National Aeronautics and
Space Administration

NASA SBIR/STTR PARTICIPATION GUIDE

Small Business Innovation Research
Small Business Technology Transfer

sbir.nasa.gov

LONG ENDURANCE AIRCRAFT SET WORLD RECORD

Challenge: NASA is at the forefront of exploring remote territories on Earth – including the Arctic and Antarctica. Eager to expand understanding of both regions, NASA sought a unique aircraft solution that could fly long distances without refueling to some of the coldest places on Earth.

Mission Directorate:
Science

Small Company:
Vanilla Aircraft
Falls Church, VA

Snapshot:
A record-breaking aircraft was designed to travel far distances to collect data in very cold climates by innovating existing technologies through a joint effort funded by NASA and DoD.

Solution: A long endurance Unmanned Aircraft System (UAS) was designed by Vanilla Aircraft to cover thousands of square miles of treacherous terrain in a single flight on one tank of fuel through temperatures below –40 °F. The newly-designed UAS is specifically outfitted with instruments to collect critical information for research missions. Due to its capability for longer missions, fewer missions are needed, translating into reduced operating and personnel costs.

A non-stop, record-breaking unrefueled 56-hour test flight proved the aircraft could meet both NASA's need to explore remote locations with extreme cold climates as well as the Department of Defense's desire to add capabilities to support ground forces in critical missions.

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Introduction

This guide provides an overview of the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) program as implemented by the National Aeronautics and Space Administration (NASA).

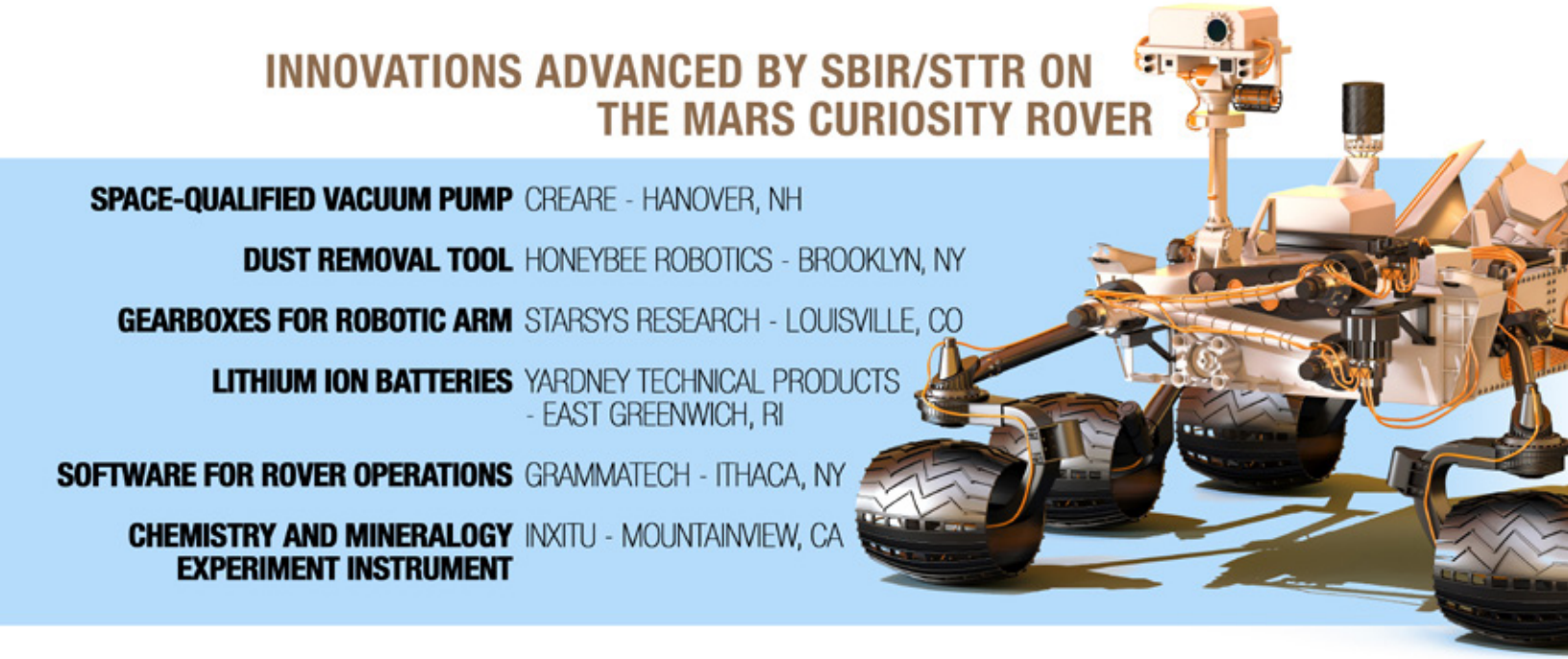
The NASA SBIR/STTR program provides opportunities for Small Business Concerns (SBCs) and Research Institutions (RIs) to participate in Government-sponsored research and development (R&D). This guide describes NASA's operation of this program, including key information on participation, points of contact, and resources for learning more about the NASA SBIR/STTR program.

Participation

If you wish to participate, NASA issues annual Solicitations for the SBIR and STTR programs via the NASA SBIR/STTR website:

sbir.nasa.gov

The Solicitation is open for proposals for approximately two months and those selected for contract negotiation are announced three months after its closing. The Solicitations provide detailed information needed to submit proposals.



SBIR/STTR Program Overview

The NASA SBIR/STTR program funds the research, development, and demonstration of innovative technologies that fulfill NASA needs as described in the annual Solicitations and have significant potential for successful commercialization. Commercialization encompasses the transition of technology into products and services for NASA mission programs, other Government agencies, and non-Government markets. Technological innovation, the overall focus of the NASA SBIR/STTR program, is vital to the performance of the NASA mission and to the Nation's prosperity and security.

Legislation

The SBIR program was established pursuant to the Small Business Innovation Development Act of 1982 (P.L. 97-219) with the purpose of strengthening the role of innovative small business concerns in Federally-funded research and development. Congress created the STTR program through the Small Business Innovation Development Act of 1992 (P.L. 102-564) to increase collaboration between SBCs and non-profit RIs. Congress has modified and extended these programs numerous times since their inception. The SBIR and STTR statute is codified at 15 U.S.C. §638.

Fund Allocation

Federal agencies with extramural R&D budgets exceeding $100 million are required to administer an SBIR program. Agencies with extramural R&D budgets exceeding $1 billion are also required to administer an STTR program. Each agency administers its own program within directives issued by the Small Business Administration (SBA). Currently, the funding for SBIR is 3.2 percent and 0.45 percent, for STTR, which is out of each participating agency's extramural R&D budget. NASA's annual funding for its SBIR/STTR program is approximately $190-210 million per year.

Program Purpose

The statutory purposes of the SBIR/STTR program is to:

- Stimulate technological innovation in the private sector;
- Strengthen the role of SBCs in meeting Federal research and development needs;
- Increase the commercial application of these research results and,
- Encourage participation of socially and economically disadvantaged persons and women-owned small businesses.

Benefits of Participating

The SBIR/STTR program provides opportunities for SBCs and partnering RIs to work with NASA to advance proposed innovations and transition resulting technologies, products and services into NASA mission programs and other markets. Other benefits of an SBIR/STTR contract with NASA include:

- "Equity-free" funding to explore, develop and demonstrate the feasibility of proposed innovations;
- Non-disclosure of proprietary data provided under the contract for a period of 20 years;
- Data and intellectual property rights necessary for commercialization, including ownership of data, copyrights, and inventions resulting from the performance of the contract; and
- Fulfillment of the Federal procurement competition requirements, enabling the award of follow-on, Phase III contracts by NASA, other Federal agencies, and prime contractors to the Government without further competition.

Participants in the NASA SBIR/STTR program report other benefits as well:

- Gaining additional credibility in the search for capital, equipment, or services;

- Obtaining exposure, experience, and contacts within NASA that can lead to other contracts or subcontracts; and
- Receiving the debriefing comments from detailed technical evaluations, which helps the SBC understand the strengths and weaknesses of their proposal.

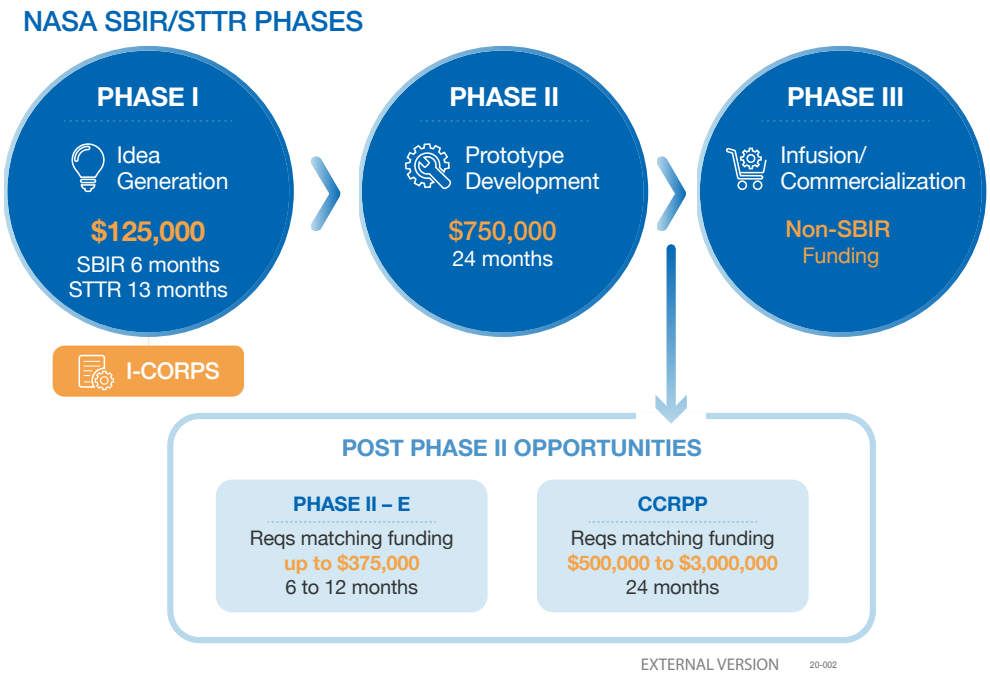
Eligibility

The recipient of an SBIR or STTR funding award, in accordance with SBA directives, must qualify as a Small Business Concern, which is defined as:

- Legally established and organized for profit with the place of business located in the U.S.;
- Operated primarily in the U.S. or makes a significant contribution to the U.S. economy;
- Majority owned and controlled by U.S. citizens or permanent resident aliens and,
- 500 employees or less including any affiliates.

For the SBIR program, the Principal Investigator (PI) must be primarily employed by the SBC (equivalent to more than 50% of the PI's work time), and precluding full-time employment with another organization. The STTR program permits employment of the PI by either the SBC or the RI.

NASA's annual funding for SBIR and STTR is approximately $190-210 million per year.



Program Structure

The structure of the NASA SBIR/STTR program reflects the Congressional understanding that the innovation process and bringing new products and services to the market takes time and has a high degree of technical and business risk. The program has three phases:

Phase I is the opportunity to establish the scientific, technical and commercial merit and feasibility of the proposed innovation in fulfillment of NASA needs. All Phase I contracts are selected competitively and require reporting on the work and results accomplished, including the strategy for the development and transition of the proposed innovation. NASA SBIR Phase I contracts last up to 6 months and STTR Phase I contracts last up to 13 months, both with maximum funding of $125,000.

I-Corps: The NASA SBIR/STTR program partners with the National Science Foundation (NSF) to offer selected teams the opportunity to participate in the NSF Innovation Corps program (I-Corps™) during Phase I. I-Corps educates teams on how to translate technologies from the lab into the marketplace.

Phase II is focused on the development, demonstration and delivery of the proposed innovation. The most promising Phase I projects are awarded Phase II contracts through a competitive selection based on scientific and technical merit, expected value to NASA, and commercial potential. All Phase II contracts require reporting on the work and results accomplished, and whenever possible, the delivery of a prototype unit or software package, or a more complete product or service, for NASA testing and utilization.

The duration of both SBIR and STTR Phase II contracts is usually a period of 24 months with maximum funding of $750,000.

Technical and Business Assistance (TABA): The John S. McCain National Defense Authorization Act for Fiscal Year 2019 permits SBIR Phase I and II awardees to enter into agreements with one or more vendors to provide TABA. TABA allows an additional supplement to the award ($6,500 for Phase I awards and $50,000 for Phase II awards) and is aimed at improving the commercialization success of SBIR awardees. TABA may be obtained from entities such as public or private organizations; including an entity established or funded by a State that facilitates or accelerates the commercialization of technologies or assists in the creation and growth of private enterprises that are commercializing technology. TABA may include access to a network of scientists and engineers engaged in a wide range of technologies or access to technical and business literature available through on-line databases. This also includes product sales, IP protections, market research, market validation, development of regulatory plans and manufacturing plans.

Post-Phase II Initiatives and Opportunities: The NASA SBIR/STTR program currently has in place several initiatives for supporting its small business partners past the basic Phase I and Phase II elements of the program that emphasize opportunities for commercialization. For example, the program offers:

- Phase II Extended (Phase II-E): The objective of the Phase II-E Option is to further encourage the advancement of innovations developed under

NASA SBIR Phase I contracts last up to 6 months and STTR Phase I contracts last up to 13 months, both with maximum funding of $125,000.

Phase II via an option to further R/R&D efforts underway on active Phase II contracts that are in good standing with NASA.

- Civilian Commercialization Readiness Pilot Program (CCRPP): CCRPP is designed to advance SBIR/STTR-developed technology through a combination of further SBIR/STTR program investment and non-SBIR/STTR program investor funds. The primary objective is infusion or commercialization, not an incremental improvement in technology maturation alone. Technology maturation without infusion or commercialization will not be accepted for CCRPP.

Phase III: Phase III is the commercialization of innovative technologies, products, and services resulting from either a Phase I or Phase II contract. This includes further development of technologies for transition into NASA programs, other Government agencies, or the private sector. There is no funding limit on Phase III awards, like there is for Phases I and II; however Phase III funding must come from non-SBIR/STTR sources.

Focus Areas

The SBIR and STTR Solicitations are produced in partnership with NASA's Mission Directorates and Centers to focus on the agency's priority mission needs. These needs, updated annually, are organized under subtopics. Subtopics are organized into groupings called "focus areas." Organizing using this method is intended to make it easier for proposers to understand related needs across the agency and thus identify subtopics where their research and development capabilities may be a good match.

Proposals eligible for award must address one or more needs within a subtopic. The Solicitations listed online at sbir.nasa.gov include tools like text search to help find subtopics of interest.

Mission Directorates

NASA's Mission Directorates and Centers manage the focus areas and subtopics for the Solicitations. Subtopics evolve in keeping with the Agency's mission needs and priorities. Each subtopic is typically the responsibility of one NASA Center, noted as "Lead Center" in the Solicitations, with assistance from "Participating Centers." All four NASA Mission Directorates participate in the SBIR program. STTR subtopics align with the Space Technology Roadmap Technology Areas (TAs) and focus on needs associated with the core competencies of NASA's Centers in support of NASA mission programs. More information about the roadmap can be found on the website of the Office of the Chief Technologist at https://www.nasa.gov/offices/oct/home/roadmaps/index.html.

AERONAUTICS RESEARCH MISSION DIRECTORATE

https://www.nasa.gov/aeroresearch

NASA's Aeronautics Research Mission Directorate (ARMD) expands the boundaries of aeronautical knowledge for the benefit of the Nation and the broad aeronautics community, which includes the Agency's partners in academia, industry, and other government agencies. ARMD is conducting high-quality, cutting-edge research that will lead to revolutionary concepts, technologies, and capabilities that enable radical change to both the airspace system and the aircrafts that fly within it, facilitating a safer, more environmentally friendly, and more efficient air transportation system. At the same time, ARMD ensures that aeronautics research and critical core competencies continue to play a vital role in support of NASA's goals for both manned and robotic space exploration.

HUMAN EXPLORATION AND OPERATIONS MISSION DIRECTORATE

https://www.nasa.gov/directorates/heo

The Human Exploration and Operations Mission Directorate (HEOMD) provides the Agency with leadership and management of NASA space operations related to human exploration in and beyond low-Earth orbit. HEOMD also oversees low-level requirements development, policy, and programmatic oversight. The International Space Station, currently orbiting the Earth with a crew of six, represents the NASA exploration activities in low-Earth orbit. Exploration activities beyond low-Earth orbit include the management of Commercial Space Transportation, Exploration Systems Development, Human Space Flight Capabilities, Advanced Exploration Systems, and Space Life Sciences Research & Applications.

INNOVATIONS ADVANCED BY SBIR/STTR ON JUPITER JUNO SPACE PROBE

REDUCED PAYLOAD MASS THROUGH CARBON NANOTUBE YARN

NANOCOMP TECHNOLOGIES, INC. - MERRIMACK, NH

The directorate is similarly responsible for Agency leadership and management of NASA space operations related to Launch Services, Space Transportation, and Space Communications in support of both human and robotic exploration programs.

SCIENCE MISSION DIRECTORATE

https://science.nasa.gov

The Science Mission Directorate (SMD) develops and operates an overall program of science and exploration. Objectives include: (1) study planet Earth from space to advance scientific understanding and meet societal needs; (2) understand the Sun and its effects on Earth and the Solar System; (3) advance scientific knowledge of the origin and history of the solar system, the potential for life elsewhere, and the hazards and resources present as humans explore space and (4) discover the origin, structure, evolution, and destiny of the universe, and search for Eartth-like planets.

SPACE TECHNOLOGY MISSION DIRECTORATE

https://www.nasa.gov/directorates/spacetech/home

Technology drives exploration to the Moon, Mars and beyond. NASA's Space Technology Mission Directorate (STMD) develops transformative space technologies to enable future missions. As NASA embarks on its next era of exploration, STMD is focused on advancing technologies and testing new capabilities at the Moon that will be critical for crewed missions to Mars. STMD engages and inspires thousands of entrepreneurs, researchers and innovators, creating a community of America's best and brightest working on the nation's toughest challenges. Space technology research and development take place at NASA centers, universities and national labs. STMD leverages partnerships with other government agencies as well as commercial and international partners. The current technology portfolio spans a range of discipline areas. Investments in revolutionary, American-made space technologies provide solutions on Earth and in space.

Phase I Proposal Preparation

Basic requirements differ in certain important details among the agencies that operate SBIR and/or STTR programs and are subject to change. Thus, a careful review of the current NASA SBIR/STTR Solicitation is necessary to comply with the instructions and requirements for an acceptable and competitive proposal to NASA. The application for submission of proposals is provided on the NASA SBIR/STTR website under Solicitations. Proposal submission tools are only available during the open Solicitation period.

Proposals include a technical proposal, budget, and other components as required by the Solicitation.

A competitive proposal will clearly and concisely: (1) describe the proposed innovation relative to the state of the art; (2) address the scientific, technical, and commercial merit and feasibility of the proposed innovation, and its relevance and significance to NASA interests as described in the current solicitation; and (3) provide a preliminary strategy that addresses key technical, market and business factors pertinent to the successful development, demonstration of the proposed innovation, and its transition into products and services for NASA mission programs, the commercial aerospace industry, and other potential markets and customers.

Each proposal submitted must address one or more NASA needs within just one subtopic. An SBC may submit more than one proposal to the same subtopic; however, the SBC should not submit the same (or substantially equivalent) proposal to more than one subtopic. NASA will not accept more than 10 proposals to either program from any one company. The acceptance of awards for essentially equivalent work being performed at any other agency of the Federal Government is not allowed and is considered fraudulent and subject to criminal prosecution.

Proposal submission tools are only available during the open Solicitation period.

Award Selection

The NASA SBIR/STTR program is highly competitive. Historically, 24 percent of SBIR Phase I proposal submissions receive awards, while 35 percent of STTR Phase I proposals receive awards. About 41 percent of the completed Phase I projects receive funding for Phase II development. NASA funding awards for SBIR and STTR projects are issued as contracts between NASA and the SBC.

All proposals must be submitted in response to the annual NASA SBIR and STTR Solicitations. Proposals are screened for compliance with proposal

submission requirements, including relevance to NASA needs described in the Solicitations. Proposals are then evaluated based on factors described in the Solicitations. These factors include:

- Scientific/Technical Merit and Feasibility
- Experience, Qualifications and Facilities
- Effectiveness of the Proposed Work Plan
- Commercial Potential and Feasibility
- Price Reasonableness

Proposals recommended for selection will be forwarded to the Program Management Office for analysis and presented to the Source Selection Official and Mission Directorate Representatives. The Source Selection Official will consider the recommendations as well as overall NASA priorities, program balance and available funding. Each proposal selected for negotiation will be evaluated for cost/price reasonableness, the terms and conditions of the contract will be negotiated and a responsibility determination made. The Contracting Officer will advise the Source Selection Official on matters pertaining to cost reasonableness and responsibility. The Source Selection Official has the final authority for selecting the specific proposals for award.

Contract Deliverables

All Phase I contracts require the delivery of reports that present (1) the work and results accomplished; (2) the scientific, technical and commercial merit and feasibility of the proposed innovation; (3) the relevance and significance to one or more NASA needs and (4) the strategy for development and transition of the proposed innovation into products and services for NASA mission programs and other potential customers.

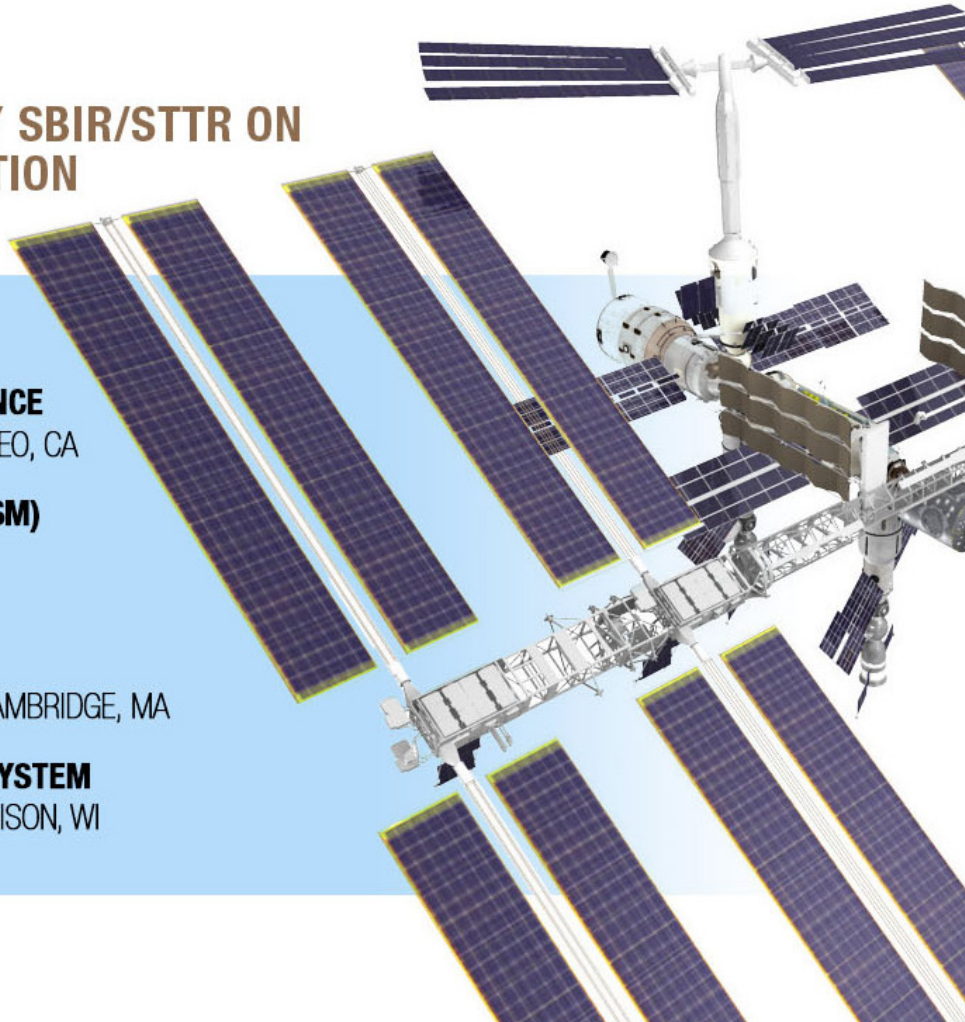
Additional Information

The NASA SBIR/STTR website (sbir.nasa.gov) contains Solicitations and schedules, along with a wealth of related information. Documents and information available include prior award lists, technical abstracts, program statistics, procurement information, and links to state and private assistance organizations. You can also access presentations from all program annual outreach events (Industry Day, Innovation and Opportunity Conference, etc.) and other conferences attended by program representatives (sbir.nasa.gov/content/event-presentations).

The SBIR/STTR Firm's Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/ index.html) provides specific help in meeting proposal and contract requirements. The Firm's Library offers templates and samples of all potential Phase I and Phase II deliverables from proposal submissions through the life of the contract. Samples include proposals, forms for proposals and contract negotiations, research agreements (STTR), briefing charts, and reports. In addition, templates and samples for items such as business plans, and success story documentation are available.

The Resources section of the NASA SBIR/STTR program's website contains Event Presentations site (sbir.nasa.gov/content/event-presentations) that provides materials from all program annual events (SBIR Industry Day, Innovation and Opportunity Conference, etc.) and other conferences attended by the program representatives.

INNOVATIONS ADVANCED BY SBIR/STTR ON INTERNATIONAL SPACE STATION



COMPLEX SCHEDULING SOFTWARE THAT LEVERAGES ARTIFICIAL INTELLIGENCE
STOTTLER HENKE ASSOCIATES, INC - SAN MATEO, CA

DIMENSIONALLY STABLE MEMBRANE (DSM) FOR HIGH PRESSURE ELECTROLYZERS
GINER, INC. - AUBERNDALE, MA

UNIVERSAL BATTERY CHARGER
AURORA FLIGHT SCIENCES CORPORATION - CAMBRIDGE, MA

DEPLOYABLE VEGETABLE PRODUCTION SYSTEM
ORBITAL TECHNOLOGIES CORPORATION - MADISON, WI

NASA TechSource (sbir.nasa.gov/techsource) provides searchable information on current and recently completed SBIR and STTR Phase I and II projects funded by NASA.

The NASA SBIR/STTR archive of proposal abstracts of previous NASA Phase I and II awards, accessible via the NASA SBIR/STTR website, is also available to assist the formulation of proposals.

The NASA Office of the Chief Technologist (nasa.gov/oct/) provides additional online technology resources for exploring other NASA research, technology, expertise and R&D capabilities.

The NASA Office of Small Business Programs (osbp.nasa.gov/) promotes and integrates all small businesses into the competitive base of contractors that pioneer the future of space exploration, scientific discovery, and aeronautics research. The Mentor-Protégé Program (MPP) offers substantial assistance to small disadvantaged businesses.

Sources of Assistance

Since the inception of the SBIR and STTR programs, a wide range of public and private sector programs and services have emerged to assist SBCs in all phases of the programs.

The SBA (http://sbir.gov) provides information on the SBIR and STTR programs across the Federal government as well as other programs and services that provide assistance for the development of small businesses and their participation in the SBIR and STTR programs.

NASA SBIR/STTR Program Support Office

For questions about the NASA SBIR/STTR Solicitations, the proposal preparation and electronic submission process, and other program related areas, please contact the NASA SBIR/STTR Program Support Office.

Telephone: 301-937-0888
Email: sbir@reisystems.com
Hours: Monday through Friday from 9am to 5pm ET

NASA SBIR/STTR Program Contacts

The Space Technology Mission Directorate provides overall policy direction for implementation of the NASA SBIR/STTR program. It is located in the NASA headquarters in Washington DC, which is home to the SBIR/STTR executive team that oversees the program. The NASA SBIR/STTR Program Management Office, which operates the program in conjunction with NASA Mission Directorates and Centers, is hosted at the NASA Ames Research Center.

The SBIR/STTR program also has contacts in each mission directorate and at each NASA Center to help answer your questions. Any SBC is welcome to communicate with NASA representatives and researchers to learn about the needs and objectives of mission programs. When the solicitation is open, representatives may be contacted about non-technical questions.

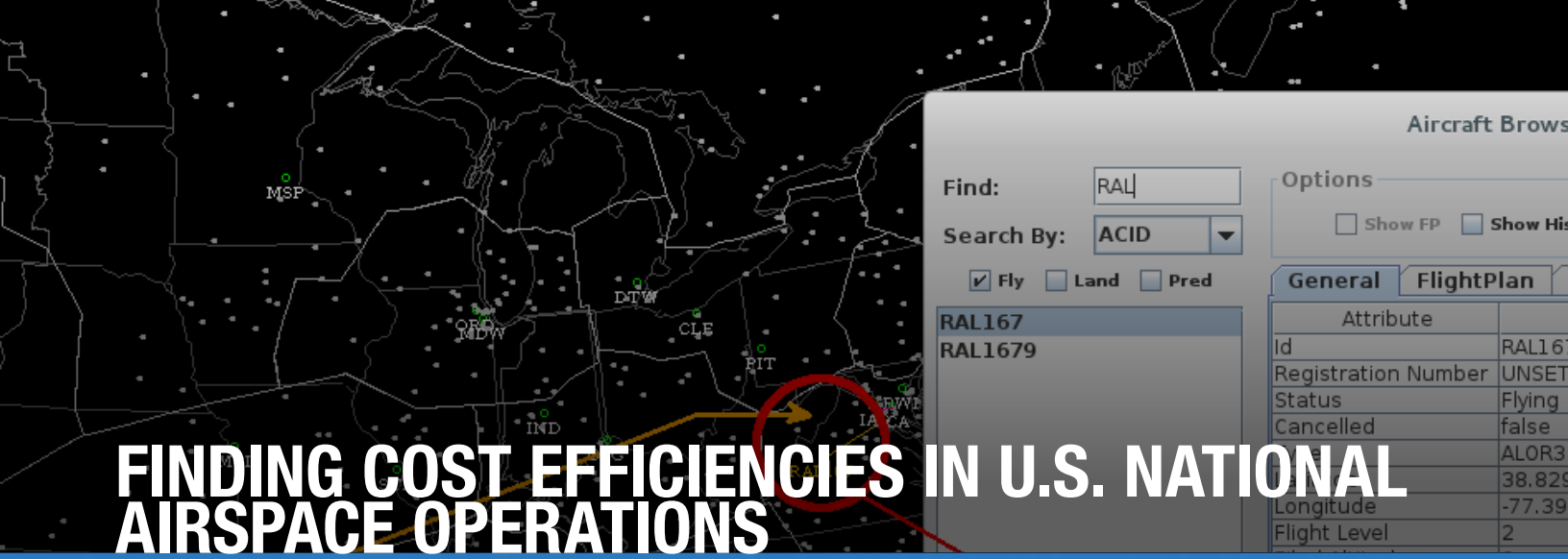
For NASA SBIR/STTR program contacts, please visit our website at sbir.nasa.gov/contacts

An equation you need to remember:

NASA TOLERANCE FOR FRAUD, WASTE, AND ABUSE = ZERO

NASA Inspector General Hotline: 1-800-424-9183 http://oig.nasa.gov/hotline.html
PO Box 23089 I L'Enfant Plaza I, Washington, DC 20026
National Aeronautics and Space Administration www.nasa.gov

Please send questions and comments to: ARC-SBIR-Outreach@mail.nasa.gov



FINDING COST EFFICIENCIES IN U.S. NATIONAL AIRSPACE OPERATIONS

Challenge: The U.S. National Airspace System (NAS) is comprised of airspace, along with navigation facilities and airports. There are approximately 41,000 NAS operational facilities in the U.S. Efficient and safe air traffic management operations are critical for NAS. The SMART NAS Test Bed (SNTB) is the leading research, test, and demonstration environment for air traffic management technologies. The SMART NAS program seeks to estimate costs for the baseline NAS for its research; however, calculating the total NAS cost is not currently possible.

Mission Directorate:
Aeronautics Research

Small Company:
Robust Analytics
Crofton, MD

Snapshot:
A ground-breaking tool for NASA scientists to study air traffic costs of the United States National Airspace System.

Solution: Under the NASA SBIR Phase II, Robust Analytics developed the Air Traffic Cost Assessment Tool (ATCAT), a model that estimates the cost of operating commercial aircraft in the NAS. The ATCAT software and associated data will be integrated with the SMART NAS Data Distribution Service message infrastructure as a stand-alone application or service for use by NASA researchers. The ATCAT version installed in the test bed will estimate in near real-time the costs of operating flights in the NAS, including: actual NAS flights, planned flights, and simulated and shadow-mode flights. This innovation offers a greater understanding of the cost drivers for aircraft operators and will help to validate the cost and revenue impacts.

SBIR AND STTR INNOVATIONS MAKE NASA SUCCESSFUL

A recent small business innovation made Juno, shown being assembled here, a lighter and stronger spacecraft. The Juno mission takes place in the strong magnetic fields of the gas giant Jupiter and its moons.

Carbon nanotube sheet and yarns were used to decrease weight and provide protection against electro-static discharge (ESD) as the spacecraft makes its way to Jupiter. The sheets replaced traditional metallic solutions. The sheets were incorporated as a layer directly onto the composite, making it an integral part of the spacecraft's flight protection system.

Learn more about SBIR and STTR successes at **https://sbir.nasa.gov/success-stories.**

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