07.3.3 - Training (ex: Training methodologies to ensure effective human response when automation/autonomy fail in time-critical situations, Data mining algorithms, etc.)							
TX07.3.4 - Integrated Risk Assessment Tools (ex: Probabilistic Risk Assessment (PRA) toolset)							
TX07.3.5 - Planetary Protection (ex: Sterilization modalities beyond time/temperature, Biobarriers for whole spacecraft, Trajectory analysis, etc.)							
TX07.3.XX - (Other)				(Other)			

TX08 - Sensors and Instruments

TX08.1 - Remote Sensing Instruments and Sensors	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX08.1.1 - Detectors and Focal Planes (ex: Backshort Undergrid bolometer arrays, Charge coupled devices, Mercury Cadmium Telluride and Strained Superlattice Arrays, etc.)							
TX08.1.2 - Electronics (ex: Low noise amplifiers, Space cube, Modular Unified Space Technology Avionics for Next Generation missions (MUSTANG), etc.)							
TX08.1.3 - Optical Components (ex: Mirrors, lenses, interferometers, gratings, prisms, and fibers, Active optical elements, etc.)							
TX08.1.4 - Microwave, Millimeter-, and Submillimeter-Waves (ex: Laser heterodyne and gas correlation radiometers, Transmit/receive modules, etc.)							
TX08.1.5 - Lasers (ex: Pulsed lasers and the electro-optical components that support them like fibers, gratings, crystals, laser diodes, electro-optical modulators, nanolasers)							
TX08.1.6 - Cryogenic/Thermal (ex: Adiabatic demagnetization refrigerators, Cryocoolers, like Stirling refrigerators, Brayton Cycle refrigerators, pulse tube refrigerators, Joule-Thomson coolers, etc.)							
TX08.1.XX - (Other)				(Other)			
TX08.2 - Observatories	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX08.2.1 - Mirror Systems (ex: Ground metrology and systems, Space cube, Onboard Synthetic Aperture Radar (SAR) processor, etc.)							
TX08.2.2 - Structures and Antennas (ex: James Webb Space telescope (JWST) deployment system and the JWST sunshade, Soil Moisture Active Passive (SMAP) and NASA-ISRO Synthetic Aperture Radar (NISAR deployable mesh antenna and boom system, etc.)							
TX08.2.3 - Distributed Aperture (ex: Submillimeter Probe of the Evolution of Cosmic Structure (SPECS), Laser interferometer space antenna)							
TX08.2.XX - (Other)				(Other)			
TX08.3 - In-Situ Instruments and Sensors	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX08.3.1 - Field and Particle Detectors (ex: Fast Plasma Instrument (FPI), Dual Electron Sensors (DES), etc.)							
TX08.3.2 - Atomic and Molecular Species Assessment (ex: Sample Analysis at Mars (SAM), Mars Organic Molecule Analyser (MOMA), Gas chromatographs, etc.)							
TX08.3.3 - Sample Handling (ex: Drills, The rock abrasion tool (RAT), etc.)							
TX08.3.4 - Environment Sensors (ex: Temperature, humidity, wind speed and direction, atmospheric pressure, seismic sensors)							
TX08.3.5 - Electromagnetic Wave-Based Sensors (ex: Strain, temperature, pressure, structure/materials, sensors)							
TX08.3.6 - Extreme Environments Related to Critical System Health Management (ex: Sensors of temperature, pressure, vibration, electrical current and voltage, torque, mechanical stress and strain, chemicals, and optical or electromagnetic characteristics)							
TX08.3.XX - (Other)				(Other)			

Comments:	

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Section 2c: Technology Taxonomy Areas 9 - 11: Entry, Descent, and Landing (EDL); Autonomous Systems; Software Modeling, Simulation, and Information Processing

For each Technology Taxonomy subarea identified in Section 2a, specify your organization's capabilities by selecting an option from the "Product/Service Capability" drop-downs. Next, indicate the type of support your organization provides to NASA and/or NOAA. Then, provide a description of the product/service within that Technology Taxonomy subarea for which your organization has capabilities and indicate whether your organization carries out Research & Development (R&D) for the given product/service. **NOTE, internal R&D is performed in-house by the organization, while external R&D is contracted out or otherwise out-sourced to another company or organization**. If the product contains any critical minerals, identify the primary critical mineral used (based on estimated level of criticality to the product/service). Lastly, for each Technology Taxonomy subarea line, provide the primary HTSUS 10-digit code if the product is imported. If your organization does not import,select "My organization does not import." in the cell to the right

TX09 - Entry, Descent, and Landing (EDL)							
TX09.1 - Aeroassist and Atmospheric Entry	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX09.1.1 - Thermal Protection Systems (TPS) (ex: Extreme environment ablative TPS, Solar and space radiation attenuating materials, etc.)							
TX09.1.2 - Hypersonic Decelerators (ex: Sample return capsules, Entry vehicles with lift/drag (l/d) 0.4 to < 2.0, etc.)							
TX09.1.3 - Passive Reentry Systems for SmallSats (ex: Drag sails, Composite booms, etc.)							
TX09.1.XX - (Other)				(Other)			
TX09.2 - Descent	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX09.2.1 - Aerodynamic Decelerators (ex: Supersonic Inflatable Aerodynamic Decelerator (SIAD), Steerable and guided deployable decelerators, Ballutes, etc.)							
TX09.2.2 - Supersonic Retropropulsion (SRP) (ex: Advanced algorithms and sensors for SRP, Deep-throttling, high-thrust engines for Mars descent)							
TX09.2.XX - (Other)				(Other)			
TX09.3 - Landing	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX09.3.1 - Touchdown Systems (ex: Penetrators and spike anchors, Mid-air retrieval (MAR), Active landing gear, etc.)							
TX09.3.2 - Propulsion Systems for Landing (ex: High efficiency propulsion, Deep throttling capabilities for fuel efficient and safe touchdowns, etc.)							
TX09.3.XX - (Other)				(Other)			
TX09.4 - Vehicle Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX09.4.1 - Architecture Design and Analysis (ex: High-fidelity, integrated performance models, Model-based systems engineering, etc.)							
TX09.4.2 - Separation Systems (ex: Mechanical or inflatable deployment of staged systems, Rigidizable aeroshell sub-systems, etc.)							
TX09.4.3 - System Integration and Analysis for EDL (ex: Event-driven environment simulation)							
TX09.4.4 - Atmosphere and Surface Characterization (ex: Automated systems to convert orbital data to onboard maps, Descent sensors to detect the surface and determine altitude and velocity, etc.)							
TX09.4.5 - Modeling and Simulation for EDL (ex: Multi-disciplinary coupled analysis tools, Fluid Structure Interaction (FSI) tools, etc.)							
TX09.4.6 - Instrumentation and Health Monitoring for EDL (ex: TPS instrumentation, Radiometers and spectrometers for entry vehicle heat shields, etc.)							
TX09.4.7 - Guidance, Navigation and Control (GN&C) for EDL (ex: Advanced guidance algorithms for safe precision landing, Advanced sensors for spacecraft velocimetry and altimetry, etc.)							
TX09.4.XX - (Other)				(Other)			
TX10 - Autonomous Systems							
TX10.1 - Situational and Self- Awareness	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX10.1.1 - Sensing and Perception for Autonomous Systems (ex: Force and tactile sensing, Three dimensional (3D) sensing and perception from stereo vision or light detection and ranging (LIDAR), etc.)							
TX10.1.2 - State Estimation and Monitoring (ex: Pose estimation for an in-space robotic-assembly arm, Oxygen-level estimation and monitoring, etc.)							
TX10.1.3 - Knowledge and Model Building (ex: Atmospheric modeling for aerial mobility, Ontologies for natural-language processing, etc.)							
TX10.1.4 - Hazard Assessment (ex: Terrain hazard assessment for spacecraft planetary landing, Collision-risk assessment of aerial mobility, etc.)							
TX10.1.5 - Event and Trend Identification (ex: Characterization of system performance, Prediction of air traffic, etc.)							
TX10.1.6 - Anomaly Detection (ex: Detection of abnormal behavior in a component or subsystem, Identification of a weather anomaly, etc.)							
TX10.1.XX - (Other)				(Other)			
TX10.2 - Reasoning and Acting	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX10.2.1 - Mission Planning and Scheduling (ex: Selection of science observations (e.g. for satellites and unmanned aerial vehicle (UAVs)), Autonomous habitat recovery and survivability planning, etc.)							
TX10.2.2 - Activity and Resource Planning and Scheduling (ex: Power/energy consumption and production planning/scheduling, Mixed initiative planning/scheduling of human spacecraft activities, etc.)							
TX10.2.3 - Motion Planning (ex: Robotic arm/manipulator kinematics/dynamic planning, Robot surface motion planning, etc.)							
TX10.2.4 - Execution and Control (ex: Reactive control (e.g. aircraft see-and-avoid, rover hazard avoidance, fault response), Subsystem procedure and automation control and situational awareness for human operator, etc.)							
TX10.2.5 - Fault Diagnosis and Prognosis (ex: UAV/spacecraft battery prognostics, Structural health monitoring, Spacecraft control moment gyro monitoring, etc.)							
TX10.2.6 - Fault Response (ex: Spacecraft fault impacts reasoning, Power system reconfiguration, etc.)							
TX10.2.7 - Learning and Adapting (ex: Learning planning/scheduling models, Learning for system degradation, etc.)							
TX10.2.XX - (Other)				(Other)			
TX10.3 - Collaboration and Interaction	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX10.3.1 - Joint Knowledge and Understanding (ex: Management of aircraft and spacecraft fault diagnostic and prognostics, Integration of information across activities and systems, etc.)							
TX10.3.2 - Behavior and Intent Prediction (ex: Workload estimation across mixed initiative systems, Integration of information for prognostic system prediction, etc.)							
TX10.3.3 - Goal and Task Negotiation (ex: Space mission planning systems, Airline Operations Center (also known as Airline Operations Control Center), etc.)							
TX10.3.4 - Operational Trust Building (ex: Aircraft Flight Mode Annunciators (FMA), Aircraft navigation performance monitoring, etc.)							
TX10.3.XX - (Other)				(Other)			
TX10.4 - Engineering and Integrity	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX10.4.1 - Verification and Validation (V&V) of Autonomous Systems (ex: Scalable formal methods for adaptive and uncertain systems (i.e., model checking, theorem proving, static analysis), Model validation frameworks, etc.)							
TX10.4.2 - Test and Evaluation of Autonomous Systems (ex: Automated systems testing, Non-destructive testing, etc.)							
TX10.4.3 - Operational Assurance of Autonomous Systems (ex: Runtime monitoring, Model invalidation, etc.)							
TX10.4.4 - Modeling and Simulation of Autonomous Systems (ex: Monte Carlo techniques, Immersive environments, etc.)							
TX10.4.5 - Architecture and Design of Autonomous Systems (ex: Correct-by-design controller synthesis, Scalable frameworks, Contract-based design, etc.)							
TX10.4.XX - (Other)				(Other)			
TX11 - Software, Modeling, Simulation, and Information Processing							
TX11.1 - Software Development, Engineering, and Integrity	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX11.1.1 - Tools and Methodologies for Software Design and Development (ex: Software Development Model Based and Auto Code Generation Techniques, Static code analyzers, etc.)							
TX11.1.2 - Verification and Validation of Software Systems (ex: Payloads and Components Real-Time Automated Test System (PACRATS), SysML Model Based Systems Engineering (MBSE), etc.)							
TX11.1.3 - Test and Evaluation (ex: Real-time and non-real-time test environments, Command and control simulation, etc.)							
TX11.1.4 - Operational Assurance (ex: Software partitioning technologies, Common mode failure techniques, etc.)							
TX11.1.5 - Architecture and Design of Software Systems (ex: Software development methodologies that emphasize modeling and/or human interaction, Human/machine interfaces and interactions, etc.)							
TX11.1.6 - Real-Time Software (ex: Fault detection response, Mechanism control, engine/thruster control, etc.)							
TX11.1.7 - Frameworks, Languages, Tools, and Standards (ex: Reusable software libraries, Common communication protocols, etc.)							
TX11.1.8 - Software Analysis and Design Tools (ex: Software development, test, and load testing tools, Static analysis tools, etc.)							
TX11.1.9 - Software Cyber Security (ex: Secure development environments to control authorized access, Secure coding practices and tools for mission systems, etc.)							
TX11.1.XX - (Other)				(Other)			
TX11.2 - Modeling	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX11.2.1 - Software Modeling and Model Checking (ex: Hybrid model checking, Automated software testing environment, etc.)							
TX11.2.2 - Integrated Hardware and Software Modeling (ex: Hardware/software (HW/SW) interface modeling specification language, Automated design specification knowledge capture system, etc.)							
TX11.2.3 - Human-System Performance Modeling (ex: Integrated human-systems models, Human digital twin, Augmented reality and virtual reality (ARVR), etc.)							
TX11.2.4 - Science Modeling (ex: Fortran compatible and interoperable parallel libraries, High performance processor toolset for science modeling, etc.)							
TX11.2.XX - (Other)				(Other)			
TX11.3 - Simulation	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX11.3.1 - Distributed Simulation (ex: Immersive environments for distributed simulation of NASA systems, Standardized NASA simulation interoperability infrastructure, etc.)							
TX11.3.2 - Integrated System Lifecycle Simulation (ex: Model and simulation interface specifications, Enterprise-level modeling and simulation repositories, etc.)							
TX11.3.3 - Distributed Aperture (ex: Multi-Domain Modeling (MDM) Frameworks, Advanced Diagnostics and Prognostics (ADP) Toolset, etc.)							
TX11.3.4 - Simulation-Based Training and Decision Support Systems (ex: Onboard simulation-based trainers, Digital-human-in-the-loop simulation system, etc.)							
TX11.3.5 - Exascale Simulation (ex: Extreme-scale software for modeling and simulation, Extreme-scale numerical validation environment, etc.)							
TX11.3.6 - Uncertainty Quantification and Nondeterministic Simulation Methods (ex: Discrete Event Simulation (DES), Probabilistic Risk Assessment (PRA) Toolset, etc.)							
TX11.3.7 - Multiscale, Multiphysics, and Multifidelity Simulation (ex: Sequential Multiscale Analysis Toolset, Lattice-Boltzmann computational fluid dynamics (CFD), Smooth Particle Hydrodynamics, etc.)							
TX11.3.XX - (Other)				(Other)			
TX11.4 - Information Processing	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX11.4.1 - Science, Engineering, and Mission Data Lifecycle (ex: Reference information system architecture frameworks, Scalable data processing frameworks, etc.)							
TX11.4.2 - Intelligent Data Understanding (ex: Intelligent data collection and prioritization toolset, Artificial intelligence (AI), etc.)							
TX11.4.3 - Semantic Technologies (ex: Semantic Enabler for Data (Text, Binary, and Databases), Semantic Bridge Framework, Analysis of Competing Hypotheses (ACH) Framework, etc.)							
TX11.4.4 - Collaborative Science and Engineering (ex: Immersive Data Explorer, Distributed Collaborative Engineering Frameworks, etc.)							
TX11.4.5 - Cyber Infrastructure (ex: On-demand, multi-mission data storage and computation, High performance networking, Block chain, etc.)							
TX11.4.6 - Cyber Security (ex: Cyber security and information assurance framework, Anomaly detection system, etc.)							
TX11.4.7 - Digital Assistant (ex: Pilot or astronaut advisor (e.g. CIMON))							
TX11.4.8 - Edge Computing (ex: In-situ data analysis, Autonomous sensor targeting, etc.)							
TX11.4.XX - (Other)				(Other)			
TX11.5 - Mission Architecture, Systems Analysis, and Concept Development	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX11.5.1 - Tools and Methodologies for Defining Mission Architectures or Mission Design (ex: Mission planner/monitor, Non-smooth optimization methods, etc.)							
TX11.5.2 - Tools and Methodologies for Performing Systems Analysis (ex: Automated system-level performance evaluation and characterization tool, Dynamic behavior modeling/SysML MBSE tool, etc.)							
TX11.5.3 - Tools and Methodologies for Vehicle or Concept Definition Activities (ex: High fidelity vehicle simulator)							
TX11.5.XX - (Other)				(Other)			
TX11.6 - Ground Computing	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX11.6.1 - Exascale Supercomputer (ex: Commercial sector supplied supercomputer at another government agency sustained 14.4 petaFLOPS (PFLOPS = 10^15 floating point operations per second) on a fluid dynamics simulation)							
TX11.6.2 - Automated Exascale Software Development Toolset (ex: Auto parallelizing compiler for shared-memory computers)							
TX11.6.3 - Exascale Supercomputer File System (ex: 20 petabyte parallel distributed file system for the Pleiades supercomputer)							
TX11.6.4 - Quantum Computer (ex: 7-qubit quantum computer)							
TX11.6.5 - Public Cloud Supercomputer (ex: Huge public clouds exist, such as those operated by the commercial sector, which can do computing on demand)							
TX11.6.6 - Cognitive Computer (ex: Brain-inspired chip architecture based on a scalable, interconnected, configurable network of "neurosynaptic cores")							
TX11.6.7 - High Performance Data Analytics Platform (ex: Data is downloaded from various sources to the local computer, where commercial and custom software perform interactive data analysis)							
TX11.6.8 - Cloud Computing (ex: Cloud-based data archive centers for science data)							
TX11.6.XX - (Other)				(Other)			
Comments:							

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Section 2F: Technology Taxonomy Areas 12 - 13: Materials, Structures, Mechanical Systems, and Manufacturing; Ground, Test, and Surface Systems

For each Technology Taxonomy subarea identified in Section 2a, specify your organization's capabilities by selecting an option from the "Product/Service Capability" drop-downs. Next, indicate the type of support your organization provides to NASA and/or NOAA. Then, provide a description of the product/service within that Technology Taxonomy subarea for which your organization has capabilities and indicate whether your organization carries out Research & Development (R&D) for the given product/service. **NOTE, Internal R&D is performed in-house by the organization, while external R&D is contracted out or otherwise out-sourced to another company or organization.** If the product contains any critical minerals, identify the primary critical mineral used (based on estimated level of criticality to the product/service). Lastly, for each Technology Taxonomy subarea line, provide the primary HTSUS 10-digit code if the product is imported. If your organization does not import,select "My organization does not import." in the cell to the right.

TX12 - Materials, Structures, Mechanical Systems, and Manufacturing

TX12.1 - Materials	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX12.1.1 - Lightweight Structural Materials (ex: Nanofibers, fibers, resins and adhesives that enable the tailoring of large monolithic structures, Novel low density metal, Composite alloys, etc.)							
TX12.1.2 - Computational Materials (ex: Characterization techniques to validate the models, Multiscale modeling, linking atomistic to continuum scale for life prediction modelling and tailoring of structural, thermal, functional materials, etc.)							
TX12.1.3 - Flexible Material Systems (ex: Applications to habitats and deployable structures, balloons, parachutes, space suits, metalized films and solar sails, tethers, multifunctional materials that include materials that enable the morphing or deployment of aerospace structures, compliant mechanisms based on elastic deformation of thin sections, flexible metal cloth created through additive manufacturing, biobarrier fabrics for planetary protection)							
TX12.1.4 - Materials for Extreme Environments (ex: Materials used for radiation environments, heat shields, cryo-insulators, high-temperature materials including nanomaterials, metallic, ceramic matrix composites, ultrahigh temperature ceramics, advanced alloys, insulators, materials that resist abrasive wear, materials with high wear resistance in vacuum, controllable Composite Technology for Exploration (CTE) materials, and materials for ultra-low temperatures including amorphous metals)							
TX12.1.5 - Coatings (ex: Includes films, optical blacks, nanofibers, nanocomposites, thermal barrier coatings, environmental coatings)							
TX12.1.6 - Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines (ex: Solid oxide, advanced anodes, advanced cathodes, polymer electrolyte membranes, graphene sheets, piezoelectric and thermoelectric materials, phase change materials, magnetostrictive materials, high strength magnetic materials, superconducting materials, amorphous and nanocrystalline coatings, diamond-like coatings, thermally sprayed materials, cold sprayed materials, hydrophobic and hydrophilic surfaces, nano-patterned surfaces, coatings that provide sensing)							
TX12.1.7 - Special Materials (ex: Adhesive materials concepts, nanofiltering and fluid barrier materials, porous/non-porous materials, optically transparent window materials, materials with negative refractive index, aerogels, metamaterials, topological materials, functionally graded materials, metallic glasses, nanocrystalline metals, materials with controllable CTE, multifunctional laminates, shape memory alloys, high entropy alloys, multi-functional materials)							
TX12.1.8 - Smart Materials (ex: Shape memory alloys, Piezoelectrics)							
TX12.1.XX - (Other)				(Other)			
TX12.2 - Structures	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX12.2.1 - Lightweight Concepts (ex: Components for space vehicles and surface habitats, in-space depots and landers, solar or antenna arrays, complex precision deployables, propulsion systems, and terrestrial airframes and engines which function either as primary load bearing or as secondary structures, etc.)							
TX12.2.2 - Design and Certification Methods (ex: High-fidelity, integrated, verified tools and processes for analysis, design, manufacturing, certification and sustainment of structures under all loading and environmental conditions, etc.)							
TX12.2.3 - Reliability and Sustainment (ex: Predictive damage/life extension prediction methods, Structural/thermal health monitoring, etc.)							
TX12.2.4 - Tests, Tools, and Methods (ex: Integrated flight test data identification model, Virtual digital fleet leader testing, etc.)							
TX12.2.5 - Innovative, Multifunctional Concepts (ex: Integrated windows, Four dimensional (4D) printed parts, Excavating tools with integrated sensing, etc.)							
TX12.2.XX - (Other)				(Other)			
TX12.3 - Mechanical Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX12.3.1 - Deployables, Docking, and Interfaces (ex: Interfaces that streamline connectivity, Provisions for operation in harsh environment, etc.)							
TX12.3.2 - Electro-Mechanical, Mechanical, and Micromechanisms (ex: Fluid transfer and refueling, Provisions for operation in harsh environment, etc.)							
TX12.3.3 - Design and Analysis Tools and Methods (ex: Dynamic behavior modeling)							
TX12.3.4 - Reliability, Life Assessment, and Health Monitoring (ex: Damage and remaining life prediction techniques, Integrated health monitoring systems including embedded sensors, etc.)							
TX12.3.5 - Certification Methods (ex: Digital probabilistic representation and virtual evaluation of the flight system—including incorporation of testing results—with comprehensive diagnostic and prognostic capabilities to enable efficient development and certification and safe, autonomous operation throughout the service life of system)							
TX12.3.6 - Mechanical Drive Systems (ex: High capacity, high efficiency magnetic materials, Materials that maintain elasticity under cryogenic conditions, etc.)							
TX12.3.7 - Mechanism Life Extension Systems (ex: Long-life bearing/lube system, Cryo long-life actuator, etc.)							
TX12.3.8 - Docking and Berthing Mechanisms and Fixtures (ex: Crew docking mechanism, Dexterous/long reach robotics, Lunar/Mars surface robotic docking mechanism, etc.)							
TX12.3.XX - (Other)				(Other)			
TX12.4 - Manufacturing	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX12.4.1 - Manufacturing Processes (ex: Additive manufacturing of metallics and nanofiber/fiber/ceramic matrix based composites, especially for large structures, In-space fabrication, assembly and repair, etc.)							
TX12.4.2 - Intelligent Integrated Manufacturing (ex: Integration of smart sensors, controls, and measurement, analysis, decision support, and communication software tools for process control)							
TX12.4.3 - Electronics and Optics Manufacturing Process (ex: Advanced architecture nanoelectronics, Optical materials, components, structures, One dimension/two dimension (1D/2D) nanoelectronics, etc.)							
TX12.4.4 - Sustainable Manufacturing (ex: Removing hazardous materials from by-product of manufacturing processes, using green energetic compounds)							
TX12.4.5 - Nondestructive Evaluation and Sensors (ex: Special focus on increased sensitivity and selectivity, with reduced mass, power consumption and a smaller overall footprint)							
TX12.4.6 - Repurpose Processes (ex: Metals components as additive manufacturing feedstock, Packaging for building material, etc.)							
TX12.4.XX - (Other)				(Other)			
TX12.5 - Structural Dynamics	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX12.5.1 - Loads and Vibration (ex: Advanced fast coupled loads analysis tools, Development of variational coupled loads analysis techniques, etc.)							
TX12.5.2 - Vibroacoustics (ex: Advanced vibroacoustic model correlation techniques, Enhanced internal payload fairing acoustic environment modeling approaches, etc.)							
TX12.5.3 - Shock and Impact (ex: Impact blast and fragmentation assessment tools, Shock analysis methods and tools, etc.)							
TX12.5.4 - Test, Tools, and Methods (ex: Large structures operational modal analysis test techniques, Smart dynamic testing approaches inclusive of multi-input/multi-output techniques, etc.)							
TX12.5.XX - (Other)				(Other)			

TX13 - Ground, Test, and Surface Systems

TX13.1 - Infrastructure Optimization	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX13.1.1 - Natural and Induced Environment Characterization and Mitigation (ex: Active and passive means to reduce acoustic energy associated with launch, Advanced flame trench surface materials, etc.)							
TX13.1.2 - Launch/Test/Ops Site Management (ex: Advanced flame trench surface materials, Collision avoidance and prognostics for cranes, Mobile launch pad kit, etc.)							
TX13.1.3 - Commodity Recovery (ex: Helium waste stream recovery, Hydrogen pooling mitigation, etc.)							
TX13.1.4 - Propellant Production, Storage and Transfer (ex: On-demand production of propellants, Thermal insulation systems, Toxic/green propellant storage and distribution, etc.)							
TX13.1.5 - Ground and Surface Logistics (ex: Counterfeit part countermeasures, Digital product lifecycle management, Supply chain and supplier economic resilience modeling, etc.)							
TX13.1.6 - Test, Operations, and Systems Safety (ex: Ground safety tools for radioactive payload processing robotic caretakers for hazardous operations/locations, automated alignment and coupling systems, On-demand, custom-fitted and lighter-weight Personnel Protective Equipment (PPE), etc.)							
TX13.1.7 - Impact/Damage/Radiation-Resistant Systems (ex: Carbon nanotube and graphene materials, Flexible structures, etc.)							
TX13.1.XX - (Other)				(Other)			
TX13.2 - Test and Qualification	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX13.2.1 - Mechanical/Structural Integrity Testing (ex: Advanced non-conventional Schlieren techniques, Composite materials repair, Dynamic impact photogrammetry, etc.)							
TX13.2.2 - Propulsion, Exhaust, and Propellant Management (ex: Advanced techniques to scale up to a launch pad or engine test stand environment, Rocket exhaust capture and filtration, Universal propellant servicing system, etc.)							
TX13.2.3 - Non-Destructive Inspection, Evaluation, and Root Cause Analysis (ex: Composite Overwrap Pressure Vessel (COPV) analysis technologies, Miniaturized robotic inspection devices, etc.)							
TX13.2.4 - Verification and Validation of Ground, Test, and Surface Systems (ex: Advanced high-speed photography, Augmented reality for design, process engineering, and test support, etc.)							
TX13.2.5 - Flight and Ground Testing Methodologies (ex: Advanced overrun runway materials, Aerospace traffic control system, etc.)							
TX13.2.6 - Advanced Life-Cycle Testing Techniques (ex: Accelerated life testing, Adaptive systems, Built-in test enhanced life forecasting, etc.)							
TX13.2.7 - Test Instruments and Sensors (ex: Ablation spectroscopy, Integrated, multi-parameter, ground-powered sensors for continuous monitoring, etc.)							
TX13.2.8 - Environment Testing (ex: Corrosion real-time and accelerated testing, Dust tolerant systems, Weather analysis, etc.)							
TX13.2.XX - (Other)				(Other)			
TX13.3 - Assembly, Integration, and Launch	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX13.3.1 - Offline Element Processing (ex: Automated alignment, coupling, assembly, and transportation systems, Intelligent crane controls, etc.)							
TX13.3.2 - Vehicle and Payload Assembly and Integration (ex: Common ground test systems (i.e., between elements and integration levels), Robotic assistants for assembly, etc.)							
TX13.3.3 - Launch, Recovery and Reutilization (ex: Anti-icing cryogenic couplers, Extraterrestrial sample return containment, etc.)							
TX13.3.XX - (Other)				(Other)			
TX13.4 - Mission Success Technologies	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX13.4.1 - Mission Planning (ex: Intelligent planning and scheduling, Multi-dimensional integration of mission plans with closed-loop activity scheduling, etc.)							
TX13.4.2 - Team Preparedness and Training (ex: Immersive training, Personal/biometric confirmation technology, etc.)							
TX13.4.3 - High-Fidelity Simulation and Visualization (ex: Automatic model-based configuration of control systems, Concurrent multi-user multi-dimensional situational information environment)							
TX13.4.4 - Autonomous, Real-Time Command and Control (ex: Automatic generation of control software and test algorithms, Highly secure and access-controlled flexible data networking, etc.)							
TX13.4.5 - Operations, Health and Maintenance for Ground and Surface Systems (ex: Anomaly and fault detection, isolation and diagnosis, Commodity management, Prediction and prognosis algorithms for components and systems; autonomous inspection, maintenance, and repair (IMR) support systems, etc.)							
TX13.4.6 - Ground Analogs for Space/Surface Systems (ex: Autonomous commodities (e.g., LOX, helium, water, air) storage and transfer operations, Launch and landing pad materials, etc.)							
TX13.4.XX - (Other)				(Other)			
Comments:							

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Section 2g: Technology Taxonomy Areas 14 - 16: Thermal Management Systems; Flight Vehicle Systems; Air Traffic Management and Range Trafficking Systems; Guidance, Control, and Navigation (GC&N); Not Specified/Other Technology Taxonomy Area

For each Technology Taxonomy subarea identified in Section 2a, specify your organization's capabilities by selecting an option from the "Product/Service Capability" drop-downs. Next, indicate the type of support your organization provides to NASA and/or NOAA. Then, provide a description of the product/service within that Technology Taxonomy subarea for which your organization has capabilities and indicate whether your organization carries out Research & Development (R&D) for the given product/service. **NOTE, internal R&D is performed in-house by the organization, while external R&D is contracted out or otherwise out-sourced to another company or organization**. If the product contains any critical minerals, identify the primary critical mineral used (based on estimated level of criticality to the product/service). Lastly, for each Technology Taxonomy subarea line, provide the primary HTSUS 10-digit code if the product is imported. If your organization does not import,select "My organization does not import." in the cell to the right.

TX14 - Thermal Management Systems

TX14.1 - Cryogenic Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX14.1.1 - In-space Propellant Storage and Utilization (ex: Low conductive heat-load structure, Micro-g fluid dynamics (2-phase transport, surface wetting, surface tension, evaporation condensation), etc.)							
TX14.1.2 - Launch Vehicle Propellant (ex: Composite structures and components and lines for cryogenic application, Vehicle feedline chill and operation, etc.)							
TX14.1.3 - Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors (ex: Cryocooler refrigeration above and below 10 K, Liquid hydrogen spacecraft dewars, Vapor cooling for instruments and storage hardware, etc.)							
TX14.1.4 - Ground Testing and Operations (ex: Advanced thermal insulation systems and concepts, Cryogenic pumps, Densification of propellants/fluids at small and large scale (cooling below the normal boiling point (NBP)), etc.)							
TX14.1.5 - Cryogenic Analysis, Safety and Properties (ex: Cryogenic systems, Cryogenic propellant/fluid safety oxygen, Material properties testing apparatus (strength, thermal/electrical conductivity, and emissivity), etc.)							
TX14.1.XX - (Other)				(Other)			
TX14.2 - Thermal Control Components and Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX14.2.1 - Heat Acquisition (ex: Boiling heat transfer, Cold plates and evaporators, High heat load collection (500 kW - 1 MW), etc.)							
TX14.2.2 - Heat Transport (ex: Capillary pumped fluid loops and loop heat pipes, Forced air cooling (heating, ventilation, and air conditioning (HVAC)), etc.)							
TX14.2.3 - Heat Rejection and Storage (ex: Autonomous radiator maintenance, Phase change materials, Transpiration cooling, etc.)							
TX14.2.4 - Insulation and Interfaces (ex: Aerogels, Foam insulations, Multi-layer insulations, etc.)							
TX14.2.5 - Thermal Control Analysis (ex: Fluid flow analysis, Orbit analysis, Thermal solvers, etc.)							
TX14.2.6 - Heating Systems (ex: Electric heaters, Nuclear-based heating source (e.g. radioisotope heater units, general-purpose heat source), etc.)							
TX14.2.7 - Verification and Validation of Thermal Management Systems (ex: Testing, correlation, and inspection)							
TX14.2.8 - Measurement and Control (ex: Mechanical thermostats, Sensors, Temperature control software and algorithms, etc.)							
TX14.2.XX - (Other)				(Other)			
TX14.3 - Thermal Protection Components and Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX14.3.1 - Thermal Protection Materials (TPM) (ex: Coatings, Foams (i.e., ascent Thermal Protection Systems (TPSs)), Tiles and blankets, etc.)							
TX14.3.2 - Thermal Protection Systems (ex: Ceramic matrix composite hot structures, Multilayer flexible (e.g., Hypersonic Inflatable Aerodynamic Decelerator (HIAD) thermal protection system), etc.)							
TX14.3.3 - Thermal Protection Analysis (ex: Aeroheating (convective and radiative), Computational materials design, Reliability assessment and failure analysis, etc.)							
TX14.3.4 - Thermal Protection Systems Testing (ex: Arc jet, laser-based, wind tunnel, solar tower, radiant, thermo-mechanical, pressurized elevated temperature, and combined (e.g., Laser Enhanced Arc-jet Facility (LEAF) Lite) flight testing, etc.)							
TX14.3.5 - Thermal Protection System Instrumentation (ex: Heat flux gauges, Radiometer/spectrometers, Sensor networks, etc.)							
TX14.3.XX - (Other)				(Other)			

TX15 - Flight Vehicle Systems

TX15.1 - Aerosciences	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX15.1.1 - Aerodynamics (ex: Flow characterization through analysis and testing, with prediction and characterization of unsteady separated flow being a primary technology challenge, etc.)							
TX15.1.2 - Aerothermodynamics (ex: Forebody and afterbody heating characteristics with heating prediction on capsule afterbodies in separated flow, Shock layer radiation prediction and characterization; advanced predictive technology, etc.)							
TX15.1.3 - Aeroelasticity (ex: Computational aeroelastic tools coupling Computational Fluid Dynamics (CFD) with structural dynamics methodologies to predict flutter, buffet, limit cycle oscillations and aeroservoelastic interactions, etc.)							
TX15.1.4 - Aeroacoustics (ex: Integrated approach to computational predictive methods, sensors, and test techniques to study aeroacoustic effects generated by shock motion, flow separation and reattachment, exhaust plumes and plume impingement, and sonic booms, etc.)							
TX15.1.5 - Propulsion Flowpath and Interactions (ex: Technology challenges include prediction and characterization of flow-related performance for integrated propulsion systems, etc.)							
TX15.1.6 - Advanced Atmospheric Flight Vehicles (ex: Concept flow-related technologies supporting development of subsonic transports, supersonic transports, hybrid electric concepts, advanced spacecraft, launch vehicle and abort vehicles, etc.)							
TX15.1.7 - Computational Fluid Dynamics (CFD) Technologies (ex: Advanced algorithms and computational strategies allowing predictive and design tools to operate efficiently on emerging high performance computing architectures, Particle methods like Lattice Boltzmann, etc.)							
TX15.1.8 - Ground and Flight Test Technologies (ex: Advanced pressure and temperature measurement; qualitative and quantitative off-body measurement techniques, advanced static and dynamic pressure sensitive paint, advanced load balances, including flow-through balances for powered testing, and model deformation measurement systems for aeroelastic test, etc.)							
TX15.1.XX - (Other)				(Other)			
TX15.2 - Flight Mechanics	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX15.2.1 - Trajectory Design and Analysis (ex: Trajectory Design and Optimization & Trajectory Reconstruction; Includes design and optimization of space vehicle and air vehicle trajectories. Includes definition of the envelope of acceptable trajectories given the capabilities of the vehicle, and determination of the optimal trajectory, etc.)							
TX15.2.2 - Flight Performance and Analysis (ex: Technologies and techniques for the analysis, design, and prediction of vehicle performance parameters and evaluation against vehicle and mission requirements and constraints, such as 3DOF analyses for preliminary designs and trade studies followed by high fidelity 6-DOF evaluations with GN&C in the loop)							
TX15.2.3 - Flight Mechanics Testing and Flight Operations (ex: Technologies to aid in-flight and post-flight assessments of vehicle performance and handling such as trajectories and environments, technology development of sensors and systems to gather relevant flight data during flight tests and operational flights, etc.)							
TX15.2.4 - Modeling and Simulation for Flight (ex: Development of technologies that simulate the physics of flight vehicles, including GN&C, natural environment models, and vehicle subsystem (plant) models that affect vehicle performance and dynamics; Uncertainty modeling; Simulation and trajectory visualization, etc.)							
TX15.2.XX - (Other)				(Other)			

TX16 - Air Traffic Management and Range Tracking Systems

TX16 - Air Traffic Management and Range Tracking Systems	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX16.1 - Safe All Vehicle Access (ex: Multi-domain situational awareness and prognostic safety awareness, prediction and alerting tools, Safety technologies for new vehicle concepts; Urban Air Mobility (UAM) viability demonstrations, etc.)							
TX16.2 - Weather/Environment (ex: Improved weather and hazard awareness detection, prediction and alerting technologies, including aircraft state and health management, etc.)							
TX16.3 - Traffic Management Concepts (ex: Operator prioritization services integrated with air navigation service provider tools, Safety analyses for new airspace concepts, etc.)							
TX16.4 - Architectures and Infrastructure (ex: Develop requirements for a secure integrated CNS (Communications, Navigation, Surveillance) system for Trajectory Based-Operations (TBO) and future autonomous operations, etc.)							
TX16.5 - Range Tracking, Surveillance, and Flight Safety Technologies (ex: Advanced (near-zero loss) telemetry systems for ascent or re-entry; Autonomous onboard flight analysis, etc.)							
TX16.6 - Integrated Modeling, Simulation, and Testing (ex: ATM testbed, Shadow-mode capability in which virtual and constructive simulations run in tandem with the live NAS, etc.)							
TX16.XX - (Other)				(Other)			

TX17 - Guidance, Navigation, and Control (GN&C)

TX17.1 - Guidance and Targeting Algorithms	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX17.1.1 - Guidance Algorithms (ex: Ascent guidance, abort guidance, and multi-vehicle formation flying guidance, Vehicle 6DOF path planning, etc.)							
TX17.1.2 - Targeting Algorithms (ex: On-the-fly adaptive guidance for opportunistic exploration and science observation)							
TX17.1.XX - (Other)				(Other)			
TX17.2 - Navigation Technologies	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX17.2.1 - Onboard Navigation Algorithms (ex: Algorithms for optical navigation, Ascent vehicle filter, Light detection and ranging (LIDAR)-based navigation, etc.)							
TX17.2.2 - Ground-based Navigation Algorithms (ex: Filtering and estimation technologies for the optimum selection of data types, Measurement frequencies and advanced techniques/methods for uncertainty analysis, etc.)							
TX17.2.3 - Navigation Sensors (ex: Accelerometers, Inertial Measurement Units (IMUs), GPS/Global Navigation Satellite System (GNSS) receivers, etc.)							
TX17.2.4 - Relative Navigation Aids (ex: Retro-reflective corner cubes, Radio Wave Marker (RF Retro-Reflector), etc.)							
TX17.2.5 - Rendezvous, Proximity Operations, and Capture Sensor Processing and Processors (ex: LIDAR calibration, Merman Ring tracking, Vis. Cam. Vehicle Centroid/Bearing; IR cam. Vehicle Centroid/Bearing; Retroreflector Centroid Bearing; Landmark (i.e. crater) Bearing; Terrain Feature Bearing; Laser Retro Range & Bearing; Laser Vehicle Range & Bearing, etc.)							
TX17.2.6 - Rendezvous, Proximity Operations, and Capture Trajectory Design and Orbit Determination (ex: Geosynchronous Earth Orbit (GEO) RPO trajectory design and orbit determination, Lunar Near Rectilinear Halo Orbit (NRHO) RPO trajectory design and orbit determination, etc.)							
TX17.2.XX - (Other)				(Other)			
TX17.3 - Control Technologies	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX17.3.1 - Onboard Maneuvering/Pointing/Stabilization/Flight Control Algorithms (ex: Adaptive flight control for launch vehicles/spacecraft/landers/atmospheric exploration vehicles time optimal (or fuel optimal) spacecraft slew control, Clohessy-Wiltshire (CW) Targeted Finite Burn, etc.)							
TX17.3.2 - Dynamics Analysis, Modeling, and Simulation Tools (ex: Flexible modes analysis, Flexible multi-body dynamics modeling tools/codes, Multi-vehicle closed loop hi-fidelity Attitude and orbit simulation, etc.)							
TX17.3.3 - Ground-based Maneuvering/Pointing/Stabilization/Flight Control Algorithms (ex: Algorithms for ground-based maneuver design, in a highly-automated manner)							
TX17.3.4 - Control Force/Torque Actuators (ex: Cold-gas Attitude control micro-thrusters, Next generation reaction wheels, Precision delta-v thrusters, etc.)							
TX17.3.5 - GN&C actuators for 6DOF Spacecraft Control During Rendezvous, Proximity Operations, and Capture (ex: 6DOF RCS thrusters)							
TX17.3.XX - (Other)				(Other)			
TX17.4 - Altitude Estimation Technologies	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX17.4.1 - Onboard Altitude/Altitude Rate Estimation Algorithms (ex: Kalman filters, Relative pose estimators)							
TX17.4.2 - Ground-Based Altitude Determination/Reconstruction Algorithm Development (ex: Sparse data trajectory reconstruction tools, Orbit determination tools/codes for formation flying spacecraft constellations)							
TX17.4.3 - Altitude Estimation Sensors (ex: Celestial sensors, Gyroscopes, Star trackers, etc.)							
TX17.4.XX - (Other)				(Other)			
TX17.5 - GN&C Systems Engineering Technologies	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX17.5.1 - GN&C System Architectures, Requirements and Specifications (ex: GN&C system architectural trade analysis tools/codes, Multi-parameter system optimization tools/codes)							
TX17.5.2 - GN&C Fault Management/Fault Tolerance/Autonomy (ex: Proximity operations (Collision Detection (RPO), Collision Avoidance Maneuver design (LEO), Collision Avoidance Maneuver design (GEO), Collision Avoidance Maneuver design (Deep Space), etc.)							
TX17.5.3 - GN&C Verification and Validation Tools and Techniques (ex: Technologies for the verification and validation of highly autonomous systems)							
TX17.5.4 - GN&C Ground Testbeds/Test Facilities (ex: GN&C system autonomy assessment testbeds, high-precision pointing and micro-vibration jitter assessment testbeds)							
TX17.5.5 - Vehicle Flight Dynamics and Mission Design Tools/Techniques (ex: Computationally efficient trajectory and Attitude optimization tools for onboard use, Improved trajectory and mission design tools and visualization methods for faster trajectory, vehicle, and mission design cycles)							
TX17.5.6 - System Identification (ex: Computationally efficient algorithms for embedded online real time parameter estimation, Prediction-error minimization (PEM) tools, codes, and algorithms, etc.)							
TX17.5.7 - End-to-End Modeling and Simulation of GN&C Systems (ex: GN&C modeling and simulation for increased autonomy, Technologies, techniques, and methods for modeling non-deterministic systems, etc.)							
TX17.5.8 - Flying/Handling Qualities (ex: Advanced tools for designing-in desired handling qualities and for evaluating handling qualities for piloted space vehicles; Tools for assessing pilot workloads, pilot performance, and handling qualities for advanced air and space vehicles (e.g. vehicles with increased structural flexibility, vehicles with increased levels of automation/autonomy))							
TX17.5.9 - Onboard and Ground-Based Terrain and Object Simulation, Mapping, and Modeling Software (ex: Terrain digital elevation map or three dimensional (3D) model generation (offline), Vehicle 3D model generation)							
TX17.5.XX - (Other)				(Other)			
TX17.6 - Technologies for Aircraft Trajectory Generation, Management, and Optimization for Airspace Operations	Product/Service Capability	Support of NASA	Support of NOAA	Product/Service Description	R&D	Primary Critical Mineral	Primary HTSUS 10-Digit Code
TX17.6.1 - Strategic Management of Air Vehicles (ex: Algorithms, ground software, and onboard software for improved traffic flow management and operations optimization for air vehicles)							
TX17.6.2 - Tactical Management of Air Vehicles (ex: Algorithms, ground software, and onboard software for separation assurance and conflict resolution for air vehicles)							
TX17.6.XX - (Other)				(Other)			

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Section 3: Critical Products and Services

Review the list of U.S. Government (USG)-designated critical products and/or services associated with/supporting space related systems. For more information, select the corresponding product or service cell. Indicate the capabilities your organization has for the listed products and services. Complete all columns related to the products and services your organization supports.
NOTE: "Currently procure from supplier" means that your organization does not have production capability but can source the product or service from a supplier.
NOTE: If your organization does not have capabilities with these critical products and services, select "My organization does not have capabilities with any of the listed Critical Products and Services." in the cell to the right.

My organization does not have capabilities with any of the listed Critical Products and Services

Critical Products and Services	Product/Service Capability	Support of NASA	Support of NOAA	Primary Facility with Capability (generated from Section 1b)
Additive Manufacturing (A.M.)/3D printing	Currently produce/service and is available for procurement	Direct Contract or Purchase Order with NASA	Direct Contract or Purchase Order with NOAA	
Adiabatic Demagnetization Refrigerators (ADR)	Currently distribute	Sub-tier supplier to NASA	Sub-tier supplier to NOAA	
Aerospace-grade Rayon (for use in reentry thermal protection systems)	Currently procure from supplier	Space Act Agreement with NASA	Other Transactional Authority with NOAA	
Air Force Elastomeric Material (AF-E)	Currently in development (available within three years)	Contractual relationship to NASA unknown	Contractual relationship to NOAA unknown	
Ammonia Scrubber	Planned development (greater than 3 years)	None	None	
Ammonia Scrubber Sorbent				
Ammonium Perchlorate				
Atomic Clocks				
Avcoat				
Bearings for Extreme Environments				
Bellows Tanks				
Carbon Fiber (Aerospace Grade)				
Carbon FiberForm and Phenolic Impregnated Carbon Ablator (PICA)				
Ceramic Tiles & Coating				
Charge Coupled Devices (CCD)				
Conductivity Sensor				
Cool Gas Generators				
Cryocoolers				
Cryogenic High Accuracy Refraction Measurement System (CHARMS)				
Electron Beam Direct Write IC Equipment				
Far-Ultraviolet Coating Capabilities				
Fuel Valves				
Gas Valves and Regulators				
Heatshield for Extreme Entry Environment Technology (HEEET)				
Helium				
High performance, sole source MIL-parts (logic ICs, memory ICs, ADCs, etc.)				
High Power Laser Diodes				
High Purity Hydrazine				
High-power, high-specific-impulse Electric Propulsion Power Processing Unit (PPU)				
High-power, High-specific-impulse Electric Propulsion Thruster				
Honeycomb Radiators				
Hot Structures (CVI C/SiC)				
Infrared Detectors				
In-Space Propulsion Systems				
Liquid Hydrogen (LH2)				
Liquid Rocket Engines				
Loop Heat Pipes				
Louvers				
Low to Moderate Power Electric Propulsion				
Mechanical Thermostats				
Monomethyl Hydrazine (MMH)				
Nitrogen Tetroxide (Rocket Fuel N2O4)				
Oxygen (O2) High Pressure Regulator				
Oven-Controlled Crystal Oscillators and Resonators (OCXO)				
Packed Multifiltration Beds				
Parachute Reefing Line Cutters				
Phase Separators				
Photovoltaics				
Precision Gyroscopes				
Pressure Sensors				
Propellant Thrusters				
Quick Disconnects				
Rad-Hard DC-DC Converters High Efficiency Power Supplies (DC-DC)				
Rad-hard processing elements (memory, processors, System on Chip)				
Rad-hard transistor and power transistors (BJT, MOSFET, HEMT, Si, SiC, GaN, etc.)				
Radiation Hardened Trusted Electronics				
Radiation Testing of Integrated Avionics Subsystems and Systems				
Radioisotope Thermoelectric Generators (RTG)				
Reaction Wheel Assemblies				
Rotary Encoders				
Sensor Chip Assembly				
Space-qualified Extended Wavelength Advanced Photodetectors (APD)				
Space-qualified Infrared (IR) Detectors - Mercury Cadmium Telluride (HgCdTe)				
Space-qualified Infrared (IR) Detectors - Type II Superlattice (T2SL)				
Space-qualified Infrared (IR) Detectors - Thermopile				
Star Trackers				
Super Lightweight Ablator (SLA)				
Tantalum Chip and Wet Tantalum Capacitors				
Traveling Wave Tubes				
Urine Processing Assembly Pump Motor				
Valves				

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

Section 4: Supplier Information

Provide information about your organization's suppliers. This section must be completed in its entirety with at least one supplier per product/service. Blank responses will not be accepted.

First, estimate the total number of direct suppliers your organization uses to produce its products and services in the box to the right. See the Definitions Tab for more information.

For each of the product and services, identify the top suppliers (up to three) and provide the following: name of the supplier, associated zip/postal code, country, primary reason of significance, the Technology Taxonomy subarea of input sourced from the supplier (and/or the critical product and service input sourced from the supplier, if applicable), a brief description of the input provided by the supplier, and the supplier sourcing criticality. If the primary reason for supplier is listed as other, utilize the explain box to provide a response.

NOTE: Do NOT paste information into this excel document.

Estimate your organization's total number of **direct suppliers in 2022** (*see* Definitions Tab):	

Your Organization's Products and Services (generated from Sections 2b-g and 3 responses)		Supplier Name	Supplier ZIP or Postal Code	Supplier Country	Primary Reason Supplier is Significant	Technology Taxonomy Subarea of Input Sourced from Supplier (if applicable)	Critical Product/Service Input Sourced from Supplier (if applicable)	Supplier Product/Service Input Description	Supplier Sourcing Criticality	Explain (if Reason Supplier Significant not listed)
Additive Manufacturing	1				Delivery Considerations				Sole Global Source	
	2				Financial Considerations				U.S. - Single Source	
	3				Number of Products/Services supported				Non-U.S. - Single Source	
Adiabatic Demagnetization Refrigerators (ADR)	1				Relationship Considerations				U.S. and/or Non-U.S. Sources	
	2				Technical Specifications					
	3				Not Listed					
Aerospace-grade Rayon (for use in reentry thermal protection systems)	1									
	2									
	3									
Air Force Elastomeric Material (AF-E)	1									
	2									
	3									
Ammonia Scrubber	1									
	2									
	3									
TX01.1.1 - Integrated Systems and Ancillary Technologies	1									
	2									
	3									
TX01.1.2 - Earth Storable	1									
	2									
	3									
TX01.1.3 - Cryogenic	1									
	2									
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Comments:										

TX01.1 - Chemical Propulsion Systems
TX01.2 - Electric Space Propulsion
TX01.3 - Aero Propulsion
TX01.4 - Advanced Propulsion
TX02.1 - Avionics Component Technologies
TX02.2 - Avionics Systems and Subsystems
TX02.3 - Avionics Tools, Models, and Analysis
TX03.1 - Power Generation and Energy Conversion
TX03.2 - Energy Storage
TX03.3 - Power Management and Distribution
TX04.1 - Sensing and Perception
TX04.2 - Mobility
TX04.3 - Manipulation
TX04.4 - Human-Robot Interaction
TX04.5 - Autonomous Rendezvous and Docking
TX04.6 - Robotics Integration
TX05.1 - Optical Communications
TX05.2 - Radio Frequency
TX05.3 - Internetworking
TX05.4 - Network Provided Position, Navigation, and Timing (PNT)
TX05.5 - Revolutionary Communications Technologies
TX05.6 - Networking and Ground Based Orbital Debris Tracking and Management
TX05.7 - Acoustic Communication
TX06.1 - Environmental Control and Life Support Systems (ECLSS) and Habitation Systems
TX06.2 - Extravehicular Activity Systems
TX06.3 - Human Health and Performance
TX06.4 - Environmental Monitoring, Safety, and Emergency Response TX06.5 - Radiation
TX06.6 - Human Systems Integration
TX07.1 - In-Situ Resource Utilization
TX07.2 - Mission Infrastructure, Sustainability, and Supportability
TX07.3 - Mission Operations and Safety
TX08.1 - Remote Sensing Instruments and Sensors
TX08.2 - Observatories
TX08.3 - In-Situ Instruments and Sensors
TX09.1 - Aeroassist and Atmospheric Entry
TX09.2 - Descent
TX09.3 - Landing
TX09.4 - Vehicle Systems
TX10.1 - Situational and Self- Awareness
TX10.2 - Reasoning and Acting
TX10.3 - Collaboration and Interaction
TX10.4 - Engineering and Integrity
TX11.1 - Software Development, Engineering, and Integrity
TX11.2 - Modeling
TX11.3 - Simulation
TX11.4 - Information Processing
TX11.5 - Mission Architecture, Systems Analysis, and Concept Development
TX11.6 - Ground Computing
TX12.1 - Materials
TX12.2 - Structures
TX12.3 - Mechanical Systems
TX12.4 - Manufacturing
TX12.5 - Structural Dynamics
TX13.1 - Infrastructure Optimization
TX13.2 - Test and Qualification
TX13.3 - Assembly, Integration, and Launch
TX13.4 - Mission Success Technologies
TX14.1 - Cryogenic Systems
TX14.2 - Thermal Control Components and Systems
TX14.3 - Thermal Protection Components and Systems
TX15.1 - Aerosciences
TX15.2 - Flight Mechanics
TX16.1 - Safe All Vehicle Access
TX16.2 - Weather/Environment
TX16.3 - Traffic Management Concepts
TX16.4 - Architectures and Infrastructure
TX16.5 - Range Tracking, Surveillance, and Flight Safety Technologies TX16.6 - Integrated Modeling,
Simulation, and Testing
TX17.1 - In-Situ Resource Utilization
TX17.2 - Navigation Technologies
TX17.3 - Control Technologies
TX17.4 - Altitude Estimation Technologies
TX17.5 - GN&C Systems Engineering Technologies
TX17.6 - Technologies for Aircraft Trajectory Generation, Management, and Optimization for Airspace
Operations

Additive Manufacturing (A.M.)/3D printing
Adiabatic Demagnetization Refrigerators (ADR)
Aerospace-grade Rayon (for use in reentry thermal protection systems)
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Star Trackers
Super Lightweight Ablator (SLA)
Tantalum Chip and Wet Tantalum Capacitors
Traveling Wave Tubes
Urine Processing Assembly Pump Motor
Valves

Section 5: Customer Information

Provide information about your organization's customers. This section must be completed in its entirety with at least one customer per product/service. **Blank responses will not be accepted.**

First, estimate the total number of direct customers your organization sold its products and services to in 2022 in the right-hand box. See the Definitions Tab for more information.

For each of your organization's products and services, provide the following: the most important customer name, its zip/postal code, its country, the most important criteria associated with selecting this customer.
Customer Criteria, "Revenue" indicates that they are your organization's most important customer for the selected product/service based on monetary/sales value.
is for that row item only.
NOTE: Do NOT paste information into this excel document.

NOTE: Under the Most Important
NOTE: Percentage of Annual Total Sales Attributable to Customer

Estimate this organization's total number of **direct customers in 2022** (see Definitions Tab):

Your Organization's Products and Services (generated from Sections 2b-g and 3 responses)		Single Most Important Customer Name	Customer ZIP or Postal Code	Customer Country	Most Important Customer Criteria	Percentage of Annual Total Sales Attributable to Customer	Technology Taxonomy Subarea of Customer's Product (ex: TX01.1 - Chemical Propulsion Systems)	Critical Product/Service Input Sourced from Supplier (if applicable)	Non-U.S. Customer Offset Arraignments (if applicable)	Customer Product/Service Description (if known)	Explain (if Customer Criteria not listed)
Additive Manufacturing	1			Country List	Customer contract is larger than $250K				Yes-Direct		
Adiabatic Demagnetization Refrigerators (ADR)	2				Delivery Considerations				Yes-Indirect		
Aerospace-grade Rayon (for use in reentry thermal protection systems)	3				Financial Considerations				Yes-Both		
Air Force Elastomeric Material (AF-E)	4				Number of Products/Services supported				No		
Ammonia Scrubber	5				Relationship Considerations						
TX01.1.1 - Integrated Systems and Ancillary Technologies	6				Technical Specifications						
TX01.1.2 - Earth Storable	7				Not Listed						
TX01.1.3 - Cryogenic	8										
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Loop Heat Pipes
Louvers
Low to Moderate Power Electric Propulsion
Mechanical Thermostats
Monomethyl Hydrazine (MMH)
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Urine Processing Assembly Pump Motor
Valves
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19

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

Section 6: Support of U.S. Government (USG) - Agencies & Space Related Programs

Identify all U.S. Government agencies that your organization has supported, directly or indirectly, from 2019-2022 (including all affiliated laboratories or federally funded research and development centers). Then, identify the primary and secondary (if applicable) product/service that your organization provides to each agency. If your organization does not support the listed agency, select "None" from the Support Type dropdown menu.

	Agency Name		Support Type	Primary Product/Service Provided (generated from Sections 2b-g and 3 responses)	Secondary Product/Service Provided (if applicable)
A.	National Aeronautics and Space Administration (NASA)		Space Related		
	National Oceanic and Atmospheric Administration (NOAA)		Non-Space Related		
	Federal Aviation Administration (FAA)		Both		
	Federal Communications Commission		None		
	National Laboratories (DOE Labs)		Unknown		
	U.S. Air Force (USAF)				
	U.S. Army				
	U.S. Coast Guard				
	U.S. Marine Corps (USMC)				
	U.S. Navy				
	U.S. Space Force (USSF)				
	U.S. DOD Defense Advanced Research Projects Agency (DARPA)				
	U.S. DOD Missile Defense Agency (MDA)				
	U.S. Intelligence Community (e.g. CIA, NGA, NRO, NSA, DNI, etc.)				
	U.S. Space Development Agency (SDA)				
	Defense Logistics Agency (DLA)				
	Other Agency	(Identify Agency)			
	Other Agency	(Identify Agency)			
	Other Agency	(Identify Agency)			
	Unlisted Agency	(Specify here)			
	Unlisted Agency	(Specify here)			

Department of Agriculture
Department of Commerce (other than NOAA)
Department of Education
Department of Energy (other than National Laboratories)
Department of Health and Human Services
Department of Homeland Security (other than Coast Guard)
Department of Justice
Department of Labor
Department of the Interior
Department of the Treasury
Department of State
Department of Transportation
Defense Logistics Agency (DLA)
DOD Defense Finance and Accounting Service
DOD Defense Threat Reduction Agency
DOD Department of Defense
DOD Joint Chiefs of Staff
DOD Office of the Secretary of Defense
DOD Washington Headquarters Service
DOD Other
Environmental Protection Agency
General Services Administration
National Archives and Records Administration
Nuclear Regulatory Commission
Office of Personnel Management
United States International Trade Commission
United States Trade Representative
Department of Veterans Affairs
White House Communications Agency
Classified

Support of USG and Space Related Programs

B.	Estimate the total number of Commercial, USG, **and** space related programs your organization has directly or indirectly supported from **2019-2022** (including those not listed below):		If your organization entered "0," proceed to Section 7.

C. From the list provided, identify all Commercial, USG, and space related program(s) your organization has supported, **directly or indirectly, from 2019-2022** and indicate how your organization supported each program. **NOTE:** STTR/SBIR are considered "prime" contracts. Then, select the top (using your own discretion/best judgment) three products/services provided in support of each program (from Sections 2b-g and 3), the key supplier your organization uses to support each program (if applicable), and the primary customer you work with in supporting each program (if your organization is a subcontractor).

If your organization participates in a USG and space related program that is not listed below, enter it manually at the bottom of this page (entries 324-333). In these cases, identify the relevant agency in the "U.S. Government Agency" column and then write-in the program in the 'Program Name' column, along with answering the other column questions about the program(s) supported. If your organization has more than ten non-listed programs to enter, enter the ten most important programs to your organization.

Use the following links to advance directly to a specific agency/program: NASA: (#1-217) | NOAA: (#218-221) | Launch Vehicles: (#222-238) | Space Force: (#239-282) | Air Force: (#283-320) | Other: Identify (#324-333)

	U.S. Government Agency/Program Type	Program Name	Participation	Top Product/Service (generated from Sections 2b-g and 3 responses) Supporting USG Programs 1	2	3	Primary Supplier (generated from Section 4 responses) (if Primary Supplier not listed, enter in comment box)	If Subcontractor, select Primary Customer supporting program (generated from Section 5 responses) (if applicable)
1	NASA	ACSC Core and Risk Reduction	Prime Contractor					
2	NASA	Advanced Air Mobility	Subcontractor					
3	NASA	Advanced Air Transport Technology	Both (Prime and Subcontractor)					
4	NASA	Advanced Composite-Based Solar Sail System (ACS3)	Other Support					
5	NASA	Advanced Composition Explorer (ACE)						
6	NASA	Aeronomy of Ice in the Mesosphere (AIM)						
7	NASA	AES Foundational Systems						
8	NASA	AES Future Projects						
9	NASA	AES Habitation Capabilities						
10	NASA	AES Strategic Operations						
11	NASA	AETC Project						
12	NASA	Air Traffic Management – eXploration						
13	NASA	Airspace Technology Demonstrations						
14	NASA	Aqua						
15	NASA	Atmospheric Waves Experiment (AWE)						
16	NASA	Aura						
17	NASA	Balloon Projects						
18	NASA	Block 1B DDT&E						
19	NASA	Chandra X-Ray Observatory (CXO)						
20	NASA	Cislunar Autonomous Positioning System Technology Operations and Navigation Experiment (CAPSTONE)						
21	NASA	Climate Absolute Radiance and Refractivity Observatory-Pathfinder (CLARREO-PF)						
22	NASA	Cloud-Aerosol Lidar & Infrared Pathfinder (CALIPSO)						
23	NASA	CloudSat						
24	NASA	Commercial Crew						
25	NASA	Commercial LEO Development Project						
26	NASA	Commercial Supersonic Technology						
27	NASA	Communication Program Office						
28	NASA	Communication Services						
29	NASA	Convergent Aeronautics Solutions						
30	NASA	Crew Health & Safety Project						
31	NASA	Cryo Fluid Management (CFM)						
32	NASA	CubeSat Handling of Multisystem Precision Time Transfer (CHOMPTT)						
33	NASA	Cubesat Laser Intersatellite Crosslink (CLICK) A & B/C						
34	NASA	Cubesat Proximity Operations Demonstration (CPOD)						
35	NASA	Cyclone Global Navigation Satellite System (CYGNSS)						
36	NASA	Deep Space Atomic Clock (DSAC)						
37	NASA	Deep Space Climate Observatory (DSCOVR) Mission operated by NOAA						
38	NASA	Deep Space Logistics						
39	NASA	Deep Space Network (DSN)						
40	NASA	Deep Space Optical Communication (DSOC)						
41	NASA	Double Asteroid Redirection Test (DART)						
42	NASA	Dragonfly						
43	NASA	DSCOVR (Reimbursable)						
44	NASA	Dynamic Radioisotope Power System Project						
45	NASA	Earth Surface Mineral Dust Source Investigation (EMIT)						
46	NASA	Ecosystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS)						
47	NASA	Electrified Powertrain Flight Demonstration (EPFD) Project						
48	NASA	EscaPADE						
49	NASA	Euclid						
50	NASA	Europa Clipper						
51	NASA	Evolvable Cryogenics (eCryo)						
52	NASA	Exploration Habitation Systems						

53	NASA	Exploration Medical Capabilities (ExMC)						
54	NASA	Fermi Gamma-Ray Large Telescope						
55	NASA	Fission Surface Power (FSP)						
56	NASA	Flight Demonstrations & Capabilities						
57	NASA	Galactic/Extragalactic ULDB Spectroscopic Terahertz Observatory (GUSTO)						
58	NASA	Geospace Dynamics Constellation						
59	NASA	Geostationary Carbon Cycle Observatory (GeoCARB)						
60	NASA	GEOTAIL						
61	NASA	Global Ecosystem Dynamics Investigation (GEDI)						
62	NASA	Global Precipitation Measurement (GPM)						
63	NASA	Global Scale Observations of Limb & Disk (GOLD)						
64	NASA	GOES-16						
65	NASA	GOES-17						
66	NASA	GOES-T						
67	NASA	GOES-U						
68	NASA	GRACE- FO						
69	NASA	Ground Systems Dev & Ops						
70	NASA	Habitation & Logistics Outpost						
71	NASA	Heliophysics Environmental and Radiation Measurement Experiment Suite (HERMES)						
72	NASA	High Performance Spaceflight Computing (HPSC)						
73	NASA	High Rate Composite Aircraft Manufacturing						
74	NASA	Hinode (Solar B)						
75	NASA	HLS Program						
76	NASA	Hubble Space Telescope Operations						
77	NASA	Human Factors & Behavioral Performance (HFBP)						
78	NASA	Human Health Countermeasures (HHC)						
79	NASA	Hybrid Thermally Efficient Core						
80	NASA	Hypersonics Technology Project						
81	NASA	Ice, Cloud and Land Elevation Satellite-2 (ICESat-2)						
82	NASA	Imaging X-ray Polarimetry Explorer (IXPE)						
83	NASA	Insight						
84	NASA	In-Space Manufacturing (ISM)						
85	NASA	In-Space Robotic Manufacturing & Assembly (IRMA) Archinaut One						
86	NASA	Interface Region Imaging spectrometer (IRIS)						
87	NASA	Interstellar Boundary Explorer (IBEX)						
88	NASA	Interstellar Mapping and Acceleration Probe (IMAP)						
89	NASA	Ionospheric Connection (ICON) Explorer						
90	NASA	ISS Crew Cargo Services						
91	NASA	ISS Spacecraft Operations						
92	NASA	James Webb Space Telescope						
93	NASA	Janus						
94	NASA	Jason-3						
95	NASA	JPSS Ground						
96	NASA	JPSS-2						
97	NASA	JPSS-3						
98	NASA	JPSS-4						
99	NASA	JUICE-PEP-Hi						
100	NASA	JUICE-RIME						
101	NASA	JUICE-UVS						
102	NASA	Juno						
103	NASA	L2/ATHENA (under PCOS SR&T)						
104	NASA	Landsat 9						
105	NASA	Laser Communications Relay Demonstration (LCRD)						
106	NASA	Launch Services Program						
107	NASA	LeO-based Flight Test Inflatable Decelerator (LOFTID)						
108	NASA	Low Boom Flight Demonstrator						
109	NASA	LSP Alpha Magnetic Spectrometer Payload						
110	NASA	Lucy						
111	NASA	Lunar Flashlight						
112	NASA	Lunar Reconnaissance Orbiter (LRO)						
113	NASA	Lunar Trailblazer						
114	NASA	LWS Space Environment Testbeds (SET)						
115	NASA	Magnetospheric Multiscale (MMS)						
116	NASA	Mars Atmosphere & Volatile (MAVEN)						
117	NASA	Mars Entry Descent and Landing Instrument 2 (MEDLI2)						
118	NASA	Mars Express						
119	NASA	Mars Odyssey 2001						
120	NASA	Mars Organic Molecule Analyzer (MOMA)						
121	NASA	Mars Oxygen ISRU Experiment (MOXIE)						
122	NASA	Mars Reconnaissance Orbiter 2005 (MRO)						
123	NASA	Mars Rover 2020						
124	NASA	Mars Sample Return						
125	NASA	Mars Science Lab (MSL 2011) -Curiosity						
126	NASA	Megane						
127	NASA	MetOp-C(Reimbursable)						
128	NASA	Mobile Launcher-2						
129	NASA	Moon & Mars Architecture						
130	NASA	Moon to Mars Enterprise Domain						
131	NASA	Multi-Angle Imager for Aerosols (MAIA)						
132	NASA	Nancy Grace Roman Space Telescope						
133	NASA	NASA ISRO Synthetic Aperture Radar (NI-SAR)						
134	NASA	Near Earth Network (NEN)						
135	NASA	Near Earth Objects Observation (NEOWISE)						
136	NASA	Near Earth Objects Surveyor Mission (NEOSM)						
137	NASA	Neil Gehrels Swift Gamma-Ray Burst Explorer						
138	NASA	Networks Integration and Engineering						
139	NASA	Neutron Star Interior Composition Explorer (NICER)						
140	NASA	New Horizons						
141	NASA	Next Generation RTG Project						
142	NASA	NextSTEP BAA						
143	NASA	NOAA-20						
144	NASA	Nuclear Spectroscopic Telescope Array (NuSTAR)						
145	NASA	Orbiting Carbon Observatory - 3 (OCO-3)						
146	NASA	Orbiting Carbon Observatory -2 (OCO-2)						
147	NASA	Orion Multi-Purpose Crew Vehicle						
148	NASA	OSAM-1 (Restore-L & SPIDER (Space Infrastructure DExterous Robot))						
149	NASA	OSIRIS-REx						
150	NASA	Ozone Mapping and Profiler Suite Limb(OMPS-L)						
151	NASA	PACE						
152	NASA	Parker Solar Probe (PSP) - formerly Solar Probe Plus (SPP)						

153	NASA	Pathfinder Technology Demonstrator (PTD-1): TUI HYDROS						
154	NASA	Pathfinder Technology Demonstrator (PTD-2): BCT HyperXACT						
155	NASA	Pathfinder Technology Demonstrator (PTD-3): TBIRD						
156	NASA	Pathfinder Technology Demonstrator (PTD-4): LISA-T						
157	NASA	Polar Radiant Energy in the Far-InfraRed Experiment (PREFIRE)						
158	NASA	Polar Resources Ice Mining Experiment-1 (PRIME-1)						
159	NASA	Polarimeter to Unify the Corona and Heliosphere (PUNCH)						
160	NASA	Power & Propulsion Element						
161	NASA	Psyche						
162	NASA	R2D2: V-R3x						
163	NASA	R2D2: X-1						
164	NASA	Rapid Analysis & Manufacturing Propulsion Technology (RAMPT)						
165	NASA	Research Operations and Integration (ROI)						
166	NASA	Revolutionary Vertical Lift Technology						
167	NASA	Robotic Systems						
168	NASA	Rocket Propulsion Testing Project						
169	NASA	Safe & Precise Landing Integrated Capabilities (SPLICE)						
170	NASA	SAGE III on ISS						
171	NASA	Sentinel-6						
172	NASA	SN Ground Segment Sustainment (SGSS)						
173	NASA	Soil Moisture Active and Passive (SMAP)						
174	NASA	Solar & Heliospheric Observatory (SoHO)						
175	NASA	Solar Dynamics Observatory (SDO)						
176	NASA	Solar Electric Propulsion (SEP)						
177	NASA	Solar Orbiter Collaboration (SOC)						
178	NASA	Solar Probe Plus						
179	NASA	Solar Terrestrial Relations Observatory (STEREO)						
180	NASA	Space Flight Crew Operations						
181	NASA	Space Launch System						
182	NASA	Space Network						
183	NASA	Space Nuclear Propulsion (SNP)						
184	NASA	Space Radiation (SR)						
185	NASA	Spectro-Photometer for the History of the Universe, Epoch of Reionization and Ices Explorer (SPHEREx)						
186	NASA	Spitzer Space Telescope						
187	NASA	Starling Demonstration						
188	NASA	Stratospheric Observatory for Infrared Astronomy						
189	NASA	Strofio						
190	NASA	Sun Radio Interferometer Space Experiment (SunRISE)						
191	NASA	Surface Water & Ocean Topography (SWOT) Mission						
192	NASA	System-Wide Safety						
193	NASA	Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites (TRACERS)						
194	NASA	Terra						
195	NASA	Thruster for the Advancement of Low temperature Operation in Space (TALOS)						
196	NASA	Time History of Events & Macroscale Interactions (THEMIS)						
197	NASA	TIMED						
198	NASA	Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats (TROPICS)						
199	NASA	Tipping Point: Courier Solar Electric Propulsion Module (Courier SEP)						
200	NASA	Tipping Point: Dual Propulsion Experiment CubeSat (DUPLEX)						
201	NASA	Tipping Point: Tiled Ionic Liquid Electrospray Propulsion Demonstration (TILE Demo)						
202	NASA	Tipping Point: X-NAV Autonomous Navigation Demonstration						
203	NASA	Total and Spectral Solar Irradiance Sensor - 2 (TSIS-2)						
204	NASA	Total and Spectral Solar Irradiance Sensor (TSIS) on ISS						
205	NASA	Transformational Tools & Technologies						
206	NASA	Transiting Exoplanet Survey Satellite (TESS)						
207	NASA	Tropospheric Emissions: Monitoring of Pollution (TEMPO)						
208	NASA	UAS Traffic Management						
209	NASA	University Innovation Project						
210	NASA	Unmanned Aircraft Systems Integration into the National Airspace System						
211	NASA	Vehicle Systems						
212	NASA	VIPER						
213	NASA	Voyager						
214	NASA	WIND						
215	NASA	xEVA						
216	NASA	XMM-Newton						
217	NASA	X-Ray Imaging and Spectrometry Mission (XRISM) (formerly XARM)						
218	NOAA	GOES-R: Geostationary Operational Environment Satellite (also, including GOES-S, T, and U)						
219	NOAA	Joint Polar Satellite System (JPSS)-1						
220	NOAA	JPSS-2						
221	NOAA	SWFO-L1 (Reimbursable)						
222	Launch Vehicles	Atlas V						
223	Launch Vehicles	Atlas V - Centaur						
224	Launch Vehicles	Atlas V - Common Core Booster						
225	Launch Vehicles	Black Brant						
226	Launch Vehicles	Blue Origin New Glenn						
227	Launch Vehicles	Blue Origin New Shepard						
228	Launch Vehicles	Boeing CST-100 Starliner						
229	Launch Vehicles	DCSS - Delta Cryogenic Second Stage						
230	Launch Vehicles	Delta IV						
231	Launch Vehicles	Delta IV - Common Booster Core						
232	Launch Vehicles	Delta IV - Heavy						
233	Launch Vehicles	Dragon						
234	Launch Vehicles	HMS - Handheld, Manpack, and Small Form Fit Radios						
235	Launch Vehicles	Space X - Falcon Heavy						
236	Launch Vehicles	Star 48 Upper Stage						
237	Launch Vehicles	Star 48BV						
238	Launch Vehicles	Starship						
239	Space Force	AEHF - Advanced Extremely High Frequency						
240	Space Force	AN/FPQ-16 Perimeter Acquisition Radar Attack Characterization System (PARCS/EPARCS)						
241	Space Force	AN/FPS-108 COBRA DANE Radar						
242	Space Force	AN/FPS-85 Radar						
243	Space Force	ARTS - Automated Remote Tracking Station						
244	Space Force	CCS - Counter Communications System						
245	Space Force	DMSP - Defense Meteorological Satellite Program						
246	Space Force	DSCS - Defense Satellite Communications System						
247	Space Force	DSP - Defense Support Program Satellites						
248	Space Force	GBS - Global Broadcast Service						
249	Space Force	GEODSS - Ground-Based Electro Optical Deep Space Surveillance						
250	Space Force	GLOBUS II						
251	Space Force	GLOBUS III						
252	Space Force	GPS Block IIA						
253	Space Force	GPS Block IIF						

254	Space Force	GPS Block III						
255	Space Force	GPS Block IIIA						
256	Space Force	GPS Block IIR						
257	Space Force	GSSAP - Geosynchronous Space Situational Awareness Program						
258	Space Force	JETSS - Joint Execution and Training System for Space						
259	Space Force	LADO - Launch, Early Orbit, Anomaly, & Disposal Operations						
260	Space Force	MSX - Midcourse Space Experiment						
261	Space Force	Milstar Satellites						
262	Space Force	Milstar/DMU II Terminals						
263	Space Force	Milstar SMCS Satellite Mission Control Subsystem						
264	Space Force	MOSS - Morón Optical Space Surveillance						
265	Space Force	NSSL - National Security Space Launch/Evolved Expendable Launch Vehicle (EELV)						
266	Space Force	OCS - GPS Operational Control Segment						
267	Space Force	OCX - Next Generation Operational Control System						
268	Space Force	PAVE PAWS - Phased Array Warning System						
269	Space Force	S2E2 - SBIRS Survivable Endurable Evolution						
270	Space Force	SBIRS - Space Based Infrared System						
271	Space Force	SBIRS Fixed Sites						
272	Space Force	SBIRS High-Space Based Infrared System						
273	Space Force	SBIRS Mobile Vehicles						
274	Space Force	SBIRS Space Segment						
275	Space Force	SBSS - Space Based Space Surveillance - Block 10						
276	Space Force	Space Fence						
277	Space Force	SST - Space Surveillance Telescope						
278	Space Force	Vulcan Centaur						
279	Space Force	WSF-M - Weather System Follow-on Microwave						
280	Space Force	Wideband Global SATCOM - WGS Block I						
281	Space Force	Wideband Global SATCOM - WGS Block II						
282	Space Force	Wideband Global SATCOM - WGS Block III						
283	Air Force	ADAP - Advanced Digital Antenna Production						
284	Air Force	AEP - Architecture Evolution Program						
285	Air Force	AFCPT - Air Force Command Post Terminals						
286	Air Force	AFSCN ESD - Air Force Satellite Control Network Electronic Schedule Dissemination 2.7						
287	Air Force	AFSCN ESD - Air Force Satellite Control Network Electronic Schedule Dissemination 3.0						
288	Air Force	AFSCN RBC - Air Force Satellite Control Network Remote Tracking Station Block Change						
289	Air Force	AFSSS - Air Force Space Surveillance System						
290	Air Force	AFWET - Air Force Wideband Enterprise Terminals						
291	Air Force	AITG - Airborne Integrated Terminals Group						
292	Air Force	ARS - Archival Recorder Systems						
293	Air Force	BMEWS - Ballistic Missile Early Warning System						
294	Air Force	CCS-C Block 1 - Command and Control System						
295	Air Force	Control and Reporting Center (CRC)						
296	Air Force	EPS - Enhanced Polar System						
297	Air Force	FAB-T - Family of Advanced Beyond Line-of-Sight Terminals (Inc 1)						
298	Air Force	GMT - Ground Multiband Terminal						
299	Air Force	HUSIR - Haystack Ultra-Wideband Satellite Imaging Radar						
300	Air Force	JMS - Joint Space Operations Center (JSpOC) Mission System (JMS)						
301	Air Force	LIONS - Logistics Information Operations Systems						
302	Air Force	LTRS - Launch Test Range System						
303	Air Force	MAGR-2K - Miniaturized Airborne GPS Receiver 2000						
304	Air Force	MARK IVB - Meteorological Data Station						
305	Air Force	MGUE-GPS User Equipment: Modernized UE						
306	Air Force	Mini-MUTES - Mini-Multiple Threat Emitter System						
307	Air Force	MMP-Minuteman MEECN Program						
308	Air Force	MMSOC-GSA - Multi-Mission Space Operations Center Ground Support Architecture						
309	Air Force	MUTES - Multiple Threat Emitter System						
310	Air Force	NDS - Nuclear Detonation Detection System						
311	Air Force	OSR - Operational Switch Replacement						
312	Air Force	RAIDRS - Rapid Attack Identification Detection Reporting System						
313	Air Force	RSLP - Rocket Systems Launch Program						
314	Air Force	RSTN - Radio Solar Telescope Network						
315	Air Force	SCAMP - Single Channel Anti-Jam Man Portable Terminal						
316	Air Force	SOON - Solar Observing Optical Network						
317	Air Force	SSAEM-Space Situational Awareness Environmental Monitoring						
318	Air Force	TacSat-3						
319	Air Force	VTS-A - Vandenberg Tracking Station-A						
320	Commercial	Starlink						
321	Commercial	Boeing Commercial Satellites						
322	Commercial	Northrop Grumman Communications Satellites						
323	Commercial	Virgin Galactic						
324	(Identify Agency)	(Write in Program Here)						
325	(Identify Agency)	(Write in Program Here)						
326	(Identify Agency)	(Write in Program Here)						
327	(Identify Agency)	(Write in Program Here)						
328	(Identify Agency)	(Write in Program Here)						
329	(Identify Agency)	(Write in Program Here)						
330	(Identify Agency)	(Write in Program Here)						
331	(Identify Agency)	(Write in Program Here)						
332	(Identify Agency)	(Write in Program Here)						
333	(Identify Agency)	(Write in Program Here)						
Comments:								

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Section 7: Emerging Technologies & Capital Expenditures

A. Identify any emerging technology that your organization previously used, currently uses, conducts R&D on, or plans to use in the future. Then, indicate the primary issue, primary application area, primary product or service supported, any USG agency partnership to develop the technology, and the primary USG program associated with your use of that technology. If your organization sources its emerging technology from an external supplier, provide that supplier's information. If your organization sources its emerging technology internally, enter your organization's information in the supplier columns. Then explain any selections of "Other." **NOTE:** the "Use" and "Primary Issue" columns must be completed.

Emerging Technology	Use	Primary Issue with Use/Adoption	Primary Application Area	Primary Product/Service Supported (generated from Sections 2b-g and 3 responses) (if applicable)	Partnership with USG Agency to Develop Technology (if applicable)	Primary USG Program Supported (if applicable)	Emerging Technology Supplier Name - Single Most Important Supplier (if applicable)	Emerging Technology Supplier - ZIP or Postal Code	Emerging Technology Supplier - Country	Explain selections of "Other."
Additive Manufacturing (A.M.)/3D printing	Currently Use	Cost to Develop or Purchase, and Implement	Customer Service		Cooperative agreement				Country List	
Advanced Materials	Conduct R&D On	Lack of Information on Emerging Technology	Cyber Security		Cooperative Research and Development Agreement (CRADA)					
Artificial Intelligence	Currently Use & Conduct R&D On	Lack of Technical Talent	Data Management		Space Act Agreement					
Blockchain/Distributed Ledger Technologies	Do Not Use	Modernization Time Burden	Manufacturing		Other (explain)					
Cloud Computing	Plan to Use	Old/Incompatible Equipment or IT infrastructure	New Product Development							
Digital Engineering	Previously Used	Regulatory Burden	Process Efficiency							
Edge Computing		No Issue	Quality Control							
Encryption Technologies		Other	Other (explain)							
Hypersonics										
Internet of Things (IoT)										
Long Range Deep Space Communication										
Quantum Computing										
Robotics										
Super Computing										
Other (specify here)										
Other (specify here)										

B. Estimate the approximate number of emerging technology (both pending and current) patents (whether protected or not) that your organization has produced or registered since **2019** in the applicable boxes. If patents are non-applicable to your organization since **2019**, choose "None" in the drop-down and move to Part C.

None	Number of Pending Patents		Number of Approved/Current Patents	

C. Indicate the five most important primary emerging technology research areas and the corresponding research institution (using your own discretion/best judgment regarding both research area and institution) to further any of the emerging technologies listed in Part A. Then, provide details on the research institution partner, project title and project description, as well as the project's technology readiness level, time until it can be commercialized, and the research institution point of contact information.

If your organization does not partner with any research institutions, select "This organization does not have any research partnerships for its emerging technologies work" in the adjacent cell and proceed to Part D. | This organization does not have any research partnerships for its emerging technologies work

For a description of Technology Readiness Level (TRL), visit this link: https://www.nasa.gov/pdf/458490main_TRL_Definitions.pdf,

Primary Emerging Technology Research Area	Research Institution Partner	Project Title	Project Description	Technology Readiness Level	Time until Commercialization (in years)	Research Institution Point of Contact Name	Research Institution Point of Contact Email
				TRL 1	0-1		
				TRL 2	1-3		
				TRL 3	3-6		
				TRL 4	6-10		
				TRL 5	10+		
				TRL 6	Not meant for commercialization		
				TRL 7			
				TRL 8			
				TRL 9			
				Not Applicable			

Has your organization conducted **space related (i.e. any activity which affects space sector business)** capital expenditures (CapEx) from **2019-2022** (and or expects to for **2023-2027**)? If no, proceed to Section 8. — Yes/No

From **2019-2022**, did your organization experience any major change(s) in CapEx related to your **space related** activities? — Yes/No

If Yes, identify the reasons for these change(s):

For **2023-2027**, does your organization anticipate any major change(s) to CapEx related to your **space related** activities? — Yes/No

If Yes, identify the reasons for these change(s):

D. Between **2019 - 2027**, identify the top 10 most important machines, tools, or other CapEx-related items that are essential to your organization's (space related activities). For each entry listed, provide the following: the name or description of the equipment purchased, the equipment producer/manufacturer, the current availability of the identified equipment to your organization, whether the equipment is sourced on a single or sole basis, the typical lead time to acquire, the cost per unit to acquire, the criticality of the identified equipment to your organization's continued production/delivery of its products and or services, the associated primary product/service, and any applicable comments.

Equipment Name/Expenditure Description	Space Related	Equipment Producer Name (if applicable)	Country of Origin / Manufacturing Location	Availability	Single/Sole Source	Typical lead time to acquire (in days)	Cost per unit to acquire (in Thousands $)	Criticality	Associated Primary Product/Service (generated from Sections 2b-g and 3 responses)	Comments
	Space Related		Country List	In Current Use	Sole Global Source			5 - None		
	Non-Space Related			Currently Mothballed	U.S. - Single Source			4 - Little to no impact on production		
	Both			Intended Future Purchase	Non-U.S. - Single Source			3 - Partial impact on production		
				Not Commercially Available	U.S. and/or Non-U.S. Sources			2 - Significant impact on production		
				Import/Export Controls				1 - Critical to production (cannot produce without)		
				Prohibiting Purchase						
				Intended Future Replacement						
				No Longer Commercially Available						
				Purchased But Not Delivered						
				Other						

Comments:

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Additive Manufacturing (A.M.)/3D printing
Advanced Materials
Artificial Intelligence
Blockchain
Cloud Computing
Digital Engineering
Edge Computing
Encryption Technologies
Hypersonics
Internet of Things (IoT)
Long Range Deep Space Communication
Quantum Computing
Robotics
Super Computing

Section 8: USG Contracts

NOTE: Do NOT paste information into this excel document.

A.

	Number of Prime Contracts		
From 2019-2022, how many prime contracts, excluding SBIR and STTR contracts, has your organization been awarded by NASA, NOAA, or other USG agencies? Estimates are acceptable if exact figures are unknown. If none, indicate with a "0" for each provided box.	NASA	NOAA	Other USG Agencies

	Number of Subcontracts		
From **2019-2022, how many subcontracts**, excluding SBIR and STTR contracts, has your organization been awarded by entities contracted by NASA, NOAA, orother USG agencies? Estimates are acceptable if exact figures are unknown. If none, indicate with a "0" for each provided box.	NASA	NOAA	Other USG Agencies

		Number of SBIR and STTR Awards		
From **2019-2022, how many Small Business Innovation Research (SBIR) or Small Business Technology Transfer (STTR)** awards has your organization received by NASA, NOAA, or other USG agencies? Estimates are acceptable if exact figures are unknown. If none, indicate with a "0" for each provided box.		NASA	NOAA	Other USG Agencies
	SBIR			
	STTR			

List your top five active contracts with NASA and/or NOAA by **monetary value ($)** and provide the additional requested information. Record contract value in **$ Thousands, e.g. $12,000.00 = survey input of $12**. If your organization has no active contracts select "My organization has no active contracts" in the box to the right. — My organization has no active contracts

Contracting Agency	Prime/Subcontract	If subcontractor, Prime Contracting Entity (if Prime, leave blank)	Contract Number	Year Contract Started	Contract Length (in years)	Contract Type	If "Other" selected, Explain	Current Contract Value (in $ Thousands)	Primary Product/Service (generated from Sections 2b-g and 3 responses)	Primary USG Program Supported (if applicable)
NASA										
NOAA										

Prime/Direct SBIR Contract
Prime/Direct STTR Contract
SBIR Subcontract
STTR Subcontract

Cost-Plus Contract
Firm-Fixed Price (FFP) Contract
Indefinite-Quantity Contract
Indefinite-Delivery Contract
Labor-Hours Contract
Other Transaction Agreement (OTA)
Requirements Contract
Time-and-Materials Contracts
Other

B.

1	Is your organization dependent on selling to and/or funding from USG agencies for its continued viability?	Yes/No
	Explain (required):	
2	Between 2019-2022, have changes to acquisition or procurement practices related to/by NASA impacted your organization?	
	Explain (required):	
3	Between 2019-2022, have changes to acquisition or procurement practices related to/by NOAA impacted your organization?	
	Explain (required):	

Yes, Positive impact
Yes, Negative Impact
No Impact
Not Applicable

4 — Identify the primary issue your organization faces with regards to NASA's and/or NOAA's procurement and acquisition practices; then, specify the degree of impact. If no issue, select "Not Applicable."

Agency	Primary Issue	Degree of Impact	Explain
NASA:			
NOAA:			

Severe Impact
Significant Impact
Moderate Impact
Slight impact
Little to no Impact

Changes in Requirements
Confusion over Requirements
Contract Types Complexity
Cumbersome Requirements
Domestic Sourcing/Buy America Requirements
Inadequate Agency Budget
Inadequate Guidance/Outreach
Limited or No R&D Reimbursement
Program Cancellations
Reliance on Prime Contractors
Spending Volatility
Other (specify in "Explain" section)
Not Applicable

5	Identify the factor that most significantly influences your organization's ability to execute on its NASA and/or NOAA contract awards.		
	Explain:		

Administrative burden (reporting requirements)
Changing regulatory provisions
Contract closeout
Lack of personnel (employment/workforce issues)
Lead times
Lack of Resources
Supply chain disruptions
Other (explain below)
Not Applicable

		Overall	Space Related?
6 — Record the total number of rated orders (DO or DX) received from 2019-2022 from a USG agency and/or affiliated contractor.	DO		
	DX		

C.

Note: Complete Part C prior to advancing to Parts D-E.

Number of **SBIR or STTR** projects in which your organization participated or currently participates in from **2019-2022** (automatically populates from Part A):

Provide information for your organization's **top three NASA/NOAA-related SBIR or STTR projects by monetary value ($) from 2019-2022**.

For a description of Technology Readiness Level (TRL), visit this link: https://www.nasa.gov/pdf/458490main_TRL_Definitions.pdf

	Project Title	Award/Grant Number	SBIR/STTR Program	Year Program Started	Primary NASA Mission Directorate Supported	Primary Product/Service Supported (generated from Sections 2b-g and 3 responses)	Current Program Phase	Technology Readiness Level (TRL)	Description of Project
1			SBIR		Aeronautics Research Human Exploration and Operations Science Space Technology		Phase I		
2			STTR				Phase II		
3							Phase III		

Aeronautics Research
Human Exploration and Operations
Science
Space Technology

Phase I
Phase II
Phase III

TRL 1
TRL 2
TRL 3
TRL 4
TRL 5
TRL 6
TRL 7
TRL 8
TRL 9
Not Applicable

Provide information for your organization's **top three space related, non-NASA/NOAA SBIR or STTR projects by monetary value ($)** in which your organization participated or currently participates in from **2019-2022**.

For a description of Technology Readiness Level (TRL), visit this link: https://www.nasa.gov/pdf/458490main_TRL_Definitions.pdf

If your organization does/did not participate in any **space related, non-NASA SBIR/STTR** projects, select the "This organization has not participated in space related, non-NASA SBIR/STTR projects" in the adjacent cell and advance to Part D. — This organization has not participated in space-related, non-NASA SBIR/STTR projects

	Project Title	Award/Grant Number	SBIR/STTR Program	Year Program Started	Primary USG Agency Supported	Primary Product/Service Supported (generated from Sections 2b-g and 3 responses) (if applicable)	Current Program Phase	Technology Readiness Level (TRL)	Description of Project
1			SBIR		(Identify Agency)		Phase I		
2			STTR		(Identify Agency)		Phase II		
3					(Identify Agency)		Phase III		

Department of Agriculture
Department of Education
Department of Energy
Department of Health and Human Services
Department of Homeland Security
Department of Transportation
DOD Defense Advanced Research Projects Agency (DARPA)
DOD Defense Health Agency
DOD Defense Logistics Agency (DLA)
DOD Defense Microelectronic Activity
DOD Defense Threat Reduction Agency
DOD Missile Defense Agency (MDA)
Environmental Protection Agency (EPA)
DOD Joint Program Executive Office for Chemical and Biological Defense
National Geospatial-Intelligence Agency (NGA)
National Institute of Standards and Technology (NIST)
National Oceanic and Atmospheric Administration (NOAA)
National Science Foundation
Small Business Administration (SBA)
U.S. Air Force
U.S. Army
U.S. Navy

D.

Indicate if your organization is working towards **commercializing** any innovations resulting from its participation in **NASA/NOAA-related SBIR or STTR programs identified in Part C**. If yes, complete the requested information. The first column will be filled in automatically based on your responses from Part C.
Do not disclose any classified information in this survey form. — My organization is not working towards commercializing any innovations results from NASA-Related SBIR or STTR programs

	Project Title (generated from Part C)	Working Towards Commercializing Innovation?	If no, indicate what happened to the technology supported by the SBIR/STTR award.	If yes, indicate the current state of technology development	Additional USG Funding Source (if applicable)	Primary External Funding Source Type (if applicable)	Primary External Funding Source Name (if applicable)	External Funding Received from Primary Funding Source (in $ Thousands)	Primary Customer/End-User	Explain
1		Yes/No	Company abandoned the technology.		(Identify Agency)					
2			Company sold the technology.		(Identify Agency)					
3			Company modified the technology and created a new product that is currently being		(Identify Agency)					

Company modified the technology and created a new product that is currently being

Feasibility or Proof of Concept continues to be developed
The technology is still being researched and developed since proof-of-concept validation
Company received a Phase II award for the technology
Company received a Phase II/E, CCRP or Sequential award for the technology
Company received a Phase III award from a Federal Agency
Technology is in Product Development
Technology is in Market Development
Technology is in the Manufacturing Stage
Technology is undergoing Clinical Trials (if applicable)
Technology is producing Revenue Generation

Friends & Family
Angels
Venture Capitalists
Stategic Investors
Crowdfunding
Other SBIR/STTR
Federal or non-Federal awards (not from NASA or NOAA and not from the SBIR/STTR programs)
Other State/Local Government awards
Foundation funding awards
Other (Explain)

E.

Indicate if your organization **partnered with other entities for each NASA/NOAA-related SBIR and STTR project provided in Part C** and provide the requested information, including the project title, number of partner entities, type of partnership, primary partner entity name, the primary partner zip/postal code and country, as well as identify the percent of project work completed by/with the partner entity.
Estimates are acceptable if exact figures are unknown for number of partner entities, and percent of project work completed by/with primary partner entity.

If this section does not apply to your organization, select the "This organization does not collaborate with partner/other entities for the listed USG projects" drop-down in the adjacent cell and advance to the Section 9.

	Project Title (generated from Part C)	Number of Partner Entities	Type of Partnership	Explain (if applicable)	Primary Partner Entity Name (NOTE: if STTR, you must identify a Research Institution)	Primary Partner Entity ZIP or Postal Code	Partner Country	Percent of Project Work Completed by/with Primary Partner Entity
1							Country List	
2								
3								

Acquisition
Distribution
Licensing
Manufacturing
Research and Development (R&D)
Resources
Strategic partner
Technical collaboration
Other, please explain

NASA
NOAA
Other USG Agency
Commercial Company
Federally Funded Research and Development Center (FFRDC)
Non-U.S. Government Organization
Not-for-profit Company
Research and Development (R&D) Organization
State/Local Government Agency

Comments:

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Section 9: U.S. Export Control Regulations

A. 1 Indicate whether your organization is subject to U.S. export control regimes (Export Administration Regulations (EAR) or International Traffic in Arms Regulations (ITAR)) for the export of space related products or services. Identify the frequency of regime use (including export control regime applications and/or licenses), the primary Commerce Control List (CCL) or United States Munitions List (USML) category used, and your primary challenge with export control regimes. For additional information on export licensing, including EAR and ITAR, see the following link: https://www.bis.doc.gov/index.php/documents/technology-evaluation/781-export-licensing/file.

If your organization is not subject to any U.S. export control regimes for the export of **space related products or services**, select "Not Applicable. Our space related products and or services are not subject to export controls" in the box to the right and proceed to section 10.

Not Applicable. Our space-related products and or services are not subject to export controls

Export Control Regime	Number of Unique ECCNs Used to Export 2019 - 2022	EAR - Primary Commerce Control List (CCL) Category	Primary Challenge Encountered
EAR			
	Number of Unique USMLs Used to Export 2019 - 2022	ITAR - Primary United States Munitions List (USML) Category	Primary Challenge Encountered
ITAR			

Costs associated with export control compliance
Difficulty finding export control subject matter experts
Outdated regulation
Overly burdensome licensing process
Program delays due to export compliance
Unclear or confusing regulation
Unilateral USG export control
No challenged encountered

A. 2 **Since 2019**, indicate your organization's top five non-U.S. space related customers by revenue and provide the required information. Estimates are acceptable for the percentage of space related annual total sales attributable to each customer. If the HTSUS 10-digit code associated with the exported product is unavailable, provide the HTS 8-digit or HS 6-digit code instead.

	Customer Name	Customer Type	Primary HTSUS 10-Digit Code (if known)	Customer Country	Primary Product/Service (generated from Sections 2b-g and 3 responses)	Average Percent of Annual Total Sales Attributable to Customer Since 2019
2		Commercial Company		Country List		
		Foreign Government				
		Intergovernmental Agency				
		Non-Government Organization (NGO)				
		University				

Category 0 - Nuclear Materials Facilities & Equipment [and Miscellaneous Items]
Category 1 - Materials Chemicals Microorganisms and Toxins
Category 2 - Materials Processing
Category 3 - Electronics Design Development and Production
Category 4 - Computers
Category 5 Part 1 - Telecommunications
Category 5 Part 2 - Information Security
Category 6 - Sensors and Lasers
Category 7 - Navigation and Avionics
Category 8 - Marine
Category 9 - Aerospace and Propulsion
EAR99

B.

Indicate the number of deemed export licenses your organization obtained between **2019-2022**. If none, enter 0.	
For deemed export licenses associated with your organization, indicate the country with the **greatest number of deemed exports** (including those with no license required) between **2019-2022**.	Country List
Have deemed export regulations caused non-U.S. students, faculty members, or employees to avoid research or other work activities within space related fields at your organization?	Yes/No, Unknown, NA
Have U.S. export controls caused your organization to limit the scope of its space related research project(s)?	Yes/No, Unknown, NA

Category I - Firearms and Related Articles
Category II - Guns and Armament
Category III - Ammunition and Ordnance
Category IV - Launch Vehicles, Guided Missiles, Ballistic Missiles, Rockets, Torpedoes, Bombs, and Mines
Category V - Explosives and Energetic Materials, Propellants, Incendiary Agents, and Their Constituents
Category VI - Surface Vessels of War and Special Naval Equipment
Category VII - Ground Vehicles
Category VIII - Aircraft and Related Articles
Category IX - Military Training Equipment and Training
Category X - Personal Protective Equipment
Category XI - Military Electronics
Category XII - Fire Control, Laser, Imaging, and Guidance Equipment
Category XIII - Materials and Miscellaneous Articles

C. Indicate up to five Export Control Classification Numbers (ECCNs) or USML classifications (or subcategories, if exact classification is unknown) that your organization would like to see revised. For each ECCN or USML classification, provide the product most impacted by current export controls, the suggested revision, and an explanation of the revision.
If your organization does not have any desired changes, select "My organization does not have any desired changes" in the box to the right.

My organization does not have any desired changes

	ECCN or USML Classification	Most Impacted Product/Service (generated from Sections 2b-g and 3 responses)	Suggested Revision	Explanation of Revision
1			Reclassify commodity to a new ECCN or USML classification Reclassify commodity to another existing ECCN or USML classification Remove from CCL or USML entirely Revise ECCN or USML classification to reflect new technological developments Revise ECCN's or USML classification's technical definitions or terms to increase clarity Revise ECCN or USML classification to include an exception for a specific commodity	
2				
3				
4				
5				

Comments:

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page Next Page

Section 10: DMSMS & Supply Chain Disruptions

NOTE: Do NOT paste information into this excel document.

Does your organization have an obsolescence/Diminishing Manufacturing Sources and Material Shortages (DMSMS) management program?	Yes, No Not Applicable
How frequently is your organization affected by issues involving obsolescense/out of production parts or components in its sourcing?	
Are there any specific items that are essential to your organization's operations that will soon no longer be available? If no, select "No" and proceed to Part B.	Yes/No

If yes, indicate which items will no longer be available. Include details about the finished product, associated USG program impacted, when the item is expected to become unavailable, and the DMSMS resolution. Explain additional details on how your organization plans to mitigate any issues, if applicable. **Record in $ Thousands, e.g. $12,000.00 = survey input of $12**

A.

	Primary Product/Service Impacted (generated from Sections 2b-g and 3 responses)	Primary Technology Taxonomy Subarea Input Disrupted (ex: TX01.1 - Chemical Propulsion Systems)	Secondary Technology Taxonomy Subarea Input Disrupted (ex: TX01.1.1 - Integrated Systems and Ancillary Technologies)	Critical Product/Service Input Disrupted (generated from Section 3 responses) (if applicable)	Primary USG Program Impacted (generated from Section 6 responses) (if applicable)	Expected Year Unavailable	DMSMS Resolution (if applicable)	Estimated Cost of Resolution (in Thousands $)	Explain
1									
2									
3									
4									
5									

Does your organization have a supply chain risk management (SCRM) program in place?	
From **2019-2022**, did your organization experience any supply chain disruptions (indicate up to five) which impacted your-ability to supply customers on schedule? If no, select "No" and advance to Part C.	

If yes, provide the product/service disrupted, the type of disruption, the length of disruption, the likelihood of recurrence, primary mitigation or resolution taken, primary impact on contractual delivery, and the primary USG program affected. Explain additional disruption details, if appicable

B.

	Product/Service Disrupted (generated from Sections 2b-g and 3 responses)	Type of Disruption	Length of Disruption (in days) (if ongoing, Enter -1)	Likelihood of Recurrence	Primary Mitigation/Resolution	Primary Impact on Contractual Delivery	Primary USG Program Affected (if applicable)	Explain (i.e., where the disruption occurred in your supply chain and the input(s) affected)
1				1 - Very Likely				
2				2 - Possible				
3				3 - Moderately Likely				
4				4 - Unlikely				
5				5 - Impossible				

From **2019-2022**, has your organization experienced any disruptions related to critical minerals, compounds, gases, metals, or other materials? If no, select "No" and advance to Part D.	

If yes, in the table(s) below, indicate any critical minerals, compounds, gases, metals, and other input materials your organization uses directly that have experienced a disruption from **2019-2022** and provide the product or service affected **(Generated from Sections 2b-3)**, the mineral disrupted, supplier information, cause of disruption, and any mitigation or resolution measures.

C.

	Type of Critical Mineral or Input Material Disrupted	Primary Supplier Name	Supplier ZIP or Postal Code	Supplier Country	Disruption Cause (if known)	Disruption(s) Mitigation Measures	Primary Product/Service Using Critical Mineral (generated from Sections 2b-g and 3 responses)	Explain
1a				Country List				
2a								
3a								

Indicate any critical compounds, gases, materials, or metals not found in the above list that have experienced a disruption from **2019-2022** and provide the product or service affected **(Generated from Sections 2b-3)**, the input disrupted, supplier information, cause of disruption, and any mitigation or resolution measures.

	Type of Critical Compound, Gas, Metal, or other input material Disrupted	Primary Supplier Name	Supplier ZIP or Postal Code	Supplier Country	Disruption Cause (if known)	Disruption(s) Mitigation Measures	Primary Product/Service Using Critical Material (generated from Sections 2b-g and 3 responses)	Explain
1b				Country List				
2b								
3b								

Does your organization utilize semiconductor products or components to produce its space related products or provide services? If no, select "No" and advance to the bottom of Part E.	Yes/No

If yes, for each category of semiconductor products or components your organization uses, identify recent/expected disruptions, associated product or service most likely to be impacted by a disruption, and expected changes in technology node (nm = nanometer) usage from **2022 to 2027**. Click on the Semiconductor Product Categories for a description.

D.

	Semiconductor Product Category	Disruption Experienced/Expected		Primary Product/Service Impacted by Disruption/Potential Disruption (generated from Sections 2b-g and 3 responses)	Primary USG Program Impacted by Disruption/Potential Disruption (if applicable)	Anticipated Change in Usage by Technology Node Range, **2022-2027**					
		2019-2022	2023-2027			<=10nm	12-26nm	28-55nm	65-130nm	150-500nm	>500nm
1	Analog Integrated Circuits (ICs)	More than 26 weeks	Very likely			Significant Increase (>50%)					
2	Microcontroller and Microprocessor Ics	8-26 weeks	Moderately likely			Moderate Increase (10-50%)					
3	Logic Ics	Less than 8 weeks	Unlikely			Minimal Change (+/- 10%)					
4	Memory Ics	None				Moderate Decrease (10-50%)					
5	Application-Specific Integrated Circuits (ASICs)					Significant Decrease (>50%)					
6	Discretes										
7	Optoelectronics										
8	Sensors & Actuators										

Explanation of Disruptions/Expectations	Explanation of Anticipated Changes in Technology Node Usage

Is your organization aware of the CHIPS ("Creating Helpful Incentives to Produce Semiconductors for America") Program?	Yes/No	If yes, how do you expect the CHIPS Program will impact your organization?		Explain

Has your location/organization been impacted by the war in Ukraine that began in February 2022? If yes, indicate the primary products or services impacted, degree of impact, an explanation of the impact, and if there is a resolution available.	

E.

	Product/Service Impacted (generated from Sections 2b-g and 3 responses)	Degree of Impact	Explanation of Issue	Primary Input Involved (if applicable)	Primary Program Affected (if applicable)	Explain Proposed/Realized Resolution

Comments:	

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None; Aluminum (bauxite); Antimony; Arsenic; Barite; Beryllium; Bismuth; Cerium; Chromium; Cobalt; Dysprosium; Erbium; Europium;Fluorspar;Gadolinium; Gallium; Germanium; Graphite (natural); Hafnium; Holmium; Helium; Indium; Iridium; Lanthanum; Lithium; Lutetium; Magnesium; Manganese; Neodymium; Nickel; Niobium; Palladium; Platinum; Praseodymium; Rhodium; Rubidium; Ruthenium; Samarium; Scandium; Tantalum; Tellurium; Terbium; Thulium; Tin; Titanium; Tungsten; Vanadium; Ytterbium; Yttrium; Zinc; Zirconium; Unknown

Constant/Ongoing
Multiple Times Per Year
Once or Twice Per Year
Less than Once Per Year
Never

TX01.1 - Chemical Propulsion Systems
TX01.2 - Electric Space Propulsion
TX01.3 - Aero Propulsion
TX01.4 - Advanced Propulsion
TX02.1 - Avionics Component Technologies
TX02.2 - Avionics Systems and Subsystems
TX02.3 - Avionics Tools, Models, and Analysis
TX03.1 - Power Generation and Energy Conversion
TX03.2 - Energy Storage
TX03.3 - Power Management and Distribution
TX04.1 - Sensing and Perception
TX04.2 - Mobility
TX04.3 - Manipulation
TX04.4 - Human-Robot Interaction
TX04.5 - Autonomous Rendezvous and Docking
TX04.6 - Robotics Integration
TX05.1 - Optical Communications
TX05.2 - Radio Frequency
TX05.3 - Internetworking
TX05.4 - Network Provided Position, Navigation, and Timing (PNT)
TX05.5 - Revolutionary Communications Technologies
TX05.6 - Networking and Ground Based Orbital Debris Tracking and Management
TX05.7 - Acoustic Communication
TX06.1 - Environmental Control and Life Support Systems (ECLSS) and Habitation Systems
TX06.2 - Extravehicular Activity Systems
TX06.3 - Human Health and Performance
TX06.4 - Environmental Monitoring, Safety, and Emergency Response TX06.5 - Radiation
TX06.6 - Human Systems Integration
TX07.1 - In-Situ Resource Utilization
TX07.2 - Mission Infrastructure, Sustainability, and Supportability
TX07.3 - Mission Operations and Safety
TX08.1 - Remote Sensing Instruments and Sensors
TX08.2 - Observatories
TX08.3 - In-Situ Instruments and Sensors
TX09.1 - Aeroassist and Atmospheric Entry
TX09.2 - Descent
TX09.3 - Landing
TX09.4 - Vehicle Systems
TX10.1 - Situational and Self- Awareness
TX10.2 - Reasoning and Acting
TX10.3 - Collaboration and Interaction
TX10.4 - Engineering and Integrity
TX11.1 - Software Development, Engineering, and Integrity
TX11.2 - Modeling
TX11.3 - Simulation
TX11.4 - Information Processing
TX11.5 - Mission Architecture, Systems Analysis, and Concept Development
TX11.6 - Ground Computing
TX12.1 - Materials
TX12.2 - Structures
TX12.3 - Mechanical Systems
TX12.4 - Manufacturing
TX12.5 - Structural Dynamics
TX13.1 - Infrastructure Optimization
TX13.2 - Test and Qualification
TX13.3 - Assembly, Integration, and Launch
TX13.4 - Mission Success Technologies
TX14.1 - Cryogenic Systems
TX14.2 - Thermal Control Components and Systems
TX14.3 - Thermal Protection Components and Systems
TX15.1 - Aerosciences
TX15.2 - Flight Mechanics
TX16.1 - Safe All Vehicle Access
TX16.2 - Weather/Environment
TX16.3 - Traffic Management Concepts
TX16.4 - Architectures and Infrastructure
TX16.5 - Range Tracking, Surveillance, and Flight Safety Technologies TX16.6 - Integrated Modeling, Simulation, and Testing
TX17.1 - In-Situ Resource Utilization
TX17.2 - Navigation Technologies
TX17.3 - Control Technologies
TX17.4 - Altitude Estimation Technologies
TX17.5 - GN&C Systems Engineering Technologies

Changes to Laws/Policies
Cyber Incident
Delivery Delays/Excessive Lead Time
Foreign Competition
Geopolitical Instability
Global Climate Change
Increased Cost
Lack of Supply Chain Transparency
Limited Market Demand
Limited or No Investment
Incentives/Resources
Limited or Sole Source
Logistics and/or Transportation Loss of (or Diminished) Resources and/or Materials Needed
Loss of (or Diminished) Specialized Equipment
Loss of (or Diminished) Specialized Technology Infrastructure
Loss of (or Diminished) Specialized Workforce
Loss of Critical Suppliers
Material/Product Shortages
Natural Disasters
Pandemic
Product Quality/Traceability (e.g., counterfeit parts)
Other (explain)

Additive Manufacturing (A.M.)/3D printing
Adiabatic Demagnetization Refrigerators (ADR)
Aerospace-grade Rayon (for use in reentry thermal protection systems)
Air Force Elastomeric Material (AF-E)
Ammonia Scrubber
Ammonia Scrubber Sorbent
Ammonium Perchlorate
Atomic Clocks
Avcoat
Bearings for Extreme Environments
Bellows Tanks
Carbon Fiber (Aerospace Grade)
Carbon FiberForm and Phenolic Impregnated Carbon Ablator (PICA)
Ceramic Tiles & Coating
Charge Coupled Devices (CCD)
Conductivity Sensor
Cool Gas Generators
Cryocoolers
Cryogenic High Accuracy Refraction Measurement System (CHARMS)
Electron Beam Direct Write IC Equipment
Far-Ultraviolet Coating Capabilities
Fuel Valves Gas Valves and Regulators
Heatshield for Extreme Entry Environment Technology (HEEET)
Helium High performance, sole source MIL-parts (logic ICs, memory ICs, ADCs, etc.)
High Power Laser Diodes
High Purity Hydrazine
High-power, high-specific-impulse Electric Propulsion Power Processing Unit (PPU)
High-power, High-specific-impulse Electric Propulsion Thruster
Honeycomb Radiators
Hot Structures (CVI C/SiC)
Infrared Detectors
In-Space Propulsion Systems
Liquid Hydrogen (LH2)
Liquid Rocket Engines
Loop Heat Pipes
Louvers
Low to Moderate Power Electric Propulsion
Mechanical Thermostats
Monomethyl Hydrazine (MMH)
Nitrogen Tetroxide (Rocket Fuel N2O4)
Oxygen (O2) High Pressure Regulator
Oven-Controlled Crystal Oscillators and Resonators (OCXO)
Packed Multifiltration Beds
Parachute Reefing Line Cutters
Phase Separators
Photovoltaics
Precision Gyroscopes
Pressure Sensors
Propellant Thrusters
Quick Disconnects
Rad-Hard DC-DC Converters High Efficiency Power Supplies (DC-DC)
Rad-hard processing elements (memory, processors, System on Chip)
Rad-hard transistor and power transistors (BJT, MOSFET, HEMT, Si, SiC, GaN, etc.)
Radiation Hardened Trusted Electronics
Radiation Testing of Integrated Avionics Subsystems and Systems
Radioisotope Thermoelectric Generators (RTG)
Reaction Wheel Assemblies
Rotary Encoders
Sensor Chip Assembly
Space-qualified Extended Wavelength Advanced Photodetectors (APD)
Space-qualified Infrared (IR) Detectors - Mercury Cadmium Telluride (HgCdTe)
Space-qualified Infrared (IR) Detectors - Type II Superlattice (T2SL)
Space-qualified Infrared (IR) Detectors - Thermopile
Star Trackers
Super Lightweight Ablator (SLA)
Tantalum Chip and Wet Tantalum Capacitors
Traveling Wave Tubes
Urine Processing Assembly Pump Motor
Additional testing/analysis and validation
Augmented training of specialized workforce
Corrective/Preventative Action Board
Deploying new resource planning techniques
Enhanced Cybersecurity Controls
Failure Review Board
Flow-down of contractual requirements
Geographical Supply Chain Diversification
Higher Inventory of Material/Product Needed
Partnering with Sole Source Suppliers
Partnering with suppliers to create new capabilities
Searching for viable alternate supplier sources
Specialized Equipment Investment
Specialized Technology Infrastructure Investment
Vertical Integration (e.g., moving production processes in-house)
Ongoing (No Resolution)
Other (explain)

Change in Product of Design/Forced to Redesign of Product
Decreased Engineering Reliability
Decreased Environmental Compatibility
Inability to fully meet customers' contractual requirements (explain)
Inability to source needed product/materials
Increased Cost
Mission Life or Success (explain)
Safety (explain)
Schedule (required longer time to deliver product/service)
Use of alternative materials
Other (explain)

Direct benefit
Indirect benefit
No Impact Direct negative
impact Indirect negative
impact

Section 11: Quality Assurance and Engineering Standards

Identify the technical standards that your organization currently complies with to operate and/or provide products and services. The standards are separated by issuing authority, and the main heading has an embedded link to direct you to a webpage with each standard's description. Only affirmative "Yes" responses are required. If your organization does not comply with any of these standards, select "My organization does not comply with any of these standards." in the cell to the right.

My organization does not comply with any of these standards

Use the following links to advance directly to certain categories of standards: NASA Standards | International Organization for Standardization (ISO) Standards | U.S. Defense Standards | American Institute of Aeronautics and Astronautics Standards | American Society for Testing and Materials Standards | Society for Automotive Standards | Other Miscellaneous Standards

		Technical Standard	Currently compliant with standard?	Currently hold independent certificate of compliance?	Comments		Technical Standard	Currently compliant with standard?	Currently hold independent certificate of compliance?	Comments
A.		**NASA Standards**								
	1	NASA-STD-8739.1, Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies	Yes	Yes		3	NASA-STD-8739.5, Fiber Optics Terminations, Cable Assemblies, and Installation			
	2	NASA-STD-8739.4, Crimping, Interconnecting Cables, Harnesses, and Wiring				4	NASA-STD-8739.6, Implementation Requirements for NASA Workmanship Standards			
B.		**International Organization for Standardization (ISO) Standards**								
	1	ISO 12931: Performance criteria for authentication solutions used to combat counterfeiting of material goods				6	ISO 14644-5: Cleanrooms and associated controlled environments — Part 5: Operations			
	2	ISO 14644-1: Cleanrooms and associated controlled environments — Part 1: Classification of air cleanliness by particle concentration				7	ISO 28000: Specification for security management systems for the supply chain			
	3	ISO 14644-2: Cleanrooms and associated controlled environments — Part 2: Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration				8	ISO 9001: Fifth Edition, Quality Management Systems - Requirements			
	4	ISO 14644-3: Cleanrooms and associated controlled environments — Part 3: Test methods				9	ISO/IEC 17025:2017: General requirements for the competence of testing and calibration laboratories			
	5	ISO 14644-4: Cleanrooms and associated controlled environments — Part 4: Design, construction and start-up								
C.		**U.S. Defense Standards**								
	1	MIL-STD-1472 DoD Design Criteria Standard - Human Engineering				6	MIL-STD-464 Electromagnetic Environmental Effects, Requirements for Systems			
	2	MIL-STD-1542 Electromagnetic Compatibility and Grounding Requirements for Space System Facilities				7	MIL-STD-704 Aircraft Electric Power Characteristics			
	3	MIL-STD-1553 Digital Time Division Command/Response Multiplex Data Bus				8	MIL-STD-810 Environmental Engineering Considerations and Laboratory Tests			
	4	MIL-STD-1576 Electro explosive Subsystem Safety Requirements and Test Methods for Space Systems				9	MIL-STD-981 Design, Manufacturing and Quality Standards for Custom Electromagnetic Devices for Space Applications			
	5	MIL-STD-461 Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment								
D.		**American Institute of Aeronautics and Astronautics Standards**								
	1	AIAA S-080 Space Systems - Metallic Pressure Vessels, Pressurized Structures, and Pressure Components				6	AIAA S-113 Criteria for Explosive Systems and Devices Used on Space and Launch Vehicles			
	2	AIAA S-081 Space Systems - Composite Overwrapped Pressure Vessels (COPVs)				7	AIAA S-114 Moving Mechanical Assemblies for Space and Launch Vehicles			
	3	AIAA S-110 Space Systems - Structures, Structural Components, and Structural Assemblies				8	AIAA S-119 Flight Dynamics Model Exchange Standard			
	4	AIAA S-111 Qualification and Quality Requirements for Space Solar Cells				9	AIAA S-120A Mass Properties Control for Space Systems			
	5	AIAA S-112 Qualification and Quality Requirements for Space Solar Panels				10	AIAA S-122 Electrical Power Systems for Unmanned Spacecraft			
E.		**American Society for Testing and Materials Standards**								
	1	ASTM E1025 Standard Practice for Design, Manufacture, and Material Grouping Classification of Hole-Type Image Quality Indicators (IQI) Used for Radiology				7	ASTM E1817 Standard Practice for Controlling Quality of Radiological Examination by Using Representative Quality Indicators (RQIs)			
	2	ASTM E1316 Standard Terminology for Nondestructive Examinations				8	ASTM E2033 Standard Practice for Radiographic Examination Using Computed Radiography (Photostimulable Luminescence Method)			
	3	ASTM E1417/E1417M Standard Practice for Liquid Penetrant Testing				9	ASTM E2375 Standard Practice for Ultrasonic Examination of Wrought Products			
	4	ASTM E1444/E1444M Standard Practice for Magnetic Particle Testing				10	ASTM E2445/E2445M Standard Practice for Performance Evaluation and Long-Term Stability of Computer Radiography Systems			
	5	ASTM E164 Standard Practice for Contact Ultrasonic Testing of Weldments				11	ASTM E2698 Standard Practice for Radiological Examination Using Digital Detector Arrays			
	6	ASTM E1742 Standard Practice for Radiographic Examination				12	ASTM E2737 Standard Practice for Digital Detector Array Performance Evaluation and Long-Term Stability			
F.		**Society for Automotive Standards**								
	1	SAE AMS2647, Fluorescent Penetrant Inspection Aircraft and Engine Component Maintenance				6	SAE AS9100D, Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations			
	2	SAE AS4787, Eddy Current Inspection of Circular Holes in Nonferrous Metallic Aircraft Engine Hardware				7	SAE EIA-649-2, Configuration Management Requirements for NASA Enterprises			
	3	SAE AS5553C, Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition				8	SAE EIA-649C, Configuration Management Requirements			
	4	SAE AS6174A, Counterfeit Materiel, Assuring Acquisition of Authentic and Conforming Materiel				9	SAE GEIA-STD-0005-1A, Performance Standard for Aerospace and High Performance Electronic Systems Containing Lead-free Solder			
	5	SAE AS9003A, Inspection and Test Quality Systems, Requirements for Aviation, Space, and Defense Organizations				10	SAE GEIA-STD-0005-2A, Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High Performance Electronic Systems			
G.		**Other Miscellaneous Standards**								
	1	AIA/NAS NAS410 Certification and Qualification of Nondestructive Test Personnel				7	AWS QC1 Standard for AWS Certification of Welding Inspectors			
	2	ANSI/ESD S20.20-2014, ESD Association Standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment (Excluding Electrically Initiated Explosive Devices)				8	FAA HF-STD-001 Human Factors Design Standard			
	3	AS5553 Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition				9	IPC J-STD-001GS, Joint Industry Standard, Space Applications Electronic Hardware Addendum to IPC J-STD-001G Requirements for Soldered Electrical and Electronic Assemblies (Chapter 10 of IPC J-STD-001GS does not apply to NASA)			
	4	AS6081 Counterfeit Electronic Parts (applies to distributors so if that is not included in our target remove)				10	Other Quality Assurance or Engineering Standard (name in "Comments" box)			
	5	AS9110C, Quality Maintenance Systems - Aerospace - Requirements for Maintenance Organizations								

Comments:

Section 12: Challenges & COVID-19 Impacts

A.

Identify the issues that have impacted your organization from **2019 to present day**. **Only affirmative responses are required**. Then, rank your organization's top five issues (1 - being the most important issue; 2 - being the next most important issue, etc.) and explain the issues with examples and narratives that will aid the U.S. Government's understanding of your concerns.

Issue	Affirmative "Yes"	Rank Top 5	Explanation of Issue
Aging equipment, facilities, or infrastructure	Yes		
Aging workforce			
Counterfeit parts			
Cybersecurity			
Domestic competition			
Environmental regulations/remediation			
Export controls - EAR			
Export controls - ITAR			
Financial Solvency			
Financing/credit availability			
Foreign competition			
Government acquisition process			
Government purchasing volatility			
Government regulatory burden			
Health and safety/OSHA compliance			
Healthcare costs			
Industrial espionage - domestic			
Industrial espionage - foreign			
International Conflict(s)			
Input availability			
Intellectual property/patent infringement			
Labor availability			
Labor costs			
Natural disasters (including disease/quarantine)			
Obsolescence			
Pension costs			
Proximity to customers			
Proximity to suppliers			
Qualifications/certifications			
Quality of inputs			
R&D costs			
Reduction in USG demand			
Taxes			
Trade disputes/tariffs			
Worker/skills retention			
Other (specify here)			

B.

Identify any impacts experienced and actions taken at your organization because of the COVID-19 pandemic. **Only affirmative responses are required**. Then, rank your organization's top three most significant impacts experienced and actions taken (1 - being the most significant impact/action; 2 - being the next most significant impact/action, etc.). Also, indicate whether the actions taken were short-term or long-term solutions.

Impacts Experienced	Affirmative "Yes"	Rank Top 3	Actions Taken	Short Term/ Long Term	Rank Top 3
Customer business closures	Yes		Business digitization	Short Term	
Domestic supplier manufacturing delays			Conduct regular COVID-19 testing of employees	Long Term	
Financing difficulties			Establish vaccine mandates for employees	Both	
Foreign supplier manufacturing delays			Identify new market(s)/product growth opportunities	No	
Inability to access work organization			Improve demand forecasting		
Inability to fulfill contracts			Improve supply chain visibility		
Increased cost of materials			Increase inventories		
Increased demand			Increase online/remote work capabilities		
Labor shortages			Increase supplier redundancy		
Reduced productivity			Increase use of domestic suppliers		
Reduced sales			Increase use of foreign suppliers		
Supplier business closures			Increase use of PPE		
Transportation-based disruptions			Reduce workforce		
Other (specify here)			Seek government assistance		
			Shift to vendor managed inventories		
			Other (specify here)		

Explain any USG actions that could mitigate further COVID-19 impacts to your organization or write "none."	

Indicate if your organization applied for and/or received financial assistance from the listed USG COVID-19 assistance/relief programs. Provide the dollar amount awarded for each year, if applicable.

USG COVID-19 Program	Applied for/Received Assistance?	Assistance Amount Received, 2020 (in Thousands $)	Assistance Amount Received, 2021 (in Thousands $)
COVID-19 Economic Impact Disaster Loan (EIDL)	Yes, applied for but did not receive funding		
Paid Leave Reimbursement	Yes, applied for and did receive funding		
Paycheck Protection Program (PPP) Loan	No, did not apply for or receive funding		
Small Business Administration (SBA) COVID-19 Debt Relief			
Other USG COVID-19 relief program (specify here)			

C.

There are many federal and state government programs and services available to assist your organization to better compete in the global marketplace. If your organization would like information regarding these government programs, select the specific areas of interest below. The U.S. Department of Commerce will follow-up with your organization regarding your selections.
Only affirmative responses are required.

Business Continuity Planning		Yes	Product Development		
Cybersecurity			R&D/Innovation programs		
Emerging Technology			Nearshoring/Reshoring/Friend-shoring/Creating Domestic Supply Chains		
Export Controls/Licensing (EAR/ITAR)			Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs		
Government Acquisition and Procurement / Regulatory Modification			Supply Chain Improvements and Resilience		
Tech Transfer			ESG		
Patents and Trademarks			Workforce/Technical Labor Resources		
Other	(specify here)		Other	(specify here)	

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Next Page

Section 13: Employment & STEM Workforce

A. Record the total number of full time equivalent (FTE) employees and contractors employed by your organization from 2019-2022. The year 2022 should be populated with the organization's most recent employment numbers.
NOTE: these yearly numbers should include employees and contractors who work off-site but still report to this organization. Next, estimate the percentage (1-100%) of total workforce that currently works on space related products/services. NOTE: If your organization is 100% space related, then enter 100%.

	2019	2020	2021	2022
FTE U.S. Employees				
FTE Contractors				
Total Non-U.S. Citizen Workers (Employees and or Contractors)				

Estimate the percentage of your total FTE workforce that currently work on space related (i.e. any activity which affects space sector business) products/services:

B. Indicate whether your organization has difficulty hiring and/or retaining any part of its workforce and the associated degree of difficulty. Next, enter the current number of unfilled vacancies overall by occupation type (estimates are allowed). Specify the job title most impacted by the identified workforce issue (if applicable). Lastly, indicate the top workforce issue area and/or future workforce issue area for each occupation type.

Occupation	Difficulty	Degree of Difficulty	# of Unfilled Vacancies	Job Title Most Impacted	Top Workforce Issue Area
Total (All Occupations)	Hiring	Low			
Engineers, Scientists, R&D	Retaining	Medium			
Information Technology and Cybersecurity	Both	High			
Production Line Operations	Neither				
Testing and Quality Control					
Other (specify here)					
Other (specify here)					

Top Workforce Issue Area options: Attracting workers to location; Employee turnover; Finding experienced workers; Finding qualified workers; Finding workers able to get security clearances; Significant portion of workforce retiring; Unions/Collective bargaining; Workers unable/not allowed to access location

C.

	STEM-related and Other Workforce Questions	Yes/No	Explain (required)
1	Does your organization experience difficulty hiring and/or retaining STEM-related employees? Explain your answer.		Yes, hiring; Yes, retaining; Yes, both hiring and retaining; No
2	Does your organization actively engage in efforts to interest K-12 students in the STEM field? If yes, how? If no, explain why.	Yes/No	
3	Does your organization sponsor STEM-related training for your employees? Explain your answer.	Yes/No	
4	Has your organization benefited from any USG STEM-related programs and/or initiatives? If yes, provide the program name. If no, explain why.	Yes/No	
5	Can the USG adapt its STEM-related programs and/or initiatives to better serve your organization? Explain your answer.	Yes/No	
6	Has your organization benefitted from having a diversity, equity, inclusion, and accessibility (DEIA) program? Explain your answer.	Yes/No/ Not Applicable	

D. If your organization currently employs Non-U.S. Citizen Workers (employees and or contractors), Select the country of origin from the list.and provide the following: **total** non-U.S. citizen workers, the **space related** non-U.S. citizen workers, the **space related** primary occupation associated with the non-U.S. citizen workers , the primary USG program supported by non-U.S. workers, and the associated primary product/service with the listed non-U.S. citizen workers. If your organization has more than 10 countries to list, list the top 10 in order of total volume. If the country is not listed, omit your response for that specific country and proceed to the next country (if applicable).

	Country	**Total** Non-U.S. Citizen Workers	**Space Related** Non-U.S. Citizen Workers	**Space Related** Primary Occupation	Primary USG Program (if applicable)	Associated Primary Product/Service (generated from Sections 2b-g and 3 responses) (if applicable)
1	Country List			Engineer, Scientist, R&D; Production Line Operations; Testing and Quality Control; Information Technology/Computing		
2						
3						
4						
5						
6						
7						
8						
9						
10						

Comments:

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Section 14: Cyber Stature

A.

1	Indicate which of the following security measures are in place at your organization. Only affirmative "Yes" responses required. If your organization does not have any of these measures in place, select "My organization does not have any of these measures in place." in the cell to the right.					
	Account Monitoring and Control	Yes	Inventory of Authorized/Unauthorized Software			
	Application Software Security		Limitation/Control of Network Ports and Services			
	Boundary Defense		Maintenance, Monitoring, & Analysis of Audit Logs			
	Code Review of External Products		Malware Defenses			
	Continuous Vulnerability Assessment		Penetration Tests and Red Team Exercises			
	Continuous Vulnerability Management		Personnel Security			
	Controlled Access Based on Need to Know		Remote Access			
	Controlled Use of Administrative Privileges		Secure Configurations of Network Devices			
	Data Encryption - In Storage (at rest)		Secure Configurations on Hardware			
	Data Encryption - In Transit (transmitted internally or externally)		Secure Network Engineering			
	Data Recovery Capability		Security Skills Assessments and Training			
	Incident Response and Management		Wireless Access Control			
	Inventory of Authorized/Unauthorized Devices		Other	(specify here)		
2	Estimate the percentage of your organization's annual operating costs allocated to Information Technology (IT)					
	Estimate the percentage of your organization's annual IT budget spent on cybersecurity					

B.

Does your cyber incident response protocols include notifying customers in the event of a breach?			Yes, all customers Yes, only impacted customers No
Does your organization evaluate the cyber security practices of vendors before making a decision to buy from or subcontract to them?	Yes/No/NA	Does your organization enforce requirements on the cyber security practices of vendors after buying from or subcontracting to them?	Yes/No/NA
If an event occurred that resulted in the loss of access to a significant portion/all of your organization's data, how long do you estimate it would take to restore full functionality from system backups?			Immediate 1 to 7 Days 8 to 30 Days Over 30 Days No Backup Exists
Does your organization restrict or prohibit external data/cloud storage provider(s) from storing commercially sensitive information outside of the U.S.?			Restrict Prohibit No

C.

Identify any malicious cyber activities that your location experienced between 2019-2022 that jeopardized the confidentiality, integrity, or availability of an information system or that constituted a violation or imminent threat of violation of security policies, security procedures, or acceptable use policies. Then, provide the required details on each method of compromise: the typical length of compromise, typical impact, typical response, typical reporting response, the primary product/service impacted/implicated (if applicable), and the primary USG program impacted/implicated (if applicable).
If your organization did not experience any malicious cyber activities,select "My organization did not experience any malicious cyber activities." in the cell to the right.

My organization did not experience any malicious cyber activities

Methods of Compromise	Typical Length of Compromise	Typical Impact	Typical Response	Typical Reporting Response	Primary Product/Service Impacted/Implicated (generated from Sections 2b-g and 3 responses) (if applicable)	Primary USG Program Impacted/Implicated (if applicable)
Code/SQL Injection	1-7 days	Costs from response/recovery	Changed software/hardware vendors	External		
Denial of Service (DoS/DDoS)	2-4 weeks	Damage to company capabilities	Enhanced user training	Internal		
Brute Force	2-6 months	Damage to IT infrastructure	Exit from foreign markets or market segments	Law Enforcement/Government		
Malware	7-12 months	Exfiltration of sensitive data	Exit from product or business line	External & Internal		
Man in the Middle (MitM)	Over 1 year	Network downtime	Legal action against responsible party	Internal & Law Enforcement/Government		
Phishing	N/A	Loss of sales/business interruption	Major new investment in cybersecurity	External, Internal, and Law Enforcement/Government		
Ransomware		Reputational damage	Significant change in R&D strategy	Do Not Report		
Supply Chain Attack		Theft of software and/or source code	Incident has not been resolved and remains ongoing			
Zero-day Exploit						
Other (specify here)						

D.

Indicate if your organization has adopted, partially adopted, or plans to adopt the list of cybersecurity-related standards. Select the hyperlinked text to view additional information regarding each standard.

U.S. Government Best Practices		Adoption	Explain
NIST Cybersecurity Framework		Adopted	
NIST Risk Management Framework		Partially Adopted	
NIST SP 800-53, Revision 5: Security and Privacy Controls for Information Systems and Organizations		Plan to Adopt	
NIST SP 800-218, Version 1.1: Recommendations for Mitigating the Risk of Software Vulnerabilities		Do Not Plan to Adopt	
Other Cybersecurity Standard	(specify here)	Not Applicable	

Comments:

The U.S. Government encourages the reporting of suspected or confirmed cybersecurity incidents to the Federal Bureau of Investigation (FBI) or the Cyber Security and Infrastructure Security Agency (CISA). Local FBI field offices can be identified at https://www.fbi.gov/contact-us/field-offices; the FBI's 24/7 Cyber Watch (CyWatch) can be contacted by phone at 855-292-3937, or by email at CyWatch@fbi.gov; and cybersecurity incidents and vulnerabilities can be reported to CISA at https://www.us-cert.gov/report. No-cost technical assistance can be requested from CISA, using the same website address.

Section 15: Financial Information

Report line items from your organization's financial statements for 2019-2022.
NOTE: space related activities refer to any activity which affects space sector business.
SBIR/STTR conracts are considered "external" funding. PPP loans are considered income.

NOTE:

Business Unit/Division
Corporate/Whole Organization

Estimates are acceptable.

Source of Financial Line Items:	
Reporting Schedule:	Calendar Year

	Income Statement (Select Line Items)	Record in $ Thousands, e.g. $12,000.00 = survey input of $12			
		2019	2020	2021	2022
A.	Net Sales (and other revenue)				
1	Space Related Sales Percentage (as a % of A.)				
2	U.S. Government Sales Percentage (as a % of A.)				
B.	Cost of Sales (Cost of Goods Sold)				
C.	Operating Income				
D.	Earnings Before Interest & Taxes (EBIT)				
E.	Net Income				

	Balance Sheet (Select Line Items)	Record in $ Thousands, e.g. $12,000.00 = survey input of $12			
		2019	2020	2021	2022
A.	Accounts Receivable				
B.	Cash and Cash Equivalents				
C.	Inventories				
D.	Marketable Securities (Current or short-term securities)				
E.	Current Assets				
F.	Current Liabilities				
G.	Total Assets				
H.	Total Liabilities				

	Other Select Items	Record in $ Thousands, e.g. $12,000.00 = survey input of $12			
		2019	2020	2021	2022
A.	**Total** Research and Development (R&D) Expenditure				
1	*Internally-funded R&D Percentage (as a % of total R&D Expenditure)*				
2	*Externally-funded R&D Percentage (as a % of total R&D Expenditure)*				

Data Confirmation
Listed 2022 Revenue
None

On a scale of 1 to 10, estimate your organization's overall financial health (1 being imminent failure and 10 being highly profitable for the foreseeable future). If your score is below 7, please explain in the comment box.	

Use Comments box to qualify with narrative any anomalies, transactions, or non-recurring events reflected in your financial statement line items, e.g. reporting restatement, merger and acquisition or other major corporate activity, Chapter 11, SEC investigation, etc.

Comments:	

BUSINESS CONFIDENTIAL - Per Section 705(d) of the Defense Production Act

Previous Page

Section 16: Certification	
The undersigned certifies that the information herein supplied in response to this questionnaire is complete and correct to the best of his/her knowledge. It is a criminal offense to willfully make a false statement or representation to any department or agency of the United States Government as to any matter within its jurisdiction (18 U.S.C. § 1001). Once this survey is complete, save it to your computer and then submit the document via the Census Bureau portal linked here:	
https://respond.census.gov/csib	
Organization Name	
Name of Authorizing Official	
Title of Authorizing Official	
E-mail Address	
Phone Number and Extension	
Date Certified (update with each survey submission)	
In the box below, provide any additional comments or any other information you wish to include regarding this survey assessment.	
How many hours did it take to complete this survey? **(update with each survey submission)**	

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