

National Aeronautics and Space Administration

**SMALL BUSINESS
INNOVATION RESEARCH (SBIR)
Fiscal Year 2014 Select Program
Solicitation**

Opening Date: November 14, 2013

Closing Date: January 29, 2014

**Part 1: Phase I Proposal Instructions and
Evaluation Criteria for the
NASA Fiscal Year 2014 Select SBIR Solicitation**

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Fiscal Year 2014 NASA Select SBIR Program Solicitation

1. Program Description

1.1 Introduction

This solicitation is for a small group of select topics that are of particular interest to NASA under NASA's Small Business Innovative Research (SBIR) Program. The specific topics are outlined in section 9 of this solicitation. Only Small Business Concerns (SBC) are invited to submit proposals. Program background information, eligibility requirements for participants, information on the three program phases, and information for submitting responsive proposals is contained herein. The Fiscal Year 2014 Select SBIR Solicitation period for Phase I proposals begins November 14, 2013 and ends January 29, 2014.

NOTE: Only proposals for the research areas designated in section 9 of this solicitation will be accepted.

The NASA SBIR Program does not accept proposals solely directed towards system studies, market research, routine engineering development of existing product(s), proven concepts, or modifications of existing products without substantive innovation.

It is anticipated that Select SBIR Phase I proposals will be selected for negotiation of firm-fixed-price contracts in approximately April 2014.

NASA will not accept more than 3 proposals to this solicitation from any one firm in order to ensure the broadest participation of the small business community. NASA does not plan to award more than 2 Select SBIR contracts to any offeror under this solicitation.

Proposals must be submitted online via the Proposal Submissions Electronic Handbook at (<http://sbir.nasa.gov>) and include all relevant documentation. Unsolicited proposals will not be accepted.

1.2 Program Authority and Executive Order

SBIR and STTR opportunities are solicited annually pursuant to the Small Business Innovation Development Act of 1982, P.L. 97-219 (codified at 15 U.S.C. 638) as amended by the Small Business Innovation Research (SBIR) Program, Extension, P.L. 99-443 which extended the program through September 30, 1993. On October 28, 1992, through the Small Business Innovation Research and Development Act of 1992 (P.L. 102-564), Congress reauthorized and extended the SBIR Program for another seven years (2000). Subsequently, on December 21, 2000, through the Small Business Reauthorization Act of 2000 (P.L. 106-554) Congress again reauthorized the SBIR Program. With the approval of H.R. 2608, Continuing Appropriations Act 2012, the SBIR Program was authorized through December 31, 2011. On December 31, 2011, the President signed into law the National Defense Reauthorization Act of 2012 (Defense Reauthorization Act), P. L. 112-81, Section 5001, Division E of the Defense Reauthorization Act contains the SBIR/STTR Reauthorization Act of 2011 (SBIR/STTR Reauthorization Act)), which extends both the SBIR and Small Business Technology Transfer (STTR) programs through September 30, 2017.

1.3 Program Management

The Space Technology Mission Directorate provides overall policy direction for implementation of the NASA SBIR/STTR programs. The NASA SBIR/STTR Program Management Office, which operates the programs in conjunction with NASA Mission Directorates and Centers, is hosted at the NASA Ames Research Center. NASA Shared Services Center (NSSC) provides the overall procurement management for the programs. All of the NASA Centers actively participate in the SBIR/STTR programs; and to reinforce NASA's objective of infusion of SBIR/STTR developed technologies into its programs and projects, each Center has personnel focused on that activity.

NASA research and technology areas to be solicited are identified annually by the Agency’s Mission Directorates. The Directorates identify high priority research and technology needs for their respective programs and projects. The needs are explicitly described in the topics and subtopics descriptions developed by technical experts at NASA’s Centers. The range of technologies is broad, and the list of topics and subtopics may vary in content from year to year. See section 9.1 for details on the Mission Directorate research topic descriptions for the Select SBIR Program.

As technological innovation is at the core of the SBIR/STTR program it is critical to NASA’s Technology Transfer efforts that any new innovation derived from an SBIR/STTR award is reported to NASA in accordance with its New Technology Reporting Requirements.

Information regarding the Mission Directorates and the NASA Centers can be obtained at the following web sites:

Space Technology	
Space Technology Roadmaps	http://www.nasa.gov/offices/oct/home/roadmaps/index.html

NASA Mission Directorates	
Aeronautics Research	http://www.aeronautics.nasa.gov/
Human Exploration and Operations	http://www.nasa.gov/directorates/heo/home/
Science	http://nasascience.nasa.gov
Space Technology	http://www.nasa.gov/directorates/spacetech/home/index.html

NASA Centers	
Ames Research Center (ARC)	http://www.nasa.gov/centers/ames/home/index.html
Dryden Flight Research Center (DFRC)	http://www.nasa.gov/centers/dryden/home/index.html
Glenn Research Center (GRC)	http://www.nasa.gov/centers/glenn/home/index.html
Goddard Space Flight Center (GSFC)	http://www.nasa.gov/centers/goddard/home/index.html
Jet Propulsion Laboratory (JPL)	http://www.nasa.gov/centers/jpl/home/index.html
Johnson Space Center (JSC)	http://www.nasa.gov/centers/johnson/home/index.html
Kennedy Space Center (KSC)	http://www.nasa.gov/centers/kennedy/home/index.html
Langley Research Center (LaRC)	http://www.nasa.gov/centers/langley/home/index.html
Marshall Space Flight Center (MSFC)	http://www.nasa.gov/centers/marshall/home/index.html
Stennis Space Center (SSC)	http://www.nasa.gov/centers/stennis/home/index.html

1.4 Three-Phase Program

The Select SBIR Program is divided into three funding and development stages.

Maximum value and period of performance for Select Phase I and Select Phase II contracts:

Select Phase I Contracts	SBIR
Maximum Contract Value	\$125,000
Period of Performance	6 months
Select Phase II Contracts	SBIR
Maximum Contract Value	\$1,500,000
Maximum Period of Performance	24 months

Select Phase I

The purpose of Select Phase I is to determine the scientific, technical, and commercial merit of the proposed innovation, and the quality of the SBC’s performance. Select Phase I work and results should provide a sound basis for the continued development, demonstration and delivery of the proposed innovation in Phase II and follow-on efforts. In particular, Select Phase I projects should result in a strong foundation for the delivery of the innovation developed in Phase II. Successful completion of Phase I objectives is a prerequisite to consideration for a Phase II award.

Select Phase II

The purpose of Select Phase II is the development, demonstration and delivery of the innovation. Only SBCs awarded a Select Phase I contract are eligible to submit a proposal for a Select Phase II funding agreement. Select Phase II projects are chosen as a result of competitive evaluations and based on selection criteria provided in the Select Phase II Proposal Instructions and Evaluation Criteria. The funding outlined above for Select Phase II contracts should enable significant test, demonstration, and evaluation activities leading to technologies at high readiness levels for NASA utilization.

Opportunities for Continued Technology Development Post-Phase II

Phase II Enhancement (Phase II-E) and Phase II eXpanded (Phase II-X)

The purpose of the Phase II-E Option is to further encourage the advancement of innovations developed under Phase II via an extension of R/R&D efforts underway on current Phase II contracts. Under a Phase II-E option, the NASA SBIR/STTR Program will match, on a dollar-to-dollar basis, a minimum of \$25,000 and a maximum of \$150,000 of non-NASA-SBIR/STTR investments in a small business by an eligible third party to extend a project from 6-to-12 months. New work proposed under a Phase II-E effort must build upon and demonstrably advance the R/R&D conducted during Phase II, and should therefore lead to new outcomes not achievable with Phase II funding alone. Eligible third parties include a NASA project, NASA contractor, or any commercial investor. The total cumulative award for the Select Phase II contract plus the Phase II-E match is not expected to exceed \$1,650,000 of SBIR/STTR funding. The non-SBIR/non-STTR contribution is not limited since it is regulated under the guidelines for Phase III awards.

Phase II Enhancement	Minimum non-SBIR/STTR Funding Required for Eligibility for Matching in Phase II-E	Corresponding SBIR/STTR Program Contribution	Anticipated Period of Additional Performance
	\$25,000	\$25,000	6-12 Months
	Maximum non-SBIR/STTR Funding to be Matched by SBIR/STTR Program in Phase II-E	Corresponding SBIR/STTR Program Contribution	Anticipated Period of Additional Performance
	\$150,000	\$150,000	6-12 Months

The purpose of the Phase II-X Option is to establish a strong and direct partnership between the NASA SBIR/STTR Program and other NASA projects undertaking the development of new technologies of innovations for future use. Under a Phase II-X option, innovations developed in Phase II are to be advanced via an extension of R/R&D efforts to the current Phase II contract. There are two specific requirements to be met for firms to be eligible for a Phase II-X option.

- First, eligible firms must secure a NASA program or project (other than the NASA SBIR/STTR Program) as a partner to invest in enhancing their technology for further research or infusion.
- Second, there is a minimum funding requirement for Phase II-X, as eligible firms must secure at least \$75,000 in NASA program or project funding.

Under a Phase II-X option, the NASA SBIR/STTR Program will match, on a 2-for-1 basis, up to \$250,000 of NASA program or project funding, thus enabling a maximum of \$500,000 of SBIR/STTR award funds to be added from the NASA SBIR/STTR Program. The total cumulative award for the Select Phase II contract plus the Phase II-X match is not expected to exceed \$2,000,000 of SBIR/STTR funding. Contributions from other NASA programs or projects are not limited since it is regulated under the guidelines for Phase III awards.

Phase II eXpanded	Minimum Funding Required from non-SBIR/STTR NASA Source for Eligibility for Matching in Phase II-X	Corresponding SBIR/STTR Program Contribution	Anticipated Period of Additional Performance
		\$75,000	\$150,000
Phase II eXpanded	Maximum Funding Amount from non-SBIR/STTR NASA Source to be Matched in Phase II-X	Corresponding SBIR/STTR Program Contribution	Anticipated Period of Additional Performance
		\$250,000	\$500,000

All Phase II award recipients will have the Phase II-E and Phase II-X options written into their contract. Please refer to the NASA SBIR/STTR website (<http://sbir.gsfc.nasa.gov/content/post-phase-ii-initiatives>) for additional information.

Phase III

NASA may award Phase III contracts for products or services with non-SBIR funds. The competition for SBIR Phase I and Phase II awards satisfies any competition requirement of the Armed Services Procurement Act, the Federal Property and Administrative Services Act, and the Competition in Contracting Act. Therefore, an agency that wishes to fund a Phase III project is not required to conduct another competition in order to satisfy those statutory provisions. Phase III work may be for products, production, services, R/R&D, or any combination thereof that is derived from, extends, or concludes efforts performed under prior SBIR funding agreements. A Federal agency may enter into a Phase III agreement at any time with a Phase I or Phase II awardee.

There is no limit on the number, duration, type, or dollar value of Phase III awards made to a business concern. There is no limit on the time that may elapse between a Phase I or Phase II and a Phase III award. The small business size limits for Phase I and Phase II awards do not apply to Phase III awards.

1.5 Eligibility Requirements

1.5.1 Small Business Concern

Only firms qualifying as SBCs, as defined in section 2.23, are eligible to participate in these programs. Socially and economically disadvantaged and women-owned SBCs are particularly encouraged to propose.

1.5.2 Place of Performance

R/R&D must be performed in the United States (section 2.28). However, based on a rare and unique circumstance (for example, if a supply or material or other item or project requirement is not available in the United States), NASA may allow a particular portion of the research or R&D work to be performed or obtained in a country outside of the United States. Proposals must clearly indicate if any work will be performed outside the United States, including subcontractor performance.. Prior to award, approval by the Contracting Officer for such specific condition(s) must be in writing.

Note: Offerors are responsible for ensuring that all employees who will work on this contract are eligible under export control and International Traffic in Arms (ITAR) regulations. Any employee who is not a U.S. citizen or a permanent resident may be restricted from working on this contract if the technology is restricted under export control and ITAR regulations unless the prior approval of the Department of State or the Department of Commerce is obtained via a technical assistance agreement or an export license. Violations of these regulations can result in criminal or civil penalties. For further information on ITAR visit (http://www.pmdtc.state.gov/regulations_laws/itar.html). For additional assistance, refer to (<http://sbir.gsfc.nasa.gov/content/training-resources>) or contact the NASA SBIR helpdesk at sbir@reisystems.com.

1.5.3 Principal Investigator (PI) Employment Requirement

The primary employment of the Principal Investigator (PI) shall be with the SBC. Primary employment means that more than 50% of the PI’s total employed time (including all concurrent employers, consulting, and self-employed time) is spent with the SBC at time of award and during the entire period of performance. Primary employment with

a small business concern precludes full-time employment at another organization. If the PI does not currently meet these primary employment requirements, then the offeror must explain how these requirements will be met if the proposal is selected for contract negotiations that may lead to an award. Co-Principle Investigators are not allowed.

Note: NASA considers a fulltime workweek to be nominally 40 hours and we consider 19.9-hour or more workweek elsewhere to be in conflict with this rule. In rare occasions, minor deviations from this requirement may be necessary; however, any minor deviation must be approved in writing by the contracting officer after consultation with the NASA SBIR Program Manager/Business Manager.

Requirements	SBIR
Primary Employment	PI must be employed with the SBC
Employment Certification	The offeror must certify in the proposal that the primary employment of the PI will be with the SBC at the time of award and during the conduct of the project
Co-PIs	Not Allowed
Misrepresentation of Qualifications	Shall result in rejection of the proposal or termination of the contract
Substitution of PIs	Shall receive advanced written approval from NASA

1.5.4 Restrictions on Funding Activity with the People’s Republic of China

No funds can be used to participate, collaborate or coordinate bilaterally in any way with China or any Chinese-owned firm at either the prime contract level or any tier of subcontracting. This restriction on the use of funds appropriated to NASA is found in Section 1340(a) of The Department of Defense and Full-Year Appropriations Act, Public Law 112-10, Section 539 of the Consolidated and Further Continuing Appropriation Act of 2012, PL 112-55, and Section 535 of the Consolidated and Further Continuing Appropriations Act, 2013, PL113-6. NASA anticipates this restriction will be contained in future appropriation acts

1.5.5 Restrictions on Venture Capital-owned Businesses

As set forth in the SBIR Reauthorization Act of 2011, small businesses owned in majority part by multiple venture capital operating companies, hedge funds, or private equity firms may be eligible for SBIR awards. SBA's regulations of 13 CFR part 121 sets forth the eligibility criteria for SBIR applicants that are owned in majority part by multiple venture capital operating companies, hedge funds, or private equity firms. Please note that SBIR agencies must submit a written determination (to the SBA, the Senate Committee on Small Business and Entrepreneurship, the House Committee on Small Business, and the House Committee on Science, Space, and Technology) at least 30 calendar days before it begins making awards to SBCs that are owned in majority part by multiple venture capital operating companies, hedge funds, or private equity firms. **At the current time, NASA is considering this change. Currently, such firms are not eligible to submit proposals to the NASA SBIR, STTR, and SBIR Select solicitations.**

1.5.6 Required Benchmark Transition Rate

The Phase I to Phase II Transition benchmark requirement applies to SBIR and STTR Phase I applicants that have received more than 20 Phase I awards over the past 5 fiscal years, excluding the most recently-completed fiscal year. For these companies, this benchmark rate establishes a minimum number of Phase II awards the SBC must have received for a given number of Phase I awards received during the 5-year time period. The required benchmark Transition Rate is 0.25.

SBA calculates company Phase I - Phase II Transition Rates once a year, on June 1st, using SBIR and STTR award information across all agencies in its TechNet database. A company’s transition rate is the total number of SBIR and STTR Phase II awards it received during the past 5 years divided by the total number of SBIR and STTR Phase I awards it received during the past 5 years excluding the most recently-completed year. The 5-year period over

which Phase I awards are counted excludes the most recently completed fiscal year because not all Phase II awards can occur within the same year as the Phase I award.

Companies with more than 20 Phase I awards during the past 5 years can view their Transition Rate if they log onto their Company Registry account at (www.SBIR.gov). Companies that do not meet the benchmark rate on June 1st are notified by SBA that they are ineligible for an SBIR or STTR Phase I award until the following June 1st.

1.6 NASA SBIR Technology Available “TAV”

All subtopics have the option of using Technology Available (TAV) with NASA IP (defined below), which may also include NASA non-patented software technology requiring a Software Usage Agreement (SUA) or similar permission for use by others. All subtopics address the objective of increasing the commercial application of innovations derived from Federal R&D. While NASA scientists and engineers conduct breakthrough research that leads to innovations, the range of NASA's effort does not extend to commercial product development in any of its intramural research areas. Additional work is often necessary to exploit these NASA technologies for either infusion or commercial viability and likely requires innovation on behalf of the private sector. NASA provides these technologies "as is" and makes no representation or guarantee that additional effort will result in infusion or commercial viability.

The NASA technologies identified in a subtopic or via the IP search tool (<http://technology.nasa.gov>): (1) are protected by NASA-owned patents (NASA Patents), (2) are non-patented NASA-owned or controlled software (NASA software), or (3) are otherwise available for use by the public. In the event offeror requests to use NASA owned or controlled technologies, which are not NASA patents or NASA software, NASA shall consider such request and permit such uses as NASA, in its sole discretion, deems appropriate and permissible. If a proposer elects to use a NASA patent, a non-exclusive, royalty-free research license will be required to use the NASA IP during the SBIR performance period.

Similarly, if a proposer wishes to use NASA software, the parties will be required to enter into a Software Usage Agreement on a non-exclusive, royalty-free basis in order to use such NASA software for government purposes and “Government-Furnished Computer Software and Related Technical Data” will apply to the contract. As used herein, “NASA IP” refers collectively to NASA patents and NASA software disclaimer: All subtopics include an opportunity to license or otherwise use NASA IP on a non-exclusive, royalty-free basis, for research use under the contract. Use of the NASA IP is strictly voluntary. Whether or not a firm uses NASA IP within their proposed effort will not in any way be a factor in the selection for award. NASA software release is governed by NPR 2210.1C.

Use of NASA Software

Software identified and requested under a SBIR contract shall be treated as Government Purpose Rights. Government purpose releases includes releases to other NASA Centers, Federal government agencies, and recipients who have a government contract. The software may be used for "government purposes" only. The recipients of such software releases are typically U.S. citizens. Non U.S. citizens will not be allowed access to NASA software under the SBIR contract.

A Software Usage Agreement (SUA) shall be requested after contract award from the appropriate NASA Center Software Release Authority (SRA). The SUA request shall include the NASA software title, version number, requesting firm contract info including recipient name, and SBIR contract award info. The SUA will expire when the contract ends.

Use of NASA Patent

All offerors submitting proposals citing a NASA patent must submit a non-exclusive, royalty-free license application if the use of a NASA patent is desired. The NASA license application is available on the NASA SBIR/STTR website: http://sbir.gsfc.nasa.gov/sites/default/files/research_license_app.doc. NASA only will grant research licenses to those SBIR offerors who submitted a license application and whose proposal resulted in an SBIR award under this solicitation. Such grant of non-exclusive research license will be set forth in the successful offeror's SBIR contract. License applications will be treated in accordance with Federal patent licensing regulations as provided in 37 CFR Part 404.

SBIR offerors are notified that no exclusive or non-exclusive commercialization license to make, use or sell products or services incorporating the NASA patent will be granted unless an SBIR offeror applies for and receives such a license in accordance with the Federal patent licensing regulations at 37 CFR Part 404. Awardees with contracts that identify a specific NASA patent will be given the opportunity to negotiate a non-exclusive commercialization license or, if available, an exclusive commercialization license to the NASA patent.

An SBIR awardee that has been granted a non-exclusive, royalty-free research license to use a NASA patent under the SBIR award may, if available and on a non-interference basis, also have access to NASA personnel knowledgeable about the NASA patent. The NASA Intellectual Property Manager (IPM) located at the appropriate NASA Center will be available to assist awardees requesting information about a patent that was identified in the SBIR contract and, if available and on a non-interference basis, provide access to the inventor or surrogate for the purpose of knowledge transfer.

Note: Access to the inventor for the purpose of knowledge transfer, will require the requestor to enter into a Non-Disclosure Agreement (NDA), the awardee “may” be required to reimburse NASA for knowledge transfer activities.

1.7 Commercialization Technical Assistance

In accordance with the Small Business Act (15 U.S.C. 632), NASA will authorize the recipient of a Phase I SBIR award to purchase technical assistance services, such as 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 data bases, for the purpose of assisting such concerns in:

1. Making better technical decisions concerning such projects.
2. Solving technical problems which arise during the conduct of such projects.
3. Minimizing technical risks associated with such projects.
4. Developing and commercializing new commercial products and processes resulting from such projects.

If you are interested in proposing use of a vendor for technical assistance, you must provide a cost breakdown under "Other Direct Costs (ODCs)" of the Cost Volume and provide a one page description of the vendor you will use and the technical assistance you will receive. The proposed amount may not exceed \$5,000 and the description should be included as the LAST page of the Technical Volume. This description will not count against the page limit and will NOT be evaluated. Approval of technical assistance is not guaranteed and is subject to review of the contracting officer.

1.8 General Information

1.8.1 Means of Contacting NASA SBIR/STTR Program

- (1) NASA SBIR/STTR Website: <http://sbir.nasa.gov>
- (2) Help Desk: The NASA SBIR/STTR Help Desk can answer any questions regarding clarification of proposal instructions and any administrative matters. The Help Desk may be contacted by:

E-mail: sbir@reisystems.com
Telephone: 301-937-0888 between 9:00 a.m.-5:00 p.m. (Mon.-Fri., Eastern Time)
Facsimile: 301-937-0204

The requestor must provide the name and telephone number of the person to contact, the organization name and address, and the specific questions or requests.

- (3) NASA SBIR/STTR Program Manager: Specific information requests that could not be answered by the Help Desk should be mailed or e-mailed to:

Dr. Gary C. Jahns, Program Manager
NASA SBIR/STTR Program Management Office
MS 202A-3, Ames Research Center
Moffett Field, CA 94035-1000
Gary.C.Jahns@nasa.gov

1.8.2 Questions About This Solicitation

Proposers seeking clarity regarding SBIR Select subtopic descriptions may submit questions to NASA for a period of 10 business-days after the Solicitation opens. Questions must be submitted on-line via the NASA SBIR/STTR website (<http://sbir.nasa.gov>) using the “Question and Answer Form” located below each subtopic description in the SBIR Select Solicitation.

Questions should be limited to specific information related to improving the understanding of a particular subtopic’s requirements. Proposers may not ask questions for advice or guidance on solution approach, nor submit additional materials (such as marketing materials or product samples). NASA personnel will answer appropriate questions and both the question and answer will be posted for public viewing.

The identity of the proposer will remain anonymous to the public and the proposer will be notified via e-mail if their question was accepted and or rejected for answering. Any proposer whose question is accepted will be notified via e-mail when a response has been posted. **Only questions regarding the 2014 SBIR Select Solicitation’s subtopics may be submitted.**

2. Definitions

2.1 Awardee

The organizational entity receiving an SBIR Phase I, Phase II, or Phase III award.

2.2 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.

2.3 Economically Disadvantaged Women-Owned Small Businesses (EDWOSBs)

To be an eligible EDWOSB, a firm must:

(1) Be a Women Owned Small Business (WOSB) that is at least 51% owned by one or more women who are “economically disadvantaged”. (2) Have one or more economically disadvantaged women manage the day-to-day operations, make long-term decisions for the business, hold the highest officer position in the business and work at the business full-time during normal working hours. A woman is presumed economically disadvantaged if she has a personal net worth of less than \$750,000 (with some exclusions), her adjusted gross yearly income averaged over the three years preceding the certification less than \$350,000, and the fair market value of all her assets is less than \$6 million.

Please note that for both WOSB and EDWOSB, the 51% ownership must be unconditional and direct. For a general definition please see FAR 2.101 ([https://www.acquisition.gov/far/current/html/Subpart 2_1.html](https://www.acquisition.gov/far/current/html/Subpart%202.1.html)).

2.4 Essentially Equivalent Work

The “scientific overlap,” which occurs when (1) substantially the same research is proposed for funding in more than one contract proposal or grant application submitted to the same Federal agency; (2) substantially the same research is submitted to two or more different Federal agencies for review and funding consideration; or (3) a specific research objective and the research design for accomplishing an objective are the same or closely related in two or more proposals or awards, regardless of the funding source.

2.5 Feasibility

The practical extent to which a project can be performed successfully.

2.6 Federal Laboratory

As defined in 15 U.S.C. §3703, means any laboratory, any federally funded research and development center, or any center established under 15 U.S.C. §§ 3705 & 3707 that is owned, leased, or otherwise used by a Federal agency and funded by the Federal Government, whether operated by the Government or by a contractor.

2.7 Funding Agreement

Any contract, grant, cooperative agreement, or other funding transaction entered into between any Federal agency and any entity for the performance of experimental, developmental, research and development, services, or research work funded in whole or in part by the Federal Government.

2.8 Funding Agreement Officer

A contracting officer, a grants officer, or a cooperative agreement officer.

2.9 Historically Underutilized Business Zone (HUBZone) Small Business Concern

A HUBZone small business concern means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration. To see the full definition of a HUBZone see the FAR 2.101 ([https://www.acquisition.gov/far/current/html/Subpart 2_1.html](https://www.acquisition.gov/far/current/html/Subpart%202.1.html)) or go to the SBA HUBzone site (www.sba.gov/hubzone) for more details.

2.10 Infusion

The integration of SBIR/STTR developed knowledge or technologies within NASA programs and projects, other Government agencies and/or commercial entities. This includes integration with NASA program and project funding, development and flight and ground demonstrations.

2.11 Innovation

An innovation is something new or improved, having marketable potential, including: (1) development of new technologies, (2) refinement of existing technologies, or (3) development of new applications for existing technologies.

2.12 Intellectual Property (IP)

The separate and distinct types of intangible property that are referred to collectively as “intellectual property,” including but not limited to: patents, trademarks, copyrights, trade secrets, SBIR/STTR technical data (as defined in section 2.20), ideas, designs, know-how, business, technical and research methods, other types of intangible business assets, and including all types of intangible assets either proposed or generated by the SBC as a result of its participation in the SBIR/STTR Program.

2.13 NASA Intellectual Property (NASA IP)

NASA IP is NASA-owned, patented technologies that NASA is offering under a non-exclusive, royalty-free research license for use under the SBIR award.

2.14 New Technology Reporting Requirements

Anyone performing experimental, developmental, or research work under a NASA funding agreement, including SBIR/STTR Awardees, is required to disclose any new technology, invention or innovation as a result of the work performed under the contract. Any improvement, regardless of how big or small, should be reported via the New Technology Report (NTR) process defined below. Reportable items include a discovery, an invention, an innovation, or simply an advance in the state of the art. More detail on NASA’s New Technology Reporting requirements can be found at: <https://invention.nasa.gov>.

2.15 New Technology Report (NTR)

NASA’s New Technology Report (NTR), also known as a NASA Form 1679, is the method by which new technologies (inventions and/or innovations) are disclosed. The NTR captures essential information about the technology /innovation, including its purpose, features, benefits and uses. NTR’s should be submitted within two months after the inventor discloses it in writing to the Awardee’s personnel responsible for patent matters. NTRs may be submitted via NASA’s e-NTR system, by way of a link in the EHB.

2.16 New Technology Summary Reports (NTSR): Interim and Final

The New Technology Summary Report is a required deliverable in all research contracts. It is used to summarize any and all technologies (inventions and/or innovations) developed during the performance of the contract. If no new technologies were developed under the contract, the Awardee shall submit an NTSR which contains a certification stating no new technology was developed.

2.17 electronic NASA's New Technology Reporting System (e-NTR)

NASA's e-NTR system is an on-line system used to submit NTRs, Interim NTSRs and Final NTSRs. The system may be found at URL: <https://invention.nasa.gov>. In addition, for SBIR/STTR awardees, the e-NTR system link may be found within the SBIR/STTR EHB.

2.18 Principal Investigator (PI)

The one individual designated by the SBC to provide the scientific and technical direction to a project supported by the funding agreement.

2.19 Research or Research and Development (R/R&D)

Creative work that is undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture, and society, and the use of this stock of knowledge to devise new applications. It includes administrative expenses for R&D. It excludes physical assets for R&D, such as R&D equipment and facilities. It also excludes routine product testing, quality control, mapping, collection of general-purpose statistics, experimental production, routine monitoring and evaluation of an operational program, and training of scientific and technical personnel.

Basic Research: systematic study directed toward fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind. Basic research, however, may include activities with broad applications in mind.

Applied Research: systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

Development: systematic application of knowledge or understanding, directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

Note: NASA SBIR/STTR programs do not accept proposals solely directed towards system studies, market research, routine engineering development of existing products or proven concepts and modifications of existing products without substantive innovation (see section 1.1).

2.20 SBIR/STTR Technical Data

Technical data includes all data generated in the performance of any SBIR/STTR funding agreement.

2.21 SBIR/STTR Technical Data Rights

The rights an SBC obtains for data generated in the performance of any SBIR/STTR funding agreement that an awardee delivers to the Government during or upon completion of a federally funded project, and to which the Government receives a license.

2.22 Service Disabled Veteran-Owned Small Business

A Service-Disabled Veteran-Owned Small Business is one that is: (1) Not less than 51% of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51% of the stock of which is owned by one or more service-disabled veterans; (2) management and daily business operations, which are controlled by one or more service-disabled veterans or, in the case of a service-disabled veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran; and (3) is small as defined by e-CFR §125.11.

Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service connected, as defined in 38 U.S.C. 101(16). For a general definition, see FAR 2.101 ([https://www.acquisition.gov/far/current/html/Subpart 2 1.html](https://www.acquisition.gov/far/current/html/Subpart%202.1.html)).

2.23 Small Business Concern (SBC)

An SBC is one that, at the time of award of Phase I and Phase II funding agreements, meets the following criteria: (1) Is organized for profit, with a place of business located in the United States, which operates primarily within the United States or which makes a significant contribution to the United States economy through payment of taxes or use of American products, materials or labor; (2) is in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative; except that where the form is a joint venture, there can be no more than 49 percent participation by business entities in the joint venture; (3) is at least 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States: except in the case of a joint venture, where each entity to the venture must be 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States; and (4) has, including its affiliates, not more than 500 employees.

The terms “affiliates” and “number of employees” are defined in greater detail in 13 CFR Part 121. For a general definition please see FAR 2.101 ([https://www.acquisition.gov/far/current/html/Subpart 2 1.html](https://www.acquisition.gov/far/current/html/Subpart%202.1.html)).

2.24 Socially and Economically Disadvantaged Individual

See 13 C.F.R. § § 124.103 & 124.104.

2.25 Socially and Economically Disadvantaged Small Business Concern

See 13 CFR part 124, Subpart B.

2.26 Subcontract

Any agreement, other than one involving an employer-employee relationship, entered into by an awardee of a funding agreement calling for supplies or services for the performance of the original funding agreement.

2.27 Technology Readiness Level (TRLs)

Technology Readiness Level (TRLs) is a uni-dimensional scale used to provide a measure of technology maturity.

Level 1: Basic principles observed and reported.

Level 2: Technology concept and/or application formulated.

Level 3: Analytical and experimental critical function and/or characteristic proof of concept.

Level 4: Component and/or breadboard validation in laboratory environment.

Level 5: Component and/or breadboard validation in relevant environment.

Level 6: System/subsystem model or prototype demonstration in a relevant environment (Ground or Space).

Level 7: System prototype demonstration in an operational (space) environment.

Level 8: Actual system completed and (flight) qualified through test and demonstration (Ground and Space).

Level 9: Actual system (flight) proven through successful mission operations.

Additional information on TRLs is available in Appendix A.

2.28 United States

Includes the 50 States, the territories and possessions of the Federal Government, the Commonwealth of Puerto Rico, the District of Columbia, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau.

2.29 Veteran-Owned Small Business

A veteran-owned SBC is a small business that: (1) is at least 51% unconditionally owned by one or more veterans, as defined at 38 U.S.C. 101(2); or in the case of any publicly owned business, at least 51% of the stock of which is unconditionally owned by one or more veterans; and (2) whose management and daily business operations are controlled by one or more veterans. For a general definition please see FAR 2.101 ([https://www.acquisition.gov/far/current/html/Subpart 2_1.html](https://www.acquisition.gov/far/current/html/Subpart%202.1.html)).

2.30 Women-Owned Small Business (WOSB)

To be an eligible WOSB, a company must: (1) be a small business that is at least 51% percent unconditionally and directly owned and controlled by one or more women who are United States citizens. (2) have one or more women who manage the day-to-day operations, make long-term decisions for the business, hold the highest officer position in the business and work at the business full-time during normal working hours.

Please note that for a WOSB the 51% ownership must be unconditional and direct. For a general definition please see FAR 2.101 ([https://www.acquisition.gov/far/current/html/Subpart 2_1.html](https://www.acquisition.gov/far/current/html/Subpart%202.1.html)).

3. Proposal Preparation Instructions and Requirements

3.1 Fundamental Considerations

Multiple Proposal Submissions

Each proposal submitted must be based on a unique innovation, must be limited in scope to just one subtopic and shall be submitted only under that one subtopic within each program. An offeror shall not submit more than 3 proposals to the Select SBIR Program. An offeror may submit more than one unique proposal to the same subtopic; however, an offeror should not submit the same (or substantially equivalent) proposal to more than one subtopic. Submitting substantially equivalent proposals to several subtopics may result in the rejection of all such proposals. In order to enhance SBC participation, NASA does not plan to select more than 2 Select SBIR proposals from any one offeror under this solicitation.

Contract Deliverables

All Select Phase I contracts shall 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, and Phase I results; (3) its relevance and significance to one or more NASA needs (section 9); and (4) the strategy for development, transition of the proposed innovation, and Phase I results into products and services for NASA mission programs and other potential customers. Phase I contracts for Select Subtopics will provide a critical foundation for the development, demonstration and delivery of the innovation in a Phase II. It is expected that Phase I deliverables will emphasize a detailed and thorough presentation of items (2) and (4) above, or both, depending on the specific subtopic proposed to. Select Phase I deliverables may also include the demonstration of the proposed innovation and/or the delivery of a prototype or test unit, product or service for NASA testing and utilization. For SBIR Select Phase I contracts, a final NTSR is due at the end of the contract, prior to submission of the final invoice. See section 5.2 for gaining access to the Electronic Handbook (EHB) and submitting reports.

Report deliverables shall be submitted electronically via the Electronic Handbook (EHB). NASA requests the submission of report deliverables in PDF or Word format.

3.2 Select Phase I Proposal Requirements

3.2.1 General Requirements

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 needs as described in section 9; 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 and other potential customers.

3.2.2 Format Requirements

Proposals that do not follow the formatting requirement are subject to rejection during administrative screening.

Page Limitations and Margins

Any page(s) going over the required page limited will be deleted and omitted from the proposal review. A Phase I proposal shall not exceed a total of 23 standard 8 1/2 x 11 inch (21.6 x 27.9 cm) pages, inclusive of the technical content and the required forms. Forms A, B, and C count as one page each, regardless of whether the completed forms print as more than one page. Each page shall be numbered consecutively at the bottom. Margins shall be 1.0 inch (2.5 cm). All required items of information must be covered in the proposal and will count towards the total page count. The space allocated to each part of the technical content will depend on the project chosen and the offeror's approach.

Each proposal submitted must contain the following items in the order presented:

- (1) Cover Sheet (Form A), electronically endorsed, counts as 1 page towards the 23-page limit.
- (2) Proposal Summary (Form B), counts as 1 page towards the 23-page limit (and must not contain proprietary data).
- (3) Budget Summary (Form C), counts as 1 page towards the 23-page limit.
- (4) Technical Content (11 parts in order as specified in section 3.2.4, not to exceed 20 pages), including all graphics, with a table of contents.
- (5) Briefing Chart, is not included in the 23-page limit (and must not contain proprietary data).
- (6) NASA Research License Application is not included in the 23-page limit (only if TAV is being proposed).

Note: Letters of general endorsement are not required or desired and will not be considered during the review process. However, if submitted, such letter(s) will count against the page limit.

In addition to the above items, each offeror must submit the following firm level forms, which must be filled out once during each submission period and are applicable to all firm proposals submissions:

- (7) Firm Level Certifications, are not included in the 23-page limit.
- (8) Audit Information, is not included in the 23-page limit.
- (9) Prior Awards Addendum, is not included in the 23-page limit.
- (10) Commercial Metrics Survey, is not included in the 23-page limit.

Previews of all forms and certifications are available via the NASA SBIR/STTR Firm Library, located at: (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html).

Please note: Website references, relevant technical papers, product samples, videotapes, slides, or other ancillary items will not be considered during the review process.

Type Size

No type size smaller than 10 point shall be used for text or tables, except as legends on reduced drawings. Proposals prepared with smaller font sizes will be rejected without consideration.

Header/Footer Requirements

Header must include firm name, proposal number, and project title. Footer must include the page number and proprietary markings if applicable. Margins can be used for header/footer information.

Classified Information

NASA does not accept proposals that contain classified information.

3.2.3 Forms

All form submissions shall be done electronically, with each form counting as 1 page towards the 23-page limit and accounting for pages 1-3 of the proposal regardless of the length.

3.2.3.1 Cover Sheet (Form A)

A sample Cover Sheet (Form A) is provided in the NASA SBIR/STTR Firm Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html). The offeror shall provide complete information for each item and submit the form as required in section 6. The proposal project title shall be concise and descriptive of the proposed effort. The title should not use acronyms or words like "Development of" or "Study of." The NASA research topic title must not be used as the proposal title. Form A counts as one page towards the 23-page limit.

3.2.3.2 Proposal Summary (Form B)

A sample Proposal Summary (Form B) is provided in the NASA SBIR/STTR Firm Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html). The offeror shall provide complete information for each item and submit Form B as required in section 6. Form B counts as one page towards the 23-page limit.

Note: Proposal Summary (Form B), including the Technical Abstract, is public information and may be disclosed. Do not include proprietary information on Form B.

3.2.3.3 Budget Summary (Form C)

A sample of the Budget Summary (Form C) is provided in the NASA SBIR/STTR Firm Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html). The offeror shall complete the Budget Summary following the instructions provided with the sample form. The total requested funding for the Phase I effort shall not exceed \$125,000. A text box is provided on the electronic budget form for additional explanation. Information shall be submitted to explain the offeror's plans for use of the requested funds to enable NASA to determine whether the proposed price is fair and reasonable. Form C counts as one page towards the 23-page limit.

Note: The Government is not responsible for any monies expended by the firm before award of any contract.

3.2.4 Technical Proposal

This part of the submission should not contain any budget data and must consist of all eleven (11) parts listed below in the given order. All eleven parts of the technical proposal must be numbered and titled. Parts that are not applicable must be included and marked "Not Applicable." A proposal omitting any part will be considered non-responsive to this solicitation and will be rejected during administrative screening. The required table of contents is provided below:

Phase I Table of Contents

Part 1: Table of Contents.....	Page 4
Part 2: Identification and Significance of the Innovation	
Part 3: Technical Objectives	
Part 4: Work Plan	
Part 5: Related R/R&D	
Part 6: Key Personnel and Bibliography of Directly Related Work	
Part 7: Relationship with Phase II or Future R/R&D	
Part 8: Facilities/Equipment	
Part 9: Subcontracts and Consultants	
Part 10: Potential Post Applications	
Part 11: Essentially Equivalent and Duplicate Proposals and Awards	

Part 1: Table of Contents

The technical proposal shall begin with a brief table of contents indicating the page numbers of each of the parts of the proposal and should start on page 4 because Forms A, B, and C account for pages 1-3.

Part 2: Identification and Significance of the Proposed Innovation

Succinctly describe:

- (1) The proposed innovation;
- (2) the relevance and significance of the proposed innovation to a need or needs, within a subtopic described in section 9; and
- (3) the proposed innovation relative to the state of the art.

Part 3: Technical Objectives

State the specific objectives of the Phase I R/R&D effort including the technical questions posed in the subtopic description that must be answered to determine the feasibility of the proposed innovation.

TAV Note: All offerors submitting proposals who are planning to use NASA IP must describe their planned developments with the IP. The NASA Research License Application should be added as an attachment at the end of the proposal and will not count towards the 23-page limit (See paragraph 1.6).

Part 4: Work Plan

Include a detailed description of the Phase I R/R&D plan to meet the technical objectives. The plan should indicate what will be done, where it will be done, and how the R/R&D will be carried out. Discuss in detail the methods planned to achieve each task or objective. Task descriptions, schedules, resource allocations, estimated task hours for each key personnel and planned accomplishments including project milestones shall be included.

Part 5: Related R/R&D

Describe significant current and/or previous R/R&D that is directly related to the proposal including any conducted by the PI or by the offeror. Describe how it relates to the proposed effort and any planned coordination with outside sources. The offeror must persuade reviewers of his or her awareness of key recent R/R&D conducted by others in the specific subject area. As an option, the offeror may use this section to include bibliographic references.

Please note:

This solicitation complies with Executive Order 13329 (issued February 26, 2004) directing Federal agencies that administer the SBIR and STTR programs to encourage innovation in manufacturing related research and development consistent with the objectives of each agency and to the extent permitted by law.

On February 26, 2004, the President issued Executive Order 13329 (69 FR 9181) entitled “Encouraging Innovation in Manufacturing.” In response to this Executive Order, NASA encourages the submission of applications that deal with some aspect of innovative manufacturing technology. **If a proposal has a connection to manufacturing this should be indicated in the Part 5 (Related R/R&D) of the proposal and a brief explanation of how it is related to manufacturing should be provided.**

Energy Independence and Security Act of 2007, section 1203, stated that federal agencies shall give high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system research and development projects. **If a proposal has a connection to energy efficiency or alternative and renewable energy this should be indicated in Part 5 (Related R/R&D) of the proposal. Provide a brief explanation of how it is related to energy efficiency and alternative and renewable energy.**

Part 6: Key Personnel and Bibliography of Directly Related Work

Identify all key personnel involved in Phase I activities whose expertise and functions are essential to the success of the project. Provide bibliographic information including directly related education and experience.

The PI is considered key to the success of the effort and must make a substantial commitment to the project. The following requirements are applicable:

Functions: The functions of the PI are: planning and directing the project; leading it technically and making substantial personal contributions during its implementation; serving as the primary contact with NASA on the project; and ensuring that the work proceeds according to contract agreements. Competent management of PI functions is essential to project success. The Select Phase I proposal shall describe the nature of the PI's activities and the amount of time that the PI will personally apply to the project. The amount of time the PI proposes to spend on the project must be acceptable to the Contracting Officer.

Qualifications: The qualifications and capabilities of the proposed PI and the basis for PI selection are to be clearly presented in the proposal. NASA has the sole right to accept or reject a PI based on factors such as education, experience, demonstrated ability and competence, and any other evidence related to the specific assignment.

Eligibility: This part shall also establish and confirm the eligibility of the PI, and indicate the extent to which other proposals recently submitted or planned for submission in 2014 and existing projects commit the time of the PI concurrently with this proposed activity. Any attempt to circumvent the restriction on PIs working more than half time for an academic or a nonprofit organization by substituting an ineligible PI will result in rejection of the proposal. Please see section 1.5.3 for further explanation.

Part 7: Relationship with Future R/R&D

State the anticipated results of the proposed R/R&D effort if the project is successful (through Phase I and Phase II). Discuss the significance of the Phase I effort in providing a foundation for the Phase II R/R&D effort and for follow-on development, application and commercialization efforts (Phase III).

Part 8: Facilities/Equipment

General: Describe available equipment and physical facilities (this should include physical location [where the work is to be performed], square footage, and major equipment) necessary to carry out the proposed Phase II and projected Phase III efforts. Items of equipment or facilities to be purchased (as detailed in the cost proposal) shall be justified under this section.

Use of Federal facilities or equipment: In accordance with the Federal Acquisition Regulations (FAR) Part 45, it is NASA's policy not to provide facilities (capital equipment, tooling, test and computer facilities, etc.) for the performance of work under SBIR contracts. Generally an SBC will furnish its own facilities to perform the proposed work on the contract. Government-wide SBIR policies restrict the use of any SBIR funds for the use of Federal equipment and facilities (except for those facilities designated as a Federal laboratory). This does not preclude an SBC from utilizing a Federal facility or Federal equipment, but any charges for such use may not be paid for with SBIR funds. In rare and unique circumstances, SBA may issue a case-by-case waiver to this provision after review of an agency's written justification. Federal facilities designated as Federal laboratories are exempt from this waiver requirement (see 15 U.S.C. § 3710a(d) and the SBA SBIR Policy Directive). Any NASA facility generally would be considered a Federal laboratory; however, requests for things such as office space would be deemed to be a Federal facility requiring a waiver. Additionally, NASA may not and cannot fund the use of the Federal facility (including Federal laboratories) or personnel for the SBIR project with NASA program or project money.

When a proposed project or product demonstration requires the use of a unique Federal facility that is not designated as a Federal laboratory to be funded by the SBIR Program, then the offeror must provide a) a letter from the SBC Official explaining why the SBIR research project requires the use of the Federal facility or personnel, including data that verifies the absence of non-Federal facilities or personnel capable of supporting the research effort, and b) a statement, signed by the appropriate Government official at the facility, verifying that it will be available for the required effort. Proposals requiring waivers must explain why the waiver is appropriate. NASA will provide this explanation to SBA during the Agency waiver process. NASA cannot guarantee that a waiver from this policy can be obtained from SBA. These letters should be uploaded in Form C of your proposal. **Failure to provide this explanation and a written letter of availability from the Government official authorized to approve such use may invalidate any proposal selection.**

When a proposed project or product demonstration requires the use of a Federal laboratory then the offeror must provide a letter justifying the use of a Federal laboratory from the SBC official, as well as, a letter from the Government agency that verifies the availability. These letters should be uploaded in Form C of your proposal. **Failure to provide a written letter of availability from the Government official authorized to approve such use of the Federal laboratory and the letter of justification from the SBC shall invalidate any proposal selection.**

Additionally, any proposer requiring the use of Federal laboratory, property, or facilities must, within ten (10) business days of notification of selection for negotiations, provide to the NASA Shared Services Center Contracting Officer all required documentation, to include, an agreement by and between the Contractor and the appropriate Federal facility, executed by the Government official authorized to approve such use. The Agreement must delineate the terms of use, associated costs, property and facility responsibilities and liabilities.

Part 9: Subcontracts and Consultants

Subject to the restrictions set forth below, the SBC may establish business arrangements with other entities or individuals to participate in performance of the proposed R/R&D effort. The offeror must describe all subcontracting or other business arrangements, and identify the relevant organizations and/or individuals with whom arrangements are planned. The expertise to be provided by the entities must be described in detail, as well as the functions, services, and number of hours. Offerors are responsible for ensuring that all organizations and individuals proposed to be utilized are actually available for the time periods required. Subcontract costs should be documented in the subcontractor/consultant budget section in Form C and supporting documentation should be uploaded for each (appropriate documentation is specified in Form C). Subcontractors' and consultants' work has the same place of

performance restrictions as stated in section 1.5.2. **The following restrictions apply to the use of subcontracts/consultants:**

Select SBIR Phase I Subcontracts/Consultants
The proposed subcontracted business arrangements must not exceed 33 percent of the research and/or analytical work (as determined by the total cost of the proposed subcontracting effort (to include the appropriate OH and G&A) in comparison to the total effort (total contract price including cost sharing, if any, less profit if any).

Example: Total price to include profit - \$99,500
Profit - \$3,000
Total price less profit - \$99,500 - \$3,000 = \$96,500
Subcontractor cost - \$29,500
G&A - 5%
G&A on subcontractor cost - \$29,500 x 5% = \$1,475
Subcontractor cost plus G&A - \$29,500 + \$1,475 = \$30,975
Percentage of subcontracting effort – subcontractor cost plus G&A/total price less profit - \$30,975/\$96,500 = 32.1%

For a Select SBIR Phase I this is acceptable since it is below the limitation of 33%.

Part 10: Potential Post Applications (Commercialization)

The Select Phase I proposal shall (1) forecast the potential and targeted application(s) of the proposed innovation and associated products and services relative to NASA needs (infusion into NASA mission needs and projects) (section 9), other Government agencies and commercial markets, (2) identify potential customers, and (3) provide an initial commercialization strategy that addresses key technical, market and business factors for the successful development, demonstration and utilization of the innovation and associated products and services. Commercialization encompasses the transition of technology into products and services for NASA mission programs, other Government agencies, and non-Government markets.

Part 11a: Essentially Equivalent and Duplicate Proposals and Awards

WARNING – While it is permissible with proposal notification to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous Federal program solicitations, it is unlawful to enter into funding agreements requiring essentially equivalent work. Offerors are at risk for submitting essentially equivalent proposals and therefore, are strongly encouraged to disclose these issues to the soliciting agency to resolve the matter prior to award. See Part 11b.

If an applicant elects to submit identical proposals or proposals containing a significant amount of essentially equivalent work under other Federal program solicitations, a statement must be included in each such proposal indicating:

- (1) The name and address of the agencies to which proposals were submitted or from which awards were received.
- (2) Date of proposal submission or date of award.
- (3) Title, number, and date of solicitations under which proposals were submitted or awards received.
- (4) The specific applicable research topics for each proposal submitted for award received.
- (5) Titles of research projects.
- (6) Name and title of principal investigator or project manager for each proposal submitted or award received.

A summary of essentially equivalent work information is also required on Form A.

Part 11b: Related Research and Development Proposals and Awards

All federal agencies have a mandate to reduce waste, fraud, and abuse in federally funded programs. The submission of essentially equivalent work and the acceptance of multiple awards for essentially equivalent work in the SBIR/STTR Program have been identified as an area of abuse and possibly fraud. SBIR/STTR funding agencies and the Office of the Inspector General are actively evaluating proposals and awards to eliminate this problem. Related research and development includes proposals and awards that do not meet the definition of “Essentially Equivalent Work” (see section 2.4), but are related to the technology innovation in the proposal being submitted. Related research and development could be interpreted as essentially equivalent work by outside reviewers without additional information. Therefore, if you are submitting closely related proposals or your firm has closely related research and development that is currently or previously funded by NASA or other federal agencies, it is to your advantage to describe the relationships between this proposal and related efforts clearly delineating why this should not be considered an essentially equivalent work effort. These explanations should not be longer than one page, will not be included in the page count, and will not be part of the technical evaluation of the proposal.

3.2.5 Briefing Chart

An electronic form will be provided during the submissions process. The one-page briefing chart is required to assist in the ranking and advocacy of proposals prior to selection. It is not counted against the 23-page limit, and must not contain any proprietary data or ITAR restricted data.

3.2.6 Firm Level Certifications

Firm level certifications that are applicable across all proposal submissions submitted to this solicitation must be completed via the “Certifications” section of the Proposal Submission Electronic Handbook. The offeror must answer Yes or No as applicable. An example of the certification can be found in the NASA SBIR/STTR Firm Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html).

Note: The designated firm admin, typically the first person to register your firm, is the only individual authorized to update the certifications.

3.2.7 Audit Information

The SBC shall complete the questions regarding the firm’s rates and upload the Federal agency audit report or related information that is available from the last audit. If your firm has never been audited by a federal agency, then answer “No” to the first question and you do not need to complete the remainder of the form. The “Audit Information” will be used to assist the contracting officer with negotiations if the proposal is selected for award. If the audit provided is not acceptable, they will be advised by the contracting officer on what is required to determine reasonable cost and/or rates. There is a separate “Audit Information” section in Forms C that must also be completed. The audit information is not included in the 23-page limit. An electronic form will be provided during the submissions process.

Note: The designated firm admin, typically the first person to register your firm, is the only individual authorized to update the audit information.

3.2.8 Prior Awards Addendum

If the SBC has received more than 15 Phase II awards in the prior 5 fiscal years, submit name of awarding agency, date of award, funding agreement number, amount, topic or subtopic title, follow-on agreement amount, source, and date of commitment and current commercialization status for each Phase II. If your firm has received any SBIR or STTR Phase II awards, even if it has received fewer than 15 in the last 5 years, it is still recommended that you complete this form for those Phase II awards your firm did receive. This information will be useful when completing the Commercialization Metrics Survey, and in tracking the overall success of the SBIR and STTR programs. Any NASA Phase II awards your firm has received will be automatically populated in the electronic form, as are any Phase II awards previously entered by the SBC during prior submissions (you may update the information for these awards). The addendum is not included in the 23-page limit. An electronic form will be provided during the submissions process.

Note: The designated firm admin, typically the first person to register your firm, is the only individual authorized to update the addendum information.

3.2.9 Commercial Metrics Survey

NASA has instituted a comprehensive commercialization survey/data gathering process for firms with prior NASA SBIR/STTR awards. If the SBC has received any Phase III awards resulting from work on any NASA SBIR or STTR awards, provide the related Phase I or Phase II contract number, name of Phase III awarding agency, date of award, funding agreement number, amount, project title, and period of performance. The survey will also ask for firm sales and ownership information, as well as any commercialization success the firm has had as a result of Phase II SBIR or STTR awards. This information will allow firms to demonstrate their ability to carry SBIR/STTR research through to achieve commercial success, and allow agencies to track the overall commercialization success of their SBIR and STTR programs. The survey is not included in the 23-page limit and content should be limited to information requested above. An electronic form will be provided during the submissions process.

Note: Information received from SBIR/STTR awardees completing the survey is kept confidential, and will not be made public except in broad aggregate, with no firm-specific attribution. The Commercialization Metrics Survey is a required part of the proposal submissions process and must be completed via the Proposal Submission Electronic Handbook

3.2.10 Contractor Responsibility Information

No later than 10 business days after the notification of selection for negotiations the offeror shall provide a signed statement from your financial institution(s), on its letterhead, stating whether or not your firm is in good standing and how long you have been with the institution will be required. In addition the offeror shall provide three references with a point of contact, e-mail address, telephone number, contract/reference number. Firms must ensure that the information provided is current and accurate.

4. Method of Selection and Evaluation Criteria

4.1 Select Phase I Proposals

All proposals will be evaluated and ranked on a competitive basis. Proposals will be initially screened to determine responsiveness. Proposals determined to be responsive to the administrative requirements of this Solicitation and having a reasonable potential of meeting a NASA need, as evidenced by the technical abstract included in the Proposal Summary (Form B), will be technically evaluated by NASA personnel to determine the most promising technical and scientific approaches. Each proposal will be reviewed on its own merit. NASA is under no obligation to fund any proposal or any specific number of proposals in a given topic. It also may elect to fund several or none of the proposed approaches to the same topic or subtopic.

4.1.1 Evaluation Process

Proposals shall provide all information needed for complete evaluation. Evaluators will not seek additional information. NASA scientists and engineers will perform evaluations. Also, qualified experts outside of NASA (including industry, academia, and other Government agencies) may assist in performing evaluations as required to determine or verify the merit of a proposal. Offerors should not assume that evaluators are acquainted with the firm, key individuals, or with any experiments or other information. Any pertinent references or publications should be noted in part 5 of the technical proposal.

4.1.2 Select Phase I Evaluation Criteria

NASA intends to select for award those proposals offering the most advantageous technology to the Government and the Select SBIR Program. NASA will give primary consideration to the scientific and technical merit and feasibility of the proposal and its benefit to NASA. Each proposal will be evaluated and scored on its own merits using the factors described below:

Factor 1: Scientific/Technical Merit and Feasibility

The proposed R/R&D effort will be evaluated on whether it offers a clearly innovative and feasible technical approach to the described NASA problem area. Proposals must clearly demonstrate relevance to the subtopic as well as one or more NASA mission and/or programmatic needs. Specific objectives, approaches and plans for developing and verifying the innovation must demonstrate a clear understanding of the problem and the current state of the art. The degree of understanding and significance of the risks involved in the proposed innovation must be presented.

Factor 2: Experience, Qualifications and Facilities

The technical capabilities and experience of the PI, project manager, key personnel, staff, consultants and subcontractors, if any, are evaluated for consistency with the research effort and their degree of commitment and availability. The necessary instrumentation or facilities required must be shown to be adequate and any reliance on external sources, such as Government furnished equipment or facilities, addressed (section 3.2.4, part 8).

Factor 3: Effectiveness of the Proposed Work Plan

The work plan will be reviewed for its comprehensiveness, effective use of available resources, labor distribution, and the proposed schedule for meeting the Phase I objectives. The methods planned to achieve each objective or task should be discussed in detail. The proposed path beyond Phase I for further development and infusion into a NASA mission or program will also be reviewed. Please see Factor 5 for price evaluation criteria.

Factor 4: Commercial Potential and Feasibility

The proposal will be evaluated for the commercial potential and feasibility of the proposed innovation and associated products and services. The offeror's experience and record in technology commercialization, co-funding commitments from private or non-SBIR funding sources, existing and projected commitments for Phase III funding, investment, sales, licensing, and other indicators of commercial potential and feasibility will be considered along with the initial commercialization strategy for the innovation. Commercialization encompasses the infusion of innovative technology into products and services for NASA mission programs, other Government agencies and non-Government markets.

Factor 5: Price Reasonableness

The offeror's cost proposal will be evaluated for price reasonableness based on the information provided in Form C. NASA will comply with the FAR and NASA FAR Supplement (NFS) to evaluate the proposed price/cost to be fair and reasonable.

After completion of evaluation for price reasonableness and determination of responsibility the Contracting Officer shall submit a recommendation for award to the Source Selection Official.

Scoring of Factors and Weighting

Factors 1, 2, and 3 will be scored numerically with Factor 1 worth 50 percent and Factors 2 and 3 each worth 25 percent. The sum of the scores for Factors 1, 2, and 3 will comprise the Technical Merit score. The evaluation for Factor 4, Commercial Potential and Feasibility, will be in the form of an adjectival rating (Excellent, Very Good, Average, Below Average, Poor). For Select Phase I proposals, Technical Merit is more important than Commercial Merit. Factors 1 - 4 will be evaluated and used in the selection of proposals for negotiation. Factor 5 will be evaluated and used in the selection for award.

4.1.3 Selection

Proposals recommended for negotiations 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 has the final authority for choosing the specific proposals for contract negotiation. The selection decisions 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.

The list of proposals selected for negotiation will be posted on the NASA SBIR/STTR website (<http://sbir.nasa.gov>). All firms will receive a formal notification letter. A Contracting Officer will negotiate an appropriate contract to be signed by both parties before work begins.

4.2 Debriefing of Unsuccessful Offerors

After Select Phase I selections for negotiation have been announced, all unsuccessful offerors will be notified. Debriefings will be automatically e-mailed to the designated Business Official within 60 days of the announcement of selection for negotiation. If you have not received your debriefing by this time, contact the SBIR/STTR Program Support Office at ARC-SBIR-PMO@mail.nasa.gov. Telephone requests for debriefings will not be accepted. Debriefings are not opportunities to reopen selection decisions. They are intended to acquaint the offeror with perceived strengths and weaknesses of the proposal in order to help offerors identify constructive future action by the offeror. Debriefings will not disclose the identity of the proposal evaluators, proposal scores, the content of, or comparisons with other proposals.

5. Considerations

5.1 Awards

5.1.1 Availability of Funds

All Select Phase I awards are subject to availability of funds. NASA has no obligation to make any specific number of awards based on this solicitation, and may elect to make several or no awards in any specific technical topic or subtopic.

Select SBIR Contracts
Phase I contracts will be firm-fixed-price, for values not exceeding \$125,000, and contractors will have up to 6 months to carry out their projects, prepare their final reports, and submit Phase II proposals.

5.1.2 Contracting

To simplify contract award and reduce processing time, all contractors selected for Phase I contracts should ensure that:

- (1) All information in your proposal is current, e.g., your address has not changed, the proposed PI is the same, etc. If changes have occurred since submittal of your proposal, notify contracting officer immediately.
- (2) Your firm is registered with System for Award Management (SAM). NASA has transitioned to SAM. It is the Official U.S. Government system that consolidated the CCR/FedReg, ORCA, and EPLS systems.
- (3) The VETS 100 report submitted by your firm to the Department of Labor is current and submitted to the contracting officer within 10 business days of the notification of selection for negotiation.
- (4) Your firm HAS NOT proposed a Co-Principal Investigator.
- (5) STTR selectees should execute their Allocation of Rights Agreement within 10 business days of the notification of selection for negotiation.
- (6) Your firm has a timely response to all communications from the NSSC Contracting Officer.

Please note: NASA will be transitioning to the DOD system, Wide Area WorkFlow (WAWF). During the duration of the contract your firm may be required to register with the WAWF system. It is a secure web based system for electronic invoicing, receipt, and acceptance. The WAWF website is located at: (<https://wawf.eb.mil/>).

From the time of proposal notification of selection for negotiation, until the award of a contract, all communications shall be submitted electronically to NSSC-SBIR-STTR@nasa.gov.

Note: Costs incurred prior to and in anticipation of award of a contract are entirely the risk of the contractor in the event that a contract is not subsequently awarded. A notification of selection for negotiation is not to be misconstrued as an award notification to commence work.

Select Phase I Model Contract

An example of the Select Phase I contracts can be found in the NASA SBIR/STTR Firm Library: https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html. **Note: Model contracts are subject to change.**

5.2 Select Phase I Reporting

The technical reports and other deliverables are required as described in the contract and are to be provided to NASA. These reports shall document progress made on the project and activities required for completion. Periodic certification for payment will be required as stated in the contract. A final report must be submitted to NASA upon completion of the Phase I R/R&D effort in accordance with applicable contract provisions.

All required reports and other deliverables shall be submitted electronically via the EHB. Everyone with access to the NASA network will be required to use the NASA Account Management System (NAMS). This is the Agency's centralized system for requesting and maintaining accounts for NASA IT systems and applications. The system contains user account information, access requests, and account maintenance processes for NASA employees, contractors, and remote users such as educators and foreign users. A basic background check is required for this account.

5.3 Payment Schedule for Select Phase I

All NASA Select SBIR contracts are firm-fixed-price contracts. The exact payment terms for the Select Phase I will be included in the contract.

Invoices: All invoices are required to be submitted electronically via the SBIR/STTR website in the EHB.

5.4 Release of Proposal Information

In submitting a proposal, the offeror agrees to permit the Government to disclose publicly the information contained on the Proposal Summary (Form B). Other proposal data is considered to be the property of the offeror, and NASA will protect it from public disclosure to the extent permitted by law including the Freedom of Information Act (FOIA).

5.5 Access to Proprietary Data by Non-NASA Personnel

5.5.1 Non-NASA Reviewers

In addition to Government personnel, NASA, at its discretion and in accordance with 1815.207-71 of the NASA FAR Supplement, may utilize qualified individuals from outside the Government in the proposal review process. Any decision to obtain an outside evaluation shall take into consideration requirements for the avoidance of organizational or personal conflicts of interest and the competitive relationship, if any, between the prospective contractor or subcontractor(s) and the prospective outside evaluator. Any such evaluation will be under agreement with the evaluator that the information (data) contained in the proposal will be used only for evaluation purposes and will not be further disclosed.

5.5.2 Non-NASA Access to Confidential Business Information

In the conduct of proposal processing and potential contract administration, the Agency may find it necessary to provide proposal access to other NASA contractor and subcontractor personnel. NASA will provide access to such data only under contracts that contain an appropriate NFS 1852.237-72 Access to Sensitive Information clause that requires the contractors to fully protect the information from unauthorized use or disclosure.

5.6 Proprietary Information in the Proposal Submission

If proprietary information is provided by an applicant in a proposal, which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security, it will be treated in confidence to the extent permitted by law. This information must be clearly marked by the applicant as confidential proprietary information. NASA will treat in confidence pages listed as proprietary in the following legend that appears on the Cover Sheet (Form A) of the proposal:

"This data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of this proposal, provided that a funding agreement is awarded to the offeror as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use or disclose the data to the extent provided in the funding agreement and pursuant to applicable law. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction are contained in pages ____ of this proposal."

Note: Do not label the entire proposal proprietary. The Proposal Summary (Form B), and the Briefing Chart should not contain proprietary information; and any page numbers that would correspond to these must not be designated proprietary in Form A.

Information contained in unsuccessful proposals will remain the property of the applicant. The Government will, however, retain copies of all proposals.

5.7 Limited Rights Information and Data

The clause at FAR 52.227-20, Rights in Data—SBIR/STTR Program, governs rights to data used in, or first produced under, any Phase I or Phase II contract. The following is a brief description of FAR 52.227-20, it is not intended to supplement or replace the FAR.

5.7.1 Non-Proprietary Data

Some data of a general nature are to be furnished to NASA without restriction (i.e., with unlimited rights) and may be published by NASA. This data will normally be limited to the project summaries accompanying any periodic progress reports and the final reports required to be submitted. The requirement will be specifically set forth in any contract resulting from this solicitation.

5.7.2 Proprietary Data

If the contractor desires to continue protection of proprietary data, it shall deliver form, fit, and function data and shall not deliver the proprietary data. Data is considered to be “proprietary” when the data is developed at a private expense and (1) embodies trade secrets or contains commercial, financial and confidential, privileged information, or (2) is computer software.

5.7.3 Non-Disclosure Period

As part of SBIR contracts, for a period of 4 years after acceptance of all items to be delivered under an SBIR /STTR contract, the Government agrees to use these data for Government purposes only and they shall not be disclosed outside the Government (including disclosure for procurement purposes) during such period without permission of the Contractor, except that subject to the foregoing use and disclosure prohibitions, such data may be disclosed for use by support Contractors. After the aforesaid 4-year period, the Government has a royalty-free license to use, and to authorize others to use on its behalf, these data for Government purposes, but is relieved of all disclosure prohibitions and assumes no liability for unauthorized use of these data by third parties.

5.7.4 Copyrights

Subject to certain licenses granted by the contractor to the Government, the contractor receives copyright to any data first produced by the contractor in the performance of an SBIR/STTR contract.

5.7.5 Invention Reporting, Election of Title and Patent Application Filing

NASA Select SBIR contracts will include FAR 52.227-11 Patent Rights – Ownership by the Contractor, which requires the SBIR/STTR contractors to do the following. Contractors must disclose all subject inventions to NASA within two (2) months of the inventor’s report to the awardees. A subject invention is any invention or discovery which is or may be patentable, and is conceived or first actually reduced to practice in the performance of the contract. Once the contractor discloses a subject invention, the contractor has up to 2 years to notify the Government whether it elects to retain title to the subject invention. If the contractor elects to retain title, a patent application covering the subject invention must be filed within 1 year. If the contractor fails to do any of these within time specified periods, the Government has the right to obtain title. To the extent authorized by 35 USC 205, the Government will not make public any information disclosing such inventions, allowing the contractor the permissible time to file a patent.

Per the NASA FAR Supplement 1852.227-11 Patent Rights--Retention by the Contractor (Short Form) the awardee may use whatever format is convenient to report inventions. NASA prefers that the awardee use either the electronic or paper version of NASA Form 1679, Disclosure of Invention and New Technology (Including Software), to report inventions. Both the electronic and paper versions of NASA Form 1679 may be accessed at the electronic New Technology Reporting Web site (<http://ntr.ndc.nasa.gov/>).

A New Technology Summary Report (NTSR) listing all inventions developed under the contract or certifying that no inventions were developed must be also be submitted. Both NASA Form 1679 and the NTSR shall also be uploaded to the SBIR/STTR EHB at (<https://ehb8.gsfc.nasa.gov/contracts/public/firmHome.do>).

5.8 Profit or Fee

Select Phase I contracts may include a reasonable profit. The reasonableness of proposed profit is determined by the Contracting Officer during contract negotiations. Reference FAR 15.404-4.

5.9 Joint Ventures and Limited Partnerships

Both joint ventures and limited partnerships are permitted, provided the entity created qualifies as an SBC in accordance with the definition in section 2.23. A statement of how the workload will be distributed, managed, and charged should be included in the proposal. A copy or comprehensive summary of the joint venture agreement or partnership agreement should be appended to the proposal. This will not count as part of the 23-page limit for the Phase I proposal.

5.10 Essentially Equivalent Awards and Prior Work

If an award is made pursuant to a proposal submitted under either, Select SBIR, SBIR or STTR Solicitations, the firm will be required to certify with every invoice that it has not previously been paid nor is currently being paid for essentially equivalent work by any agency of the Federal Government. Failure to report essentially equivalent or duplicate efforts can lead to the termination of contracts or civil or criminal penalties.

5.11 Additional Information

5.11.1 Precedence of Contract Over Solicitation

This Program Solicitation reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting Select SBIR contract, the terms of the contract are controlling.

5.11.2 Evidence of Contractor Responsibility

In addition to the information required to be submitted in section 3.2.10, before award of an SBIR contract, the Government may request the offeror to submit certain organizational, management, personnel, and financial information to establish responsibility of the offeror. Contractor responsibility includes all resources required for contractor performance, i.e., financial capability, work force, and facilities.

5.11.3 1852.225-70 Export Licenses

The contractor shall comply with all U.S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR). Offerors are responsible for ensuring that all employees who will work on this contract are eligible under export control and International Traffic in Arms (ITAR) regulations. Any employee who is not a U.S. citizen or a permanent resident may be restricted from working on this contract if the technology is restricted under export control and ITAR regulations unless the prior approval of the Department of State or the Department of Commerce is obtained via a technical assistance agreement or an export license. Violations of these regulations can result in criminal or civil penalties. For further information on ITAR visit (http://www.pmdtcc.state.gov/regulations_laws/itar.html). For additional assistance, refer to (<http://sbir.gsfc.nasa.gov/content/training-resources>) or contact the NASA SBIR helpdesk at sbir@reisystems.com.

5.11.4 Government Furnished and Contractor Acquired Property

Title to property furnished by the Government or acquired with Government funds will be vested with the NASA, unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by NASA.

5.12 Required Registrations and Submissions

5.12.1 Firm SBA Firm Registry

SBA maintains and manages a Company Registry at (www.SBIR.gov) to track ownership and affiliation requirements for all companies applying to the SBIR Program. The SBIR policy directive requires each small business concern (SBC) applying for a Phase I or Phase II award to register in the Company Registry prior to submitting an application. A PDF document with the SBC registration information is available for download by the SBC upon successful registration. This PDF document must be saved by the SBC for inclusion in applications submitted to SBIR agencies. All SBCs must report and/or update ownership information to SBA prior to each SBIR application submission or if any information changes prior to award.

From the NASA SBIR/STTR Proposal Submission Electronic Handbook (EHB), the SBC must provide their unique SBC Control ID that gets assigned by SBA upon completion of the Company Registry registration, as well as upload the PDF document validating their registration. This information is submitted to NASA via a Firm level form in the Activity Worksheet and is applicable across all proposals submitted by the SBC for that specific solicitation.

5.12.2 Central Contractor Registration

Offerors should be aware of the requirement to register in the System for Award Management (SAM) prior to contract award. **To avoid a potential delay in contract award, offerors are required to register prior to submitting a proposal. Additionally, firms must certify the NAICS code of 541712.**

The SAM database is the primary repository for contractor information required for the conduct of business with NASA. It is maintained by the Department of Defense. To be registered in the SAM database, all mandatory information, which includes the DUNS or DUNS+4 number, and a CAGE code, must be validated in the SAM system. The DUNS number or Data Universal Number System is a 9-digit number assigned by Dun and Bradstreet Information Services (<http://www.dnb.com>) to identify unique business entities. The DUNS+4 is similar, but includes a 4-digit suffix that may be assigned by a parent (controlling) business concern. The CAGE code or Commercial Government and Entity Code is assigned by the Defense Logistics Information Service (DLIS) to identify a commercial or Government entity. If an SBC does not have a CAGE code, one will be assigned during the CCR registration process.

The DoD has established a goal of registering an applicant in the SAM database within 48 hours after receipt of a complete and accurate application via the Internet. Offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation. Offerors and contractors may obtain information on SAM registration and annual confirmation requirements via the Internet at (<https://www.sam.gov/>) or by calling 866-606-8220.

5.12.3 52.204-8 Annual Representations and Certifications

Offerors should be aware of the requirement that the Representation and Certifications required from Government contractors must be completed through SAM website (<https://www.sam.gov/>). FAC 01-26 implements the final rule for this directive and requires that all offerors provide representations and certifications electronically via the BPN website; to update the representations and certifications as necessary, but at least annually, to keep them current, accurate and complete. NASA will not enter into any contract wherein the Contractor is not compliant with the requirements stipulated herein.

5.12.4 52.222-37 Employment Reports on Special Disabled Veterans, Veterans of the Vietnam-Era, and Other Eligible Veterans

In accordance with Title 38, United States Code, Section 4212(d), the U.S. Department of Labor (DOL), Veterans' Employment and Training Service (VETS) collects and compiles data on the Federal Contractor Program Veterans' Employment Report (VETS-100 Report) from Federal contractors and subcontractors who receive Federal contracts that meet the threshold amount of \$100,000. The VETS-100 reporting cycle begins annually on August 1 and ends September 30. Any federal contractor or prospective contractor that has been awarded or will be awarded a federal contract with a value of \$100,000 or greater must have a current VETS 100 report on file. Please visit the DOL VETS 100 website at (<http://www.dol.gov/vets/programs/fcp/main.htm>). NASA will not enter into any contract wherein the firm is not compliant with the requirements stipulated herein.

5.12.5 1852.225-72 Restriction on funding Activity with China – Representation.

- (a) Definition - "China" or "Chinese-owned" means the People's Republic of China, any firm owned by the People's Republic of China or any firm incorporated under the laws of the People's Republic of China.
- (b) Public Laws 112-10, Section 1340(a) 112-55, Section 536, and Section 535, PL 113-6 restrict NASA from contracting to participate, collaborate, or coordinate bilaterally in any way with China or a Chinese-owned firm with funds appropriated on or after April 25, 2011. NASA anticipates this restriction will be in future appropriation acts. Contracts for commercial and non-developmental items are excepted from the prohibition as they constitute purchase of goods or services that would not involve participation, collaboration, or coordination between the parties.
- (c) Representation. By submission of its offer, the offeror represents that the offeror is not China or a Chinese-owned firm.

5.12.6 Software Development Standards

Offerors proposing projects involving the development of software should comply with the requirements of NASA Procedural Requirements (NPR) 7150.2, "NASA Software Engineering Requirements" are available online at (<http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=7150&s=2>).

5.12.7 Human and/or Animal Subject

Due to the complexity of the approval process, use of human and/or animal subjects is not allowed for Phase I contracts.

5.12.8 HSPD-12

Firms that require access to federally controlled facilities for six consecutive months or more must adhere to the following:

PIV Card Issuance Procedures in accordance with FAR clause 52.204-9 Personal Identity Verification of Contractor Personnel.

Purpose: To establish procedures to ensure that recipients of contracts are subject to essentially the same credentialing requirements as Federal Employees when performance requires physical access to a federally-controlled facility or access to a Federal information system **for six consecutive months or more**. (Federally - controlled facilities and Federal information system are defined in FAR 2.101(b)(2)).

Background: Homeland Security Presidential Directive 12 (HSPD-12), "Policy for a Common Identification Standard for Federal Employees and Contractors", and Federal Information Processing Standards Publication (FIPS PUB) Number 201, "Personal Identity Verification (PIV) of Federal Employees and Contractors" require agencies to establish and implement procedures to create and use a Government-wide secure and reliable form of identification NLT October 27, 2005. See: <http://csrc.nist.gov/publications/fips/fips201-1/FIPS-201-1-chng1.pdf>. In accordance with the FAR clause 52.204-9 Personal Identity Verification of Contractor Personnel which states in parts contractor shall comply with the requirements of this clause and shall ensure that individuals needing such access shall provide the personal background and biographical information requested by NASA.

If applicable, detailed procedures for the issuance of a PIV credential can be found at the following URL:
<http://itcd.hq.nasa.gov/PIV.html>.

5.13 False Statements

Knowingly and willfully making any false, fictitious, or fraudulent statements or representations may be a felony under the Federal Criminal False Statement Act (18 U.S.C. Sec 1001), punishable by a fine of up to \$10,000, up to five years in prison, or both. The Office of the Inspector General has full access to all proposals submitted to NASA.

6. Submission of Proposals

6.1 Submission Requirements

NASA uses electronically supported business processes for the Select SBIR Program. An offeror must have Internet access and an e-mail address. Paper submissions are not accepted.

The Electronic Handbook (EHB) for submitting proposals is located at (<http://sbir.nasa.gov>). The Proposal Submission EHB will guide the firms through the steps for submitting a Select SBIR proposal. All EHB submissions are through a secure connection. Communication between NASA's SBIR Program and the firm is primarily through a combination of EHBs and e-mail.

6.2 Submission Process

SBCs must register in the EHB to begin the submission process. Firms are encouraged to start the proposal process early, to allow for sufficient time to complete the submissions process. It is recommended that the Business Official, or an authorized representative designated by the Business Official, be the first person to register for the SBC. The SBC's Employer Identification Number (EIN)/Taxpayer Identification Number is required during registration.

Note: The designated firm admin, typically the first person to register your firm, is the only individual authorized to update and change the firm level forms (see section 6.2.1).

For successful proposal submission, SBCs must complete all forms online, upload their technical proposal in an acceptable format, and have the Business Official and Principle Investigator electronically endorse the proposal. Electronic endorsement of the proposal is handled online with no additional software requirements. The term "technical proposal" refers to the part of the submission as described in section 3.2.4.

6.2.1 What Needs to Be Submitted

The entire proposal including Forms A, B, C, the briefing chart, and other firm level forms must be submitted/completed via the Submissions EHB located on the NASA SBIR/STTR website. (Note: Other forms of submissions such as postal, paper, fax, diskette, or e-mail attachments are not acceptable).

- (1) Forms A, B, and C are to be completed online.
- (2) The technical proposal is uploaded from your computer via the Internet utilizing secure communication protocol.
- (3) Firms must submit a briefing chart online, which is not included in the page count (see section 3.2.5).
- (4) NASA Research License Application (only if the use of TAV is proposed).
- (5) The certifications, audit information, prior awards addendum, commercialization metrics survey are required and to be completed online. These are not included in the page count.

6.2.2 Technical Proposal Submissions

NASA converts all technical proposal files to PDF format for evaluation. Therefore, NASA requests that technical proposals be submitted in PDF format or MS Word. **Note: Embedded animation or video, as well as reference technical papers for "further reading" will not be considered for evaluation.**

Virus Check

The offeror is responsible for performing a virus check on each submitted technical proposal. As a standard part of entering the proposal into the processing system, NASA will scan each submitted electronic technical proposal for viruses. The detection, by NASA, of a virus on any electronically submitted technical proposal, may cause rejection of the proposal.

6.2.3 Technical Proposal Uploads

Firms will upload their proposals using the Submissions EHB. Directions will be provided to assist users. All transactions via the EHB are encrypted for security. Firms cannot submit security/password protected technical proposal and/or briefing chart files, as reviewers may not be able to open and read the files. An e-mail will be sent acknowledging each successful upload. Please verify the file name and file size in the confirmation email to ensure the correct proposal was uploaded. An example is provided below:

You may upload the technical proposal multiple times, with each new upload replacing the previous version, but only the final uploaded and electronically endorsed version will be considered for review.

6.3 Deadline for Select Phase I Proposal Receipt

All Select SBIR Phase I proposal submissions must be received no later than 5:00 p.m. EDT on Wednesday, January 29, 2014, via the NASA SBIR/STTR website (<http://sbir.nasa.gov>). The EHB will not be available for Internet submissions after this deadline. Any proposal received after that date and time shall be considered late and handled according to NASA FAR Supplement 1815.208.

6.4 Acknowledgment of Proposal Receipt

The final proposal submission includes successful completion of Form A (electronically endorsed by the SBC Official), Form B, Form C, the uploaded technical proposal, firm-level forms, and the briefing chart. NASA will acknowledge receipt of electronically submitted proposals upon endorsement by the SBC Official to the SBC Official's e-mail address as provided on the proposal cover sheet. If a proposal acknowledgment is not received, the offeror should call NASA SBIR/STTR Program Support Office at 301-937-0888.

6.5 Withdrawal of Proposals

Prior to the close of submissions, proposals may be withdrawn via the Proposal Submission Electronic Handbook hosted on the NASA SBIR/STTR website (<http://sbir.nasa.gov>). In order to withdraw a proposal after the deadline, the designated SBC Official must send written notification via email to sbir@reisystems.com.

6.6 Service of Protests

Protests, as defined in Section 33.101 of the FAR, that are filed directly with an agency and copies of any protests that are filed with the General Accounting Office (GAO) shall be served on the Contracting Officer by obtaining written and dated acknowledgement of receipt from the NASA SBIR/STTR Program contact listed below:

Cassandra Williams
NASA Shared Services Center
Building 1111, C Road
Stennis Space Center, MS 39529
Cassandra.Williams-1@nasa.gov

The copy of any protest shall be received within one calendar day of filing a protest with the GAO.

7. Scientific and Technical Information Sources

7.1 NASA Websites

General sources relating to scientific and technical information at NASA is available via the following web sites:

NASA Budget Documents, Strategic Plans, and Performance Reports: <http://www.nasa.gov/about/budget/index.html>

NASA Organizational Structure: <http://www.nasa.gov/centers/hq/organization/index.html>

NASA SBIR/STTR Programs: <http://sbir.nasa.gov>

7.2 United States Small Business Administration (SBA)

The Policy Directives for the SBIR/STTR Programs may be obtained from the following source. SBA information can also be obtained at: <http://www.sba.gov>.

U.S. Small Business Administration
Office of Technology – Mail Code 6470
409 Third Street, S.W.
Washington, DC 20416
Phone: 202-205-6450

7.3 National Technical Information Service

The National Technical Information Service is an agency of the Department of Commerce and is the Federal Government's largest central resource for Government-funded scientific, technical, engineering, and business related information. For information regarding their various services and fees, call or write:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 703-605-6000
URL: <http://www.ntis.gov>

8. Submission Forms and Certifications

Offerors must complete the “Certifications” section of the Proposal Submission Electronic Handbook , answering Yes or No to certifications as applicable.

Firms should carefully read each of the certification statements. The Federal government relies on the information to determine whether the business is eligible for a Small Business Innovation Research (SBIR) Program award. A similar certification will be used to ensure continued compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, SBA regulations (13 C.F.R. Part 121), the SBIR Policy Directive and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business may not meet certain eligibility requirements at the time of award, they are required to file a size protest with the U.S. Small Business Administration (SBA), who will determine eligibility. At that time, SBA will request further clarification and supporting documentation in order to assist in the verification of any of the information provided as part of a protest. If the funding agreement officer believes, after award, that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government’s right to pursue criminal, civil or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

In submitting the proposals including the certifications, each offeror understands that providing false information is a criminal offense under Title 18 US Code, Section 1001, False Statements, as well as Title 18 US Code, Section 287, False Claims.

Please note: Previews of all forms and certifications are available via the NASA SBIR/STTR Firm Library, located at: (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html).

Select SBIR Check List

For assistance in completing your Select Phase I proposal, use the following checklist to ensure your submission is complete.

1. **The entire proposal including any supplemental material shall not exceed a total of 23 8.5 x 11 inch pages and follow format requirement (section 3.2.2).**
2. The proposal and innovation is submitted for one subtopic only (section 3.1).
3. The entire proposal is submitted consistent with the requirements and in the order outlined in section 3.2.
4. The technical proposal contains all eleven parts in order (section 3.2.4).
5. A letter of commitment from the facility manager, if the research or R&D effort requires use of federal facilities (section 2.2.4).
6. Certifications in Form A are completed, and agree with the content of the technical proposal.
7. Proposed funding does not exceed \$125,000 (sections 1.4, 5.1.1).
8. Proposed project duration does not exceed 6 months (sections 1.4, 5.1.1).
9. Entire proposal including Forms A, B, and C submitted via the Internet.
 - a) All firm-level forms including: 1) The certifications, 2) audit information, 3) prior awards addendum, and 4) commercialization metrics survey.
10. Form A electronically endorsed by the SBC Official and the PI.
11. **Select Phase I proposals must be received no later than 5:00 p.m. EDT on Thursday, 29 January 2014 (section 6.3).**

National Aeronautics and Space Administration

**SMALL BUSINESS
INNOVATION RESEARCH (SBIR)**

**Part 2: Select Phase II Proposal Instructions and
Evaluation Criteria**

*The electronic version of this document
is at: <http://sbir.nasa.gov>*

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Fiscal year 2014 NASA Select SBIR Program Solicitation

1. Select SBIR Phase II Program Description

1.1 Introduction

This document provides a general description of the NASA Select SBIR Phase II Program and proposal submission requirements. All small business concerns (SBCs) that are awarded and have successfully completed their Select Phase I contracts are invited to submit Select Phase II proposals. Receipt of Select Phase II proposals are due on the last day of performance under Select SBIR Phase I contracts, the submission period will be available approximately 6 weeks prior to the contract completion date.

Proposals must be submitted online via the Proposal Submissions Electronic Handbook at (<http://sbir.nasa.gov>) and include all relevant documentation.

1.2 Select SBIR Phase II Description

Select Phase II

The purpose of Select Phase II is the development, demonstration and delivery of the innovation. Only SBCs awarded a Select Phase I contract are eligible to submit a proposal for a Select Phase II funding agreement. Select Phase II projects are chosen as a result of competitive evaluations and based on selection criteria provided in the Select Phase II Proposal Instructions and Evaluation Criteria. The funding outlined above for Select Phase II contracts should enable significant test, demonstration, and evaluation activities leading to technologies at high readiness levels for NASA utilization.

Maximum value and period of performance for Select Phase II contracts:

Phase II Contracts	SBIR
Maximum Contract Value	\$1,500,000
Period of Performance	24 months

1.3 Eligibility Requirements

1.3.1 Small Business Concern

Only firms qualifying as SBCs are eligible to participate in these programs. Socially and economically disadvantaged and women-owned SBCs are particularly encouraged to propose.

1.3.2 Place of Performance

R/R&D must be performed in the United States. However, based on a rare and unique circumstance (for example, if a supply or material or other item or project requirement is not available in the United States), NASA may allow a particular portion of the research or R&D work to be performed or obtained in a country outside of the United States. Proposals must clearly indicate if any work will be performed outside the United States. Prior to award, approval by the Contracting Officer for such specific condition(s) must be in writing.

Note: Offerors are responsible for ensuring that all employees who will work on this contract are eligible under export control and International Traffic in Arms (ITAR) regulations. Any employee who is not a U.S. citizen or a permanent resident may be restricted from working on this contract if the technology is restricted under export control and ITAR regulations unless the prior approval of the Department of State or the Department of Commerce is obtained via a technical assistance agreement or an export license. Violations of these regulations can result in criminal or civil penalties. For further information on ITAR visit (http://www.pmdtc.state.gov/regulations_laws/itar.html). For additional assistance, refer to (<http://sbir.gsfc.nasa.gov/content/training-resources>) or contact the NASA SBIR helpdesk at sbir@reisystems.com.

1.3.3 Principal Investigator (PI) Employment Requirement

The primary employment of the Principal Investigator (PI) shall be with the SBC. Primary employment means that more than 50% of the PI’s total employed time (including all concurrent employers, consulting, and self-employed time) is spent with the SBC at the time of award and during the entire period of performance. Primary employment with a small business concern precludes full-time employment at another organization. If the PI does not currently meet these primary employment requirements, then the offeror must explain how these requirements will be met if the proposal is selected for contract negotiations that may lead to an award. Co-Principle Investigators are not allowed.

Note: NASA considers a fulltime workweek to be nominally 40 hours and we consider 19.9-hour or more workweek elsewhere to be in conflict with this rule. In rare occasions, minor deviations from this requirement may be necessary; however, any minor deviation must be approved in writing by the Contracting Officer after consultation with the NASA SBIR Program Manager/Business Manager.

Requirements	SBIR
Primary Employment	PI must be employed with the SBC
Employment Certification	The offeror must certify in the proposal that the primary employment of the PI will be with the SBC at the time of award and during the conduct of the project.
Co-PIs	Not Allowed
Misrepresentation of Qualifications	Shall result in rejection of the proposal or termination of the contract
Substitution of PIs	Shall receive advanced written approval from NASA

1.4 NASA SBIR Technology Available (TAV)

All subtopics have the option of using Technology Available (TAV) with NASA IP (defined below), which may also include NASA non-patented software technology requiring a Software Usage Agreement (SUA) or similar permission for use by others. All subtopics address the objective of increasing the commercial application of innovations derived from Federal R&D. While NASA scientists and engineers conduct breakthrough research that leads to innovations, the range of NASA’s effort does not extend to commercial product development in any of its intramural research areas. Additional work is often necessary to exploit these NASA technologies for either infusion or commercial viability and likely requires innovation on behalf of the private sector. NASA provides these technologies "as is" and makes no representation or guarantee that additional effort will result in infusion or commercial viability.

The NASA technologies identified in a subtopic or via the IP search tool (<http://technology.nasa.gov>): (1) are protected by NASA-owned patents (NASA Patents), (2) are non-patented NASA-owned or controlled software (NASA software), or (3) are otherwise available for use by the public. In the event offeror requests to use NASA owned or controlled technologies, which are not NASA patents or NASA software, NASA shall consider such request and permit such uses as NASA, in its sole discretion, deems appropriate and permissible. If a proposer elects to use a NASA patent, a non-exclusive, royalty-free research license will be required to use the NASA IP during the SBIR performance period.

Similarly, if a proposer wishes to use NASA software, the parties will be required to enter into a Software Usage Agreement on a non-exclusive, royalty-free basis in order to use such NASA software for government purposes and “Government-Furnished Computer Software and Related Technical Data” will apply to the contract. As used herein, “NASA IP” refers collectively to NASA patents and NASA software disclaimer: All subtopics include an opportunity to license or otherwise use NASA IP on a non-exclusive, royalty-free basis, for research use under the contract. Use of the NASA IP is strictly voluntary. Whether or not a firm uses NASA IP within their proposed effort will not in any way be a factor in the selection for award. NASA software release is governed by NPR 2210.1C.

Use of NASA Software

Software identified and requested under a SBIR contract shall be treated as Government Purpose Rights. Government purpose releases includes releases to other NASA Centers, Federal government agencies, and recipients who have a government contract. The software may be used for "government purposes" only. The recipients of such software releases are typically U.S. citizens. Non U.S. citizens will not be allowed access to NASA software under the SBIR contract.

A Software Usage Agreement (SUA) shall be requested after contract award from the appropriate NASA Center Software Release Authority (SRA). The SUA request shall include the NASA software title, version number, requesting firm contract info including recipient name, and SBIR contract award info. The SUA will expire when the contract ends.

Use of NASA Patent

All offerors submitting proposals citing a NASA patent must submit a non-exclusive, royalty-free license application if the use of a NASA patent is desired. The NASA license application is available on the NASA SBIR/STTR website: http://sbir.gsfc.nasa.gov/SBIR/research_license_app.doc. NASA only will grant research licenses to those SBIR offerors who submitted a license application and whose proposal resulted in an SBIR award under this solicitation. Such grant of non-exclusive research license will be set forth in the successful offeror's SBIR contract. License applications will be treated in accordance with Federal patent licensing regulations as provided in 37 CFR Part 404.

SBIR offerors are notified that no exclusive or non-exclusive commercialization license to make, use or sell products or services incorporating the NASA patent will be granted unless an SBIR offeror applies for and receives such a license in accordance with the Federal patent licensing regulations at 37 CFR Part 404. Awardees with contracts that identify a specific NASA patent will be given the opportunity to negotiate a non-exclusive commercialization license or, if available, an exclusive commercialization license to the NASA patent.

An SBIR awardee that has been granted a non-exclusive, royalty-free research license to use a NASA patent under the SBIR award may, if available and on a non-interference basis, also have access to NASA personnel knowledgeable about the NASA patent. The NASA Intellectual Property Manager (IPM) located at the appropriate NASA Center will be available to assist awardees requesting information about a patent that was identified in the SBIR contract and, if available and on a non-interference basis, provide access to the inventor or surrogate for the purpose of knowledge transfer.

Note: Access to the inventor for the purpose of knowledge transfer, will require the requestor to enter into a Non-Disclosure Agreement (NDA), the awardee "may" be required to reimburse NASA for knowledge transfer activities.

2. Proposal Preparation Instructions and Requirements

2.1 Fundamental Considerations

The object of Phase II is to continue the R/R&D effort from the completed Phase I.

Contract Deliverables

Select Phase II contracts shall 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 and Phase II results, (3) its relevance and significance to one or more NASA needs, and (4) the progress towards transitioning the proposed innovation and Phase II results into follow-on investment, development, testing and utilization for NASA mission programs and other potential customers. The delivery of a prototype unit, software package, or a complete product or service, for NASA testing and utilization is desirable and, if proposed, must be described and listed as a deliverable in the proposal. For SBIR Select Phase II contracts, an Interim NTSR report is required every 12 months from the effective date of the contract as well as a final NTSR due at the end of the contract, prior to submission of the final invoice.

2.2 Select Phase II Proposal Requirements

2.2.1 General Requirements

The Select Phase I contract will serve as a request for proposal (RFP) for the Select Phase II follow-on project. Select Phase II proposals are more comprehensive than those required for Phase I. Submission of a Select Phase II proposal is in accordance with Select Phase I contract requirements and is voluntary. NASA assumes no responsibility for any proposal preparation expenses.

A competitive Select Phase II proposal will clearly and concisely (1) describe the proposed innovation relative to the state of the art and the market, (2) address Phase I results relative to the scientific, technical merit and feasibility of the proposed innovation and its relevance and significance to the NASA needs, and (3) provide the planning for a focused project that builds upon Phase I results and encompasses technical, market, financial and business factors relating to the development and demonstration of the proposed innovation, and its transition into products and services for NASA mission programs and other potential customers.

2.2.2 Format Requirements

Proposals that do not follow the formatting requirement are subject to rejection during administrative screening.

Page Limitations and Margins

Any page(s) going over the required page limited will be deleted and omitted from the proposal review. A Select Phase II proposal shall not exceed a total of 50 standard 8 1/2 x 11 inch (21.6 x 27.9 cm) pages. Forms A, B, and C count as one page each regardless of whether the completed forms print as more than one page. Each page shall be numbered consecutively at the bottom. Margins shall be 1.0 inch (2.5 cm). All required items of information must be covered in the proposal and will be included in the page total. The space allocated to each part of the technical content will depend on the project and the offeror's approach.

Each proposal submitted must contain the following items in the order presented:

- (1) Cover Sheet (Form A), electronically endorsed, counts as 1 page towards the 50-page limit.
- (2) Proposal Summary (Form B), counts as 1 page towards the 50-page limit (and must not contain proprietary data).
- (3) Budget Summary (Form C), counts as 1 page towards the 50-page limit.
- (4) Technical Content (11 Parts in order as specified in section 2.2.4, not to exceed 47 pages), including all graphics, and starting with a table of contents.
- (5) Capital Commitments Addendum Supporting Phase II and Phase III.
- (6) Briefing Chart (Not included in the 50-page limit and must not contain proprietary data).
- (7) NASA Research License Application is not included in the 50-page limit (only if TAV is being proposed).

Note: Letters of general endorsement are not required or desired and will not be considered during the review process. However, if submitted, such letter(s) will count against the page limit.

In addition to the above items, each offeror must submit the following firm level forms, which must be filled out once during each submission period and are applicable to all firm proposals submissions:

- (8) Firm Level Certifications, are not included in the 50-page limit.
- (9) Audit Information, is not included in the 50-page limit.
- (10) Prior Awards Addendum, is not included in the 50-page limit.
- (11) Commercial Metrics Survey, is not included in the 50-page limit.

Type Size

No type size smaller than 10 point shall be used for text or tables, except as legends on reduced drawings. Proposals prepared with smaller font sizes will be rejected without consideration.

Header/Footer Requirements

Header must include firm name, proposal number, and project title. Footer must include the page number and proprietary markings if applicable. Margins can be used for header/footer information.

Classified Information

NASA does not accept proposals that contain classified information.

2.2.3 Forms

All form submissions shall be done electronically, with each form counting as 1 page towards the 50-page limit and accounting for pages 1-3 of the proposal regardless of the length.

2.2.3.1 Cover Sheet (Form A)

A sample Cover Sheet (Form A) is provided in the NASA SBIR/STTR Firm Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html). The offeror shall provide complete information for each item and submit the form, as required in section 5. The proposal project title shall be concise and descriptive of the proposed effort. The title should not use acronyms or words like "Development of" or "Study of." The NASA research topic title must not be used as the proposal title. Form A counts as one page towards the 50-page limit.

2.2.3.2 Proposal Summary (Form B)

A sample Proposal Summary (Form B) is provided in the NASA SBIR/STTR Firm Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html). The offeror shall provide complete information for each item and submit Form B as required in section 5. Form B counts as one page towards the 50-page limit.

Note: Proposal Summary (Form B), including the Technical Abstract, is public information and may be disclosed. Do not include proprietary information on Form B.

2.2.3.3. Budget Summary (Form C)

A sample of the Budget Summary (Form C) is provided in the NASA SBIR/STTR Firm Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html). The offeror shall complete the Budget Summary following the instructions provided with the sample form. The total requested funding for the Phase II effort shall not exceed \$1,500,000. A text box is provided on the electronic budget form for additional explanation. Information shall be submitted to explain the offeror's plans for use of the requested funds to enable NASA to determine whether the proposed price is fair and reasonable. Form C counts as one page towards the 50-page limit.

Note: The Government is not responsible for any monies expended by the firm before award of any contract.

2.2.4 Technical Proposal

This part of the submission should not contain any budget data and must consist of all eleven (11) parts listed below in the given order. All eleven parts of the technical proposal must be numbered and titled. Parts that are not applicable must be included and marked "Not Applicable." A proposal omitting any part will be considered non-responsive to this Solicitation and will be rejected during administrative screening. The required table of contents is provided below:

Phase II Table of Contents

Part 1: Table of Contents.....	Page 4
Part 2: Identification and Significance of the Innovation and Results of the Phase I Proposal	
Part 3: Technical Objectives	
Part 4: Work Plan	
Part 5: Related R/R&D	
Part 6: Key Personnel	
Part 7: Phase III Efforts, Commercialization and Business Planning	
Part 8: Facilities/Equipment	
Part 9: Subcontracts and Consultants	
Part 10: Potential Post Applications	
Part 11: Essentially Equivalent and Duplicate Proposals and Awards	

Part 1: Table of Contents

The technical proposal shall begin with a brief table of contents indicating the page numbers of each of the parts of the proposal and should start on page 4 because Forms A, B, and C account for pages 1-3.

Part 2: Identification and Significance of the Innovation and Results of the Phase I Proposal

Drawing upon Phase I results, succinctly describe:

- (1) The proposed innovation.
- (2) the relevance and significance of the proposed innovation to a need or needs, within the subtopic.
- (3) the proposed innovation relative to the state of the market, the state of the art, and its feasibility.
- (4) the capability of the offeror to conduct the proposed R/R&D and to fulfill the commercialization of the proposed innovation.

Part 3: Technical Objectives

Define the specific objectives of the Select Phase II research and technical approach.

TAV Note: All offerors submitting proposals who are planning to use NASA IP must describe their planned developments with the IP. The NASA Research License Application should be added as an attachment at the end of the proposal and will not count towards the 50-page limit (See paragraph 1.4).

Part 4: Work Plan

Include a detailed description of the Select Phase II R/R&D plan to meet the technical objectives. The plan should indicate what will be done, where it will be done, and how the R/R&D will be carried out. Discuss in detail the

methods planned to achieve each task or objective. Task descriptions, schedules, resource allocations, estimated task hours for each key personnel and planned accomplishments including project milestones shall be included.

Part 5: Related R/R&D

Describe significant current and/or previous R/R&D that is directly related to the proposal including any conducted by the PI or by the offeror. Describe how it relates to the proposed effort and any planned coordination with outside sources. The offeror must persuade reviewers of his or her awareness of key recent R/R&D conducted by others in the specific subject area. As an option, the offer may use this section to include bibliographic references.

Part 6: Key Personnel and Bibliography of Directly Related Work

Identify all key personnel involved in Phase II activities whose expertise and functions are essential to the success of the project. Provide bibliographic information including directly related education and experience.

The PI is considered key to the success of the effort and must make a substantial commitment to the project. The following requirements are applicable:

Functions: The functions of the PI are: planning and directing the project; leading it technically and making substantial personal contributions during its implementation; serving as the primary contact with NASA on the project; and ensuring that the work proceeds according to contract agreements. Competent management of PI functions is essential to project success. The Select Phase II proposal shall describe the nature of the PI's activities and the amount of time that the PI will personally apply to the project. The amount of time the PI proposes to spend on the project must be acceptable to the Contracting Officer.

Qualifications: The qualifications and capabilities of the proposed PI and the basis for PI selection are to be clearly presented in the proposal. NASA has the sole right to accept or reject a PI based on factors such as education, experience, demonstrated ability and competence, and any other evidence related to the specific assignment.

Eligibility: This part shall also establish and confirm the eligibility of the PI, and indicate the extent to which other proposals recently submitted or planned for submission in the year and existing projects commit the time of the PI concurrently with this proposed activity. Any attempt to circumvent the restriction on PIs working more than half time for an academic or a nonprofit organization by substituting an ineligible PI will result in rejection of the proposal. Please see section 1.3.3 for further explanation.

Note: If the Phase II PI is different than that proposed under the Phase I, please provide rational for the change.

Part 7: Phase III Efforts, Commercialization and Business Planning

Present a plan for commercialization (Phase III) of the proposed innovation. Commercialization encompasses the transition of technology into products and services for NASA mission programs, other Government agencies and non-Government markets. The commercialization plan, at a minimum, shall address the following areas:

- (1) **Market Feasibility and Competition:** Describe (a) the target market(s) of the innovation and the associated product or service; (b) the competitive advantage(s) of the product or service; (c) key potential customers, including NASA mission programs and prime contractors; (d) projected market size (NASA, other Government and/or non-Government); (e) the projected time to market and estimated market share within five years from market-entry; and (f) anticipated competition from alternative technologies, products and services and/or competing domestic or foreign entities.
- (2) **Commercialization Strategy and Relevance to the Offeror:** Present the commercialization strategy for the innovation and associated product or service and its relationship to the SBC's business plans for the next five years. Infusion into NASA missions and projects is an option for commercialization strategy.
- (3) **Key Management, Technical Personnel and Organizational Structure:** Describe: (a) the skills and experiences of key management and technical personnel in technology commercialization; (b) current

organizational structure; and (c) plans and timelines for obtaining expertise and personnel necessary for commercialization.

- (4) **Production and Operations:** Describe product development to date as well as milestones and plans for reaching production level, including plans for obtaining necessary physical resources.
- (5) **Financial Planning:** Delineate private financial resources committed to the development and transition of the innovation into market-ready product or service. Describe the projected financial requirements and the expected or committed capital and funding sources necessary to support the planned commercialization of the innovation. Provide evidence of current financial condition (e.g., standard financial statements including a current cash flow statement).
- (6) **Intellectual Property:** Describe plans and current status of efforts to secure intellectual property rights (e.g., patents, copyrights, trade secrets) necessary to obtain investment, attain at least a temporal competitive advantage, and achieve planned commercialization.

Part 8: Facilities/Equipment

General: Describe available equipment and physical facilities (this should include physical location [where the work is to be performed], square footage, and major equipment) necessary to carry out the proposed Phase II and projected Phase III efforts. Items of equipment or facilities to be purchased (as detailed in the cost proposal) shall be justified under this section.

Use of Federal facilities or equipment: In accordance with the Federal Acquisition Regulations (FAR) Part 45, it is NASA's policy not to provide facilities (capital equipment, tooling, test and computer facilities, etc.) for the performance of work under SBIR contracts. Generally an SBC will furnish its own facilities to perform the proposed work on the contract. Government-wide SBIR policies restrict the use of any SBIR funds for the use of Federal equipment and facilities (except for those facilities designated as a Federal laboratory). This does not preclude an SBC from utilizing a Federal facility or Federal equipment, but any charges for such use may not be paid for with SBIR funds. In rare and unique circumstances, SBA may issue a case-by-case waiver to this provision after review of an agency's written justification. Federal facilities designated as Federal laboratories are exempt from this waiver requirement (see 15 U.S.C. § 3710a(d) and the SBA SBIR Policy Directive). Any NASA facility generally would be considered a Federal laboratory; however, requests for things such as office space would be deemed to be a Federal facility requiring a waiver. Additionally, NASA may not and cannot fund the use of the Federal facility (including Federal laboratories) or personnel for the SBIR project with NASA program or project money.

When a proposed project or product demonstration requires the use of a unique Federal facility that is not designated as a Federal laboratory to be funded by the SBIR Program, then the offeror must provide a) a letter from the SBC Official explaining why the SBIR research project requires the use of the Federal facility or personnel, including data that verifies the absence of non-Federal facilities or personnel capable of supporting the research effort, and b) a statement, signed by the appropriate Government official at the facility, verifying that it will be available for the required effort. Proposals requiring waivers must explain why the waiver is appropriate. NASA will provide this explanation to SBA during the Agency waiver process. NASA cannot guarantee that a waiver from this policy can be obtained from SBA. These letters should be uploaded in Form C of your proposal. **Failure to provide this explanation and the site manager's written availability of use may invalidate any proposal selection.**

When a proposed project or product demonstration requires the use of a Federal laboratory then the offeror must provide a letter justifying the use of a Federal laboratory from the SBC official, as well as, a letter from the Government agency that verifies the availability. These letters should be uploaded in Form C of your proposal. **Failure to provide the site manager's written availability of use of the Federal laboratory and the letter of justification from the SBC may invalidate any proposal selection.**

Additionally, any proposer requiring the use of Federal laboratory, property, or facilities must, within ten (10) business days of notification of selection for negotiations, provide to the NASA Shared Services Center Contracting Officer all required documentation, to include, an agreement by and between the Contractor and the appropriate Federal facility, executed by the Government official authorized to approve such use. The Agreement must delineate the terms of use, associated costs, property and facility responsibilities and liabilities.

Part 9: Subcontracts and Consultants

Subject to the restrictions set forth below, the SBC may establish business arrangements with other entities or individuals to participate in performance of the proposed R/R&D effort. The offeror must describe all subcontracting or other business arrangements, and identify the relevant organizations and/or individuals with whom arrangements are planned. The expertise to be provided by the entities must be described in detail, as well as the functions, services, number of hours and labor rates. Offerors are responsible for ensuring that all organizations and individuals proposed to be utilized are actually available for the time periods required. Subcontract costs should be documented in the subcontractor/consultant budget section in Form C and supporting documentation should be uploaded for each (appropriate documentation is specified in Form C). Subcontractors' and consultants' work has the same place of performance restrictions as stated in section 1.3.2. **The following restrictions apply to the use of subcontracts/consultants:**

Select SBIR Phase II Subcontracts/Consultants
The proposed subcontracted business arrangements must not exceed 50 percent of the research and/or analytical work (as determined by the total cost of the proposed subcontracting effort (to include the appropriate OH and G&A) in comparison to the total effort (total contract price including cost sharing, if any, less profit if any).

Example: Total price to include profit - \$725,000
 Profit - \$21,750
 Total price less profit - $\$725,000 - \$21,750 = \$703,250$
 Subcontractor cost - \$250,000
 G&A - 5%
 G&A on subcontractor cost - $\$250,000 \times 5\% = \$12,500$
 Subcontractor cost plus G&A - $\$250,000 + \$12,500 = \$262,500$
 Percentage of subcontracting effort – subcontractor cost plus G&A / total price less profit
 - $\$262,500 / \$703,250 = 37.3\%$

For a Select SBIR Phase II this is acceptable since it is below the limitation of 50%.

Part 10: Potential Post Applications (Commercialization)

Building upon section 2.2.4, part 7; further specify the potential NASA and commercial applications of the innovation and the associated potential customers; such as NASA mission programs and projects, within target markets. Potential NASA applications include the projected utilization of proposed contract deliverables (e.g., prototypes, test units, software) and resulting products and services by NASA organizations and contractors.

Part 11a: Essentially Equivalent and Duplicate Proposals and Awards

WARNING – While it is permissible with proposal notification to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous Federal program solicitations, it is unlawful to enter into funding agreements requiring essentially equivalent work. Offerors are at risk for submitting essentially equivalent proposals and therefore, are strongly encouraged to disclose these issues to the soliciting agency to resolve the matter prior to award. See Part 11b.

If an applicant elects to submit identical proposals or proposals containing a significant amount of essentially equivalent work under other Federal program solicitations, a statement must be included in each such proposal indicating:

- (1) The name and address of the agencies to which proposals were submitted or from which awards were received.
- (2) Date of proposal submission or date of award.
- (3) Title, number, and date of solicitations under which proposals were submitted or awards received.
- (4) The specific applicable research topics for each proposal submitted for award received.
- (5) Titles of research projects.
- (6) Name and title of principal investigator or project manager for each proposal submitted or award received.

A summary of essentially equivalent work information is also required on Form A.

Part 11b: Related Research and Development Proposals and Awards

All federal agencies have a mandate to reduce waste, fraud, and abuse in federally funded programs. The submission of essentially equivalent work and the acceptance of multiple awards for essentially equivalent work in the SBIR/STTR Program have been identified as an area of abuse and possibly fraud. SBIR/STTR funding agencies and the Office of the Inspector General are actively evaluating proposals and awards to eliminate this problem. Related research and development includes proposals and awards that do not meet the definition of “Essentially Equivalent Work”, but are related to the technology innovation in the proposal being submitted. Related research and development could be interpreted as essentially equivalent work by outside reviewers without additional information. Therefore, if you are submitting closely related proposals or your firm has closely related research and development that is currently or previously funded by NASA or other Federal agencies, it is to your advantage to describe the relationships between this proposal and related efforts clearly delineating why this should not be considered an essentially equivalent work effort. These explanations should not be longer than one page, will not be included in the page count, and will not be part of the technical evaluation of the proposal.

2.2.5 Capital Commitments Addendum Supporting Phase II and Phase III

Describe and document capital commitments from non-SBIR sources or from internal SBC funds for pursuit of Phase II and Phase III efforts. Offerors for Phase II contracts are strongly urged to obtain non-SBIR funding support commitments for follow-on Phase III activities and additional support of the Phase II from parties other than the proposing firm. Funding support commitments must show that a specific and substantial amount will be made available to the firm to pursue the stated Phase II and/or Phase III objectives. They must indicate the source, date, and conditions or contingencies under which the funds will be made available. Alternatively, self-commitments of the same type and magnitude that are required from outside sources can be considered. If a Phase III will be funded internally, offerors should describe their financial position.

Evidence of funding support commitments from outside parties must be provided in writing and should accompany the Phase II proposal. Letters of commitment should specify available funding commitments, other resources to be provided, and any contingent conditions. Expressions of technical interest by such parties in the Phase II research or of potential future financial support are insufficient and will not be accepted as support commitments by NASA. Letters of commitment should be added as an addendum to the Phase II proposal. This addendum will not be counted against the 50-page limitation.

2.2.6 Briefing Chart

A one-page briefing chart is required to assist in the ranking and advocacy of proposals prior to selection. Submission of the briefing chart is not counted against the 50-page limit, and must not contain any proprietary data or ITAR restricted data. An electronic form will be provided during the submissions process.

2.2.7 Firm Level Certifications

Firm level certifications that are applicable across all proposal submissions submitted to this solicitation must be completed via the “Certifications” section of the Proposal Submission Electronic Handbook. The offeror must answer Yes or No as applicable. An example of the certification can be found in the NASA SBIR/STTR Firm Library (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html).

Note: The designated firm admin, typically the first person to register your firm, is the only individual authorized to update the certifications.

2.2.8 Audit Information

The SBC shall complete the questions regarding the firm’s rates and upload the Federal agency audit report or related information that is available from the last audit. If your firm has never been audited by a federal agency, then answer "No" to the first question and you do not need to complete the remainder of the form. The “Audit Information” will be used to assist the contracting officer with negotiations if the proposal is selected for award. If the audit provided is not acceptable, they will be advised by the Contracting Officer on what is required to determine reasonable cost and/or rates. There is a separate “Audit Information” section in Forms C that must also be completed. The audit information is not included in the 50-page limit. An electronic form will be provided during the submissions process.

Note: The designated firm admin, typically the first person to register your firm, is the only individual authorized to update the audit information.

2.2.9 Prior Awards Addendum

If the SBC has received more than 15 Phase II awards in the prior 5 fiscal years, submit name of awarding agency, date of award, funding agreement number, amount, topic or subtopic title, follow-on agreement amount, source, and date of commitment and current commercialization status for each Phase II. If your firm has received any SBIR or STTR Phase II awards, even if it has received fewer than 15 in the last 5 years, it is still recommended that you complete this form for those Phase II awards your firm did receive. This information will be useful when completing the Commercialization Metrics Survey, and in tracking the overall success of the SBIR and STTR programs. Any NASA Phase II awards your firm has received will be automatically populated in the electronic form, as are any Phase II awards previously entered by the SBC during prior submissions (you may update the information for these awards). The addendum is not included in the 50-page limit. An electronic form will be provided during the submissions process.

Note: The designated firm admin, typically the first person to register your firm, is the only individual authorized to update the addendum information.

2.2.10 Commercial Metrics Survey

NASA has instituted a comprehensive commercialization survey/data gathering process for firms with prior NASA SBIR/STTR awards. If the SBC has received any Phase III awards resulting from work on any NASA SBIR or STTR awards, provide the related Phase I or Phase II contract number, name of Phase III awarding agency, date of award, funding agreement number, amount, project title, and period of performance. The survey will also ask for firm sales and ownership information, as well as any commercialization success the firm has had as a result of Phase II SBIR or STTR awards. This information will allow firms to demonstrate their ability to carry SBIR/STTR research through to achieve commercial success, and allow agencies to track the overall commercialization success of their SBIR and STTR programs. The survey is not included in the 50-page limit and content should be limited to information requested above. An electronic form will be provided during the submissions process.

Note: Information received from SBIR/STTR awardees completing the survey is kept confidential, and will not be made public except in broad aggregate, with no firm-specific attribution. The Commercialization Metrics Survey is a required part of the proposal submissions process and must be completed via the Proposal Submission Electronic Handbook

2.2.11 Contractor Responsibility Information

No later than 10 business days after the notification of selection for negotiations the offeror shall provide a signed statement from your financial institution(s), on its letterhead, stating whether or not your firm is in good standing and how long you have been with the institution.

3. Method of Selection and Evaluation Criteria

3.1 Select Phase II Proposals

All Select Phase II proposals will be evaluated and ranked on a competitive basis. Proposals will be initially screened to determine responsiveness. Proposals determined to be responsive to the administrative requirements of this solicitation and having a reasonable potential of meeting a NASA need, as evidenced by the technical abstract included in the Proposal Summary (Form B), will be technically evaluated by NASA personnel to determine the most promising technical and scientific approaches. Each proposal will be reviewed on its own merit. NASA is under no obligation to fund any proposal or any specific number of proposals in a given topic. It also may elect to fund several or none of the proposed approaches to the same topic or subtopic.

3.1.1 Evaluation Process

The Select Phase II evaluation process is similar to the Phase I process. Each proposal will be reviewed by NASA scientists and engineers and by qualified experts outside of NASA as needed. In addition, those proposals with high technical merit and mission relevance will be reviewed for commercial merit. Mission Relevance, described below, is a new criterion for Select Phase II proposals associated with Select Topics. NASA may use a peer review panel to evaluate commercial merit. Panel membership may include non-NASA personnel with expertise in business development and technology commercialization.

3.1.2 Select Phase II Evaluation Criteria

NASA intends to select for award those proposals that best meet the Government's need(s). Note: Past performance will not be a separate evaluation factor but will be evaluated under each factor below. The evaluation of Select Phase II proposals will apply the following factors described below.

Factor 1: Scientific/Technical Merit and Feasibility

The proposed R/R&D effort will be evaluated on (a) the originality (level of innovation, comparison to current state-of-the-art) and feasibility of the technology/project being considered for advancement during Phase II, (b) its potential technical value and relevance to the subtopic, (c) the amount of technology maturation envisioned by this project (as measured by TRL advancement for the Phase II), and (d) the proposers understanding of the problems being addressed and the risks associated with the proposed innovation. In addition, past performance of Phase I will be evaluated to determine the degree to which Phase I objectives were met, and whether the Phase I results indicate a Phase II project is appropriate.

Factor 2: Experience, Qualifications and Facilities

This refers to (a): the technical capabilities and experience of the Principle Investigator or Project Manager, key personnel, staff, consultants, and subcontractors are consistent with the research effort described in the proposal, (b) the degree of commitment and availability of the people noted in (a) is consistent and appropriate to the research effort described in the proposal, and (c) the necessary instrumentation and/or facilities required to conduct the research effort described in the proposal is shown to be adequate, including any reliance on external sources (such as government furnished equipment or facilities, as addressed in section 2.2.4, part 8).

Factor 3: Effectiveness of the Proposed Work Plan

The work plan will be reviewed for its (a) effective use of available resources, (b) labor distribution, and (c) the proposed schedule for meeting the Select Phase II objectives. The methods planned to achieve each objective or task should be discussed in detail in each proposal. Please see Factor 9 for price evaluation criteria.

Factor 4: Mission Relevance

The Mission Relevance Review means a review of the relevance and potential contributions to NASA's scientific and technical areas of emphasis as determined by (a) a Phase II connection to a recent NASA strategy document, (b) the project's potential to reduce risk, cost, size, development costs or integration costs of specific hardware or software components or subsystems, (c) the technology's potential to be infused into future NASA missions or classes of missions.

Factor 5: Commercial Potential and Feasibility

The proposal will be evaluated for the commercial potential and feasibility of the proposed innovation and associated products and services. The offeror's experience and record in technology commercialization, current funding commitments from private or non-SBIR funding sources, existing and projected commitments for Phase III funding, investment, sales, licensing, and other indicators of commercial potential and feasibility will be considered along with the commercialization plan for the innovation. Evaluation of the commercialization plan and the overall proposal will include consideration of the following areas:

- (1) **Commercial Potential and Feasibility of the Innovation:** This includes assessment of (a) the transition of the innovation into a well-defined product or service; (b) a realistic target market niche; and (c) a product or service that has strong potential for meeting a well-defined need within the target market.
- (2) **Intent and Commitment of the Offeror:** This includes assessing the commercialization of the innovation for (a) importance to the offeror's current business and strategic planning; (b) reliance on (or lack thereof) Government markets; (c) adequacy of funding sources necessary to bring technology to identified market; and (d) a commitment of necessary financial, physical, and/or personnel resources.
- (3) **Capability of the Offeror to Realize Commercialization:** This includes assessment of (a) the offeror's past performance, experience, and success in technology commercialization; (b) the likelihood that the offeror will be able to obtain the remaining necessary financial, technical, and personnel-related resources; and (c) the current strength and continued financial viability of the offeror.

Commercialization encompasses the infusion of innovative technology into products and services for NASA mission programs, other Government agencies and non-Government markets.

Factor 6: Price Reasonableness

The offeror's cost proposal will be evaluated for price reasonableness based on the information provided in (Form C). NASA will comply with the FAR and NASA FAR Supplement (NFS) to evaluate the proposed price/cost to be fair and reasonable.

After completion of evaluation for price reasonableness and determination of responsibility the Contracting Officer shall submit a recommendation for award to the Source Selection Official.

Scoring of Factors and Weighting

Factors 1, 2, and 3 will be scored numerically with Factor 1 worth 50 percent and Factors 2 and 3 each worth 25 percent. The sum of the scores for Factors 1, 2, and 3 will comprise the Technical Merit score. Proposals receiving acceptable numerical scores will be evaluated and rated for their mission relevance and commercial potential. The evaluation for Factor 4, Mission Relevance, and Factor 5, Commercial Potential and Feasibility, will both be in the form of an adjectival rating (Excellent, Very Good, Average, Below Average, Poor). For Select Phase II proposals, commercial merit is a critical factor. Factors 1 - 5 will be evaluated and used in the selection of proposals for negotiation. Factor 6 will be evaluated and used in the selection for award.

3.1.3 Selection

Proposals recommended for negotiations will be forwarded to the Program Management Office for analysis and presented to the Source Selection Official and Mission Directorate Representatives. Final selection decisions will consider the recommendations, overall NASA priorities, program balance and available funding, as well as any other evaluations or assessments (particularly pertaining to commercial potential). The Source Selection Official has the final authority for choosing the specific proposals for contract negotiation. Each proposal selected for negotiation will be evaluated for cost/price reasonableness. After completion of evaluation for cost/price reasonableness and a determination of responsibility the Contracting Officer will submit a recommendation for award to the Source Selection Official.

The list of proposals selected for negotiation will be posted on the NASA SBIR/STTR website (<http://sbir.nasa.gov>). All firms will receive a formal notification letter. A Contracting Officer will negotiate an appropriate contract to be signed by both parties before work begins.

3.2 Debriefing of Offerors

After selection for negotiations have been announced, debriefings for proposals will be available to the offeror's corporate official or designee via e-mail. Telephone requests for debriefings will not be accepted. Debriefings are not opportunities to reopen selection decisions. They are intended to acquaint the offeror with perceived strengths and weaknesses of the proposal in order to help offerors identify constructive future action by the offeror. Debriefings will not disclose the identity of the proposal evaluators, proposal scores, the content of, or comparisons with other proposals.

To request debriefings on proposals, offerors must request via e-mail to the SBIR/STTR Program Support Office at ARC-SBIR-PMO@mail.nasa.gov within 60 days after the announcement of selection for negotiation. Late requests will not be honored.

4. Considerations

4.1 Awards

4.1.1 Availability of Funds

All Select Phase II awards are subject to availability of funds. NASA has no obligation to make any specific number of awards, and may elect to make several or no awards in any specific technical topic or subtopic.

Select SBIR Contracts
Select Phase II agreements will be firm-fixed-price contracts with performance periods not exceeding 24 months and funding not exceeding \$1,500,000.

4.1.2 Contracting

To simplify contract award and reduce processing time, all contractors selected for Phase I contracts should ensure that:

- (1) All information in your proposal is current, e.g., your address has not changed, the proposed PI is the same, etc. If changes have occurred since submittal of your proposal, notify contracting officer immediately.
- (2) Your firm is registered with System for Award Management (SAM). NASA has transitioned to SAM. It is the Official U.S. Government system that consolidated the CCR/FedReg, ORCA, and EPLS systems.
- (3) The VETS 100 report submitted by your firm to the Department of Labor is current and submitted to the contracting officer within 10 business days of the notification of selection for negotiation.
- (4) Your firm HAS NOT proposed a Co-Principal Investigator.
- (5) STTR selectees should execute their Allocation of Rights Agreement within 10 business days of the notification of selection for negotiation.
- (6) Your firm has a timely response to all communications from the NSSC Contracting Officer.

Please note: NASA will be transitioning to the DOD system, Wide Area WorkFlow (WAWF). During the duration of the contract your firm may be required to register with the WAWF system. It is a secure web based system for electronic invoicing, receipt, and acceptance. The WAWF website is located at: (<https://wawf.eb.mil/>).

From the time of proposal notification of selection for negotiation, until the award of a contract, all communications shall be submitted electronically to NSSC-SBIR-STTR@nasa.gov.

Note: Costs incurred prior to and in anticipation of award of a contract are entirely the risk of the contractor in the event that a contract is not subsequently awarded. A notification of selection for negotiation is not to be misconstrued as an award notification to commence work.

Select Phase II Model Contract

An example of the Select Phase II contracts can be found in the in the NASA SBIR/STTR Firm Library: (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html). **Note: Model contracts are subject to change.**

4.2 Select Phase II Reporting

The technical reports are required as described in the contract and are to be provided to NASA. All required reports shall be submitted electronically via the EHB.

4.3 Release of Proposal Information

In submitting a proposal, the offeror agrees to permit the Government to disclose publicly the information contained on the Proposal Summary (Form B). Other proposal data is considered to be the property of the offeror, and NASA

will protect it from public disclosure to the extent permitted by law including the Freedom of Information Act (FOIA).

4.4 Access to Proprietary Data by Non-NASA Personnel

4.4.1 Non-NASA Reviewers

In addition to Government personnel, NASA, at its discretion and in accordance with 1815.207-71 of the NASA FAR Supplement, may utilize qualified individuals from outside the Government in the proposal review process. Any decision to obtain an outside evaluation shall take into consideration requirements for the avoidance of organizational or personal conflicts of interest and the competitive relationship, if any, between the prospective contractor or subcontractor(s) and the prospective outside evaluator. Any such evaluation will be under agreement with the evaluator that the information (data) contained in the proposal will be used only for evaluation purposes and will not be further disclosed.

4.4.2 Non-NASA Access to Confidential Business Information

In the conduct of proposal processing and potential contract administration, the Agency may find it necessary to provide proposal access to other NASA contractor and subcontractor personnel. NASA will provide access to such data only under contracts that contain an appropriate NFS 1852.237-72 Access to Sensitive Information clause that requires the contractors to fully protect the information from unauthorized use or disclosure.

4.5 Proprietary Information in the Proposal Submission

If proprietary information is provided by an applicant in a proposal, which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security, it will be treated in confidence to the extent permitted by law. This information must be clearly marked by the applicant as confidential proprietary information. NASA will treat in confidence pages listed as proprietary in the following legend that appears on the Cover Sheet (Form A) of the proposal:

"This data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of this proposal, provided that a funding agreement is awarded to the offeror as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use or disclose the data to the extent provided in the funding agreement and pursuant to applicable law. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction are contained in pages ____ of this proposal."

Note: Do not label the entire proposal proprietary. The Proposal Summary (Form B), and the Briefing Chart should not contain proprietary information; and any page numbers that would correspond to these must not be designated proprietary in Form B.

Information contained in unsuccessful proposals will remain the property of the firm. The Government will, however, retain copies of all proposals.

4.6 Cost Sharing

Cost sharing occurs when a contractor proposes to bear some of the burden of reasonable, allocable and allowable contract costs. Cost sharing is permitted, but not required for proposals under this Solicitation. Cost sharing is not an evaluation factor in consideration of your proposal. Cost sharing, if included, should be shown in the budget summary. No profit will be paid on the cost-sharing portion of the contract.

4.7 Profit or Fee

Select Phase II contracts may include a reasonable profit. The reasonableness of proposed profit is determined by the Contracting Officer during contract negotiations. Reference FAR 15.404-4.

4.8 Joint Ventures and Limited Partnerships

Both joint ventures and limited partnerships are permitted, provided the entity created qualifies as an SBC. A statement of how the workload will be distributed, managed, and charged should be included in the proposal. A copy or comprehensive summary of the joint venture agreement or partnership agreement should be appended to the proposal. This will not count as part of the page limit for the Select Phase II proposal.

4.9 Additional Information

4.9.1 Evidence of Contractor Responsibility

In addition to the information required to be submitted in section 2.2.11, before award of an SBIR contract, the Government may request the offeror to submit certain organizational, management, personnel, and financial information to establish responsibility of the offeror. Contractor responsibility includes all resources required for contractor performance, i.e., financial capability, work force, and facilities.

4.10 Required Registrations and Submissions

4.10.1 Firm SBA Firm Registry

SBA maintains and manages a Company Registry at (www.SBIR.gov) to track ownership and affiliation requirements for all companies applying to the SBIR Program. The SBIR policy directive requires each small business concern (SBC) applying for a Phase I or Phase II award to register in the Company Registry prior to submitting an application. A PDF document with the SBC registration information is available for download by the SBC upon successful registration. This PDF document must be saved by the SBC for inclusion in applications submitted to SBIR agencies. All SBCs must report and/or update ownership information to SBA prior to each SBIR application submission or if any information changes prior to award.

From the NASA SBIR/STTR Proposal Submission Electronic Handbook (EHB), the SBC must provide their unique SBC Control ID that gets assigned by SBA upon completion of the Company Registry registration, as well as upload the PDF document validating their registration. This information is submitted to NASA via a Firm level form in the Activity Worksheet and is applicable across all proposals submitted by the SBC for that specific solicitation.

4.10.2 Central Contractor Registration

Offerors should be aware of the requirement to register in the System for Award Management (SAM) prior to contract award. **To avoid a potential delay in contract award, offerors are required to register prior to submitting a proposal. Additionally, firms must certify the NAICS code of 541712.**

The SAM database is the primary repository for contractor information required for the conduct of business with NASA. It is maintained by the Department of Defense. To be registered in the SAM database, all mandatory information, which includes the DUNS or DUNS+4 number, and a CAGE code, must be validated in the SAM system. The DUNS number or Data Universal Number System is a 9-digit number assigned by Dun and Bradstreet Information Services (<http://www.dnb.com>) to identify unique business entities. The DUNS+4 is similar, but includes a 4-digit suffix that may be assigned by a parent (controlling) business concern. The CAGE code or Commercial Government and Entity Code is assigned by the Defense Logistics Information Service (DLIS) to identify a commercial or Government entity. If an SBC does not have a CAGE code, one will be assigned during the CCR registration process.

The DoD has established a goal of registering an applicant in the SAM database within 48 hours after receipt of a complete and accurate application via the Internet. However, registration of an applicant submitting an application through a method other than the Internet may take up to 30 days. Therefore, offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation. Offerors and contractors may obtain information on SAM registration and annual confirmation requirements via the Internet at (<https://www.sam.gov/>) or by calling 866-606-8220.

4.10.3 52.204-8 Annual Representations and Certifications

Offerors should be aware of the requirement that the Representation and Certifications required from Government contractors must be completed through SAM website (<https://www.sam.gov/>). FAC 01-26 implements the final rule for this directive and requires that all offerors provide representations and certifications electronically via the BPN website; to update the representations and certifications as necessary, but at least annually, to keep them current, accurate and complete. NASA will not enter into any contract wherein the Contractor is not compliant with the requirements stipulated herein.

4.10.4 52.222-37 Employment Reports on Special Disabled Veterans, Veterans of the Vietnam-Era, and Other Eligible Veterans

In accordance with Title 38, United States Code, Section 4212(d), the U.S. Department of Labor (DOL), Veterans' Employment and Training Service (VETS) collects and compiles data on the Federal Contractor Program Veterans' Employment Report (VETS-100 Report) from Federal contractors and subcontractors who receive Federal contracts that meet the threshold amount of \$100,000. The VETS-100 reporting cycle begins annually on August 1 and ends September 30. Any federal contractor or prospective contractor that has been awarded or will be awarded a federal contract with a value of \$100,000 or greater must have a current VETS 100 report on file. Please visit the DOL VETS 100 website at (<http://www.dol.gov/vets/programs/fcp/main.htm>). NASA will not enter into any contract wherein the firm is not compliant with the requirements stipulated herein.

4.10.5 Software Development Standards

Offerors proposing projects involving the development of software should comply with the requirements of NASA Procedural Requirements (NPR) 7150.2, "NASA Software Engineering Requirements" are available online at (<http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=7150&s=2>).

4.10.6 Human and/or Animal Subject

Offerors should be aware of the requirement that an approved protocol by a NASA Review Board is required if the proposed work include human or animal subject. An approved protocol shall be provided to the Contracting Officer prior to the initiation of any human and/or animal subject research. Offerors shall identify the use of human or animal subject on Form A. For additional information, contact the NASA SBIR/STTR Program Management Office at ARC-SBIR-PMO@mail.nasa.gov. Reference 14 CFR 1230 and 1232.

4.10.7 HSPD-12

Firms that require access to federally controlled facilities for six consecutive months or more must adhere to the following:

PIV Card Issuance Procedures in accordance with FAR clause 52.204-9 Personal Identity Verification of Contractor Personnel.

Purpose: To establish procedures to ensure that recipients of contracts are subject to essentially the same credentialing requirements as Federal Employees when performance requires physical access to a Federally-controlled facility or access to a Federal information system for six consecutive months or more. (Federally - controlled facilities and Federal information system are defined in FAR 2.101(b)(2)).

Background: Homeland Security Presidential Directive 12 (HSPD-12), "Policy for a Common Identification Standard for Federal Employees and Contractors", and Federal Information Processing Standards Publication (FIPS PUB) Number 201, "Personal Identity Verification (PIV) of Federal Employees and Contractors" require agencies to establish and implement procedures to create and use a Government-wide secure and reliable form of identification NLT October 27, 2005. See: <http://csrc.nist.gov/publications/fips/fips201-1/FIPS-201-1-chng1.pdf>. In accordance with the FAR clause 52.204-9 Personal Identity Verification of Contractor Personnel which states in parts contractor shall comply with the requirements of this clause and shall ensure that individuals needing such access shall provide the personal background and biographical information requested by NASA.

If applicable, detailed procedures for the issuance of a PIV credential can be found at the following URL:
<http://itcd.hq.nasa.gov/PIV.html>.

4.11 False Statements

Knowingly and willfully making any false, fictitious, or fraudulent statements or representations may be a felony under the Federal Criminal False Statement Act (18 U.S.C. Sec 1001), punishable by a fine of up to \$10,000, up to five years in prison, or both. The Office of the Inspector General has full access to all proposals submitted to NASA.

5. Submission of Proposals

5.1 Submission Requirements

NASA uses electronically supported business processes for the Select SBIR Program. An offeror must have Internet access and an e-mail address. Paper submissions are not accepted.

The Electronic Handbook (EHB) for submitting proposals is located at (<http://sbir.nasa.gov>). The Proposal Submission EHB will guide the firms through the steps for submitting a Select SBIR proposal. All EHB submissions are through a secure connection. Communication between NASA's SBIR Program and the firm is primarily through a combination of EHBs and e-mail.

5.2 Submission Process

SBCs must register in the EHB to begin the submission process. Firms are encouraged to start the proposal process early, to allow for sufficient time to complete the submissions process. It is recommended that the Business Official, or an authorized representative designated by the Business Official, be the first person to register for the SBC. The SBC's Employer Identification Number (EIN)/Taxpayer Identification Number is required during registration.

Note: The designated firm admin, typically the first person to register your firm, is the only individual authorized to update and change the firm level forms (see section 5.2.1).

For successful proposal submission, SBCs must complete all forms online, upload their technical proposal in an acceptable format, and have the Business Official and Principle Investigator electronically endorse the proposal. Electronic endorsement of the proposal is handled online with no additional software requirements. The term "technical proposal" refers to the part of the submission as described in section 2.2.4.

5.2.1 What Needs to Be Submitted

The entire proposal including Forms A, B, C, the briefing chart, and other firm level forms must be submitted/completed via the Submissions EHB located on the NASA SBIR/STTR website. (Note: Other forms of submissions such as postal, paper, fax, diskette, or e-mail attachments are not acceptable).

- (1) Forms A, B, and C are to be completed online.
- (2) The technical proposal is uploaded from your computer via the Internet utilizing secure communication protocol.
- (3) Firms must submit a briefing chart online, which is not included in the page count (see section 2.2.6).
- (4) NASA Research License Application (only if the use of TAV is proposed).
- (5) The certifications, audit information, prior awards addendum, commercialization metrics survey are required and to be completed online. These are not included in the page count.

5.2.2 Technical Proposal Submissions

NASA converts all technical proposal files to PDF format for evaluation. Therefore, NASA requests that technical proposals be submitted in PDF format or MS Word. **Note: Embedded animation or video, as well as reference technical papers for "further reading" will not be considered for evaluation.**

Virus Check

The offeror is responsible for performing a virus check on each submitted technical proposal. As a standard part of entering the proposal into the processing system, NASA will scan each submitted electronic technical proposal for viruses. The detection, by NASA, of a virus on any electronically submitted technical proposal, may cause rejection of the proposal.

5.2.3 Technical Proposal Uploads

Firms will upload their proposals using the Submissions EHB. Directions will be provided to assist users. All transactions via the EHB are encrypted for security. Firms cannot submit security/password protected technical proposal and/or briefing chart files, as reviewers may not be able to open and read the files. An e-mail will be sent acknowledging each successful upload. Please verify the file name and file size in the confirmation email to ensure the correct proposal was uploaded. An example is available via the NASA SBIR/STTR Firm Library, located at: (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html).

You may upload the technical proposal multiple times, with each new upload replacing the previous version, but only the final uploaded and electronically endorsed version will be considered for review.

5.3 Deadline for Select Phase II Proposal Receipt

All Select Phase II proposal submissions must be received no later than the last day of the Phase I contract, via the NASA SBIR/STTR website (<http://sbir.nasa.gov>). The EHB will be available for Internet submissions approximately 6 weeks prior to completion date of Phase I contracts. Receipt of Phase II proposals are due on the last day of performance under Select SBIR Phase I contracts. The EHB will not be available for Internet submissions after this deadline, so firms are also advised to print all forms prior to the deadline since the EHB will not be available. Any proposal received after that date and time shall be considered late and handled according to NASA FAR Supplement 1815.208.

5.4 Acknowledgment of Proposal Receipt

The final proposal submission includes successful completion of Form A (electronically endorsed by the SBC Official), Form B, Form C, the uploaded technical proposal, and the briefing chart. NASA will acknowledge receipt of electronically submitted proposals upon endorsement by the SBC Official to the SBC Official's e-mail address as provided on the proposal cover sheet. If a proposal acknowledgment is not received, the offeror should call NASA SBIR/STTR Program Support Office at 301-937-0888. An example is available via the NASA SBIR/STTR Firm Library, located at: (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html).

5.5 Withdrawal of Proposals

Prior to the close of submissions, proposals may be withdrawn via the Proposal Submission Electronic Handbook hosted on the NASA SBIR/STTR website (<http://sbir.nasa.gov>). In order to withdraw a proposal after the deadline, the designated SBC Official must send written notification via email to sbir@reisystems.com.

5.6 Service of Protests

Protests, as defined in Section 33.101 of the FAR, that are filed directly with an agency and copies of any protests that are filed with the General Accounting Office (GAO) shall be served on the Contracting Officer by obtaining written and dated acknowledgement of receipt from the NASA SBIR/STTR Program contact listed below:

Cassandra Williams
NASA Shared Services Center
Building 1111, C Road
Stennis Space Center, MS 39529
Cassandra.Williams-1@nasa.gov

The copy of any protest shall be received within one calendar day of filing a protest with the GAO.

6. Submission Forms and Certifications

Offerors must complete the “Certifications” section of the Proposal Submission Electronic Handbook , answering Yes or No to certifications as applicable.

Firms should carefully read each of the certification statements. The Federal government relies on the information to determine whether the business is eligible for a Small Business Innovation Research (SBIR) Program award. A similar certification will be used to ensure continued compliance with specific program requirements during the life of the funding agreement. The definitions for the terms used in this certification are set forth in the Small Business Act, SBA regulations (13 C.F.R. Part 121), the SBIR Policy Directive and also any statutory and regulatory provisions referenced in those authorities.

If the funding agreement officer believes that the business may not meet certain eligibility requirements at the time of award, they are required to file a size protest with the U.S. Small Business Administration (SBA), who will determine eligibility. At that time, SBA will request further clarification and supporting documentation in order to assist in the verification of any of the information provided as part of a protest. If the funding agreement officer believes, after award, that the business is not meeting certain funding agreement requirements, the agency may request further clarification and supporting documentation in order to assist in the verification of any of the information provided.

Even if correct information has been included in other materials submitted to the Federal government, any action taken with respect to this certification does not affect the Government’s right to pursue criminal, civil or administrative remedies for incorrect or incomplete information given in the certification. Each person signing this certification may be prosecuted if they have provided false information.

In submitting the proposals including the certifications, each offeror understands that providing false information is a criminal offense under Title 18 US Code, Section 1001, False Statements, as well as Title 18 US Code, Section 287, False Claims.

Please note: Previews of all forms and certifications are available via the NASA SBIR/STTR Firm Library, located at: (https://sbir.gsfc.nasa.gov/sbir/firm_library/index.html).

Select SBIR Check List

For assistance in completing your Phase II proposal, use the following checklist to ensure your submission is complete.

1. **The entire proposal including any supplemental material shall not exceed a total of 50 8.5 x 11 inch pages and format requirements (section 2.2.2).**
2. The proposal and innovation is submitted for one subtopic only.
3. The entire proposal is submitted consistent with the requirements and in the order outlined in section 2.2.
4. The technical proposal contains all eleven parts in order (section 2.2.4).
5. Certifications in Form A are completed, and agree with the content of the technical proposal.
6. Proposed funding does not exceed \$1,500,000 (sections 1.2, 4.1.1).
7. Proposed project duration does not exceed 24 months (sections 1.2, 4.1.1).
8. Entire proposal including Forms A, B, and C submitted via the Internet.
 - a) All firm-level forms including: 1) The certifications, 2) audit information, 3) prior awards addendum, and 4) commercialization metrics survey.
9. Form A electronically endorsed by the SBC Official and the PI.
10. **Select Phase II proposal submissions will be due after the last day of the Phase I contract (section 5.3).**

9. Select Research Topics for SBIR Program

Introduction

The Select SBIR Program Solicitation subtopics are developed by the NASA Mission Directorates and Centers in coordination with the NASA SBIR program.

The following are descriptions of the four NASA Mission Directorates (MDs):

Aeronautics Research

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 at the fundamental level and integrated systems level to support current and emerging applications as well as revolutionary concepts and technologies that could one day enable radical change to both the airspace system and the aircraft that fly within it, facilitating a safer, more environmentally friendly, and more efficient air transportation system. At the same time, we are ensuring 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.

ARMD is also directly addressing fundamental research challenges that must be overcome in order to implement the Next Generation Air Transportation System (NextGen). NextGen is the name given to a new National Airspace System that proposes to transform America's air traffic control system from an aging ground-based system to a satellite-based system. NextGen technology will provide advanced levels of automated support to air navigation service providers and aircraft operators enabling shortened routes for time and fuel savings, reduced traffic delays, increased capacity, and permitting controllers to monitor and manage aircraft with greater safety margins. This transformation has the aim of reducing gridlock, both in the sky and at airports. In conjunction with expanding air traffic management capabilities, research is being conducted to help address substantial noise, emissions, efficiency, performance, and safety challenges that are required to ensure vehicles can support the NextGen vision.

NASA's Aeronautics Research Mission Directorate (ARMD) supports the Agency's goal (Goal 4) to advance aeronautics research for societal benefit. The ARMD research plans directly support the National Aeronautics Research and Development Policy and accompanying Executive Order signed by the President on December 20, 2006.

In 2012, ARMD started issuing more focused solicitations by rotating subtopics every other year. The reduction in the scope of the solicitation does not imply a change in interest in a given area. For example, in 2012 we solicited proposals for airframe noise reduction and efficiency improvement (through drag reduction). In 2014 we are soliciting proposals for engine efficiencies and noise reduction. Then in 2015 we plan to return to airframe noise and efficiency improvement.

[\(http://www.aeronautics.nasa.gov/\)](http://www.aeronautics.nasa.gov/).

Human Exploration and Operations

The Human Exploration and Operations Mission Directorate (HEOMD) is chartered with the development of the core transportation elements, key systems, and enabling technologies required for beyond-Low Earth Orbit (LEO) human exploration that will provide the foundation for the next half-century of American leadership in space exploration. This new deep space exploration era starts with increasingly challenging test missions in cis-lunar space, including flights to the Lagrange points, followed by human missions to near-Earth asteroids (NEAs), moon, the moons of Mars, and Mars as part of a sustained journey of exploration in the inner solar system. HEOMD is a relatively new organization, formed in 2011 by combining the Space Operations Mission Directorate (SOMD) and the Exploration Systems Mission Directorate (ESMD) so as to optimize the elements, systems, and technologies of the precursor Directorates to the maximum extent possible. For the current year, due to budget constraints, HEOMD was asked to adjust the number of Topics and Subtopics included in the call for proposals: after considerable effort,

the number of topics included has been reduced from 21 to 12 and the number of subtopics from 57 to 36. HEOMD accomplishes its mission through the following goals:

- Development and use of launch systems and in-space transport capabilities permitting exploration of various regions of space.
- Development of space habitats which permit the processing and operation of physical and life science experiments in the space environment.
- Development of means to return data and explorers from these in-space operations to Earth.

Key technology areas including Space Transportation, Space Communications and Navigation, Human Research and Health Maintenance, Radiation Protection, Life Support and Habitation, High Efficiency Space Power Systems, and Ground Processing/ISS Utilization, along with enabling technologies and capabilities, will continue to evolve synergistically as the directorate guides their development and enhancement to meet future needs.

In addition, as other NASA programs develop new mission capabilities and requirements, operational capability will be evolved to include these new enhancements. To create the new capabilities and contribute to the knowledge that is required for humans to explore these destinations, HEOMD is responsible for:

- Conducting technology development and demonstrations to reduce cost and prove required capabilities for future human exploration.
- Developing exploration precursor robotic missions to multiple destinations to cost-effectively scout human exploration targets.
- Increasing investments in human research to prepare for long-duration missions in deep space;
- Enabling U.S. commercial human spaceflight capabilities.
- Developing communication and navigation technologies.
- Reducing operational costs.
- Expanding Human Operations in space.
- Maximizing ISS utilization.

In summary, HEOMD looks forward to incorporating SBIR-developed technologies into current and future systems to contribute to the expansion of humanity across the solar system while providing continued cost effective space access and operations for its customers, with a high standard of safety, reliability, and affordability.

Science

NASA leads the nation on a great journey of discovery, seeking new knowledge and understanding of our planet Earth, our Sun and solar system, and the universe out to its farthest reaches and back to its earliest moments of existence. NASA's Science Mission Directorate (SMD) and the nation's science community use space observatories to conduct scientific studies of the Earth from space, to visit and return samples from other bodies in the solar system, and to peer out into our Galaxy and beyond. NASA's science program seeks answers to profound questions that touch us all:

- How are Earth's climate and the environment changing?
- How and why does the Sun vary and affect Earth and the rest of the solar system?
- How do planets and life originate?
- How does the universe work, and what are the origin and destiny of the universe?
- Are we alone?

For more information on SMD, visit: (<http://science.nasa.gov/>). The following topics and subtopics seek to develop technology to enable science missions in support of these strategic objectives.

Space Technology

The Space Technology Mission Directorate (STMD) enables a new class of missions by drawing on talent from the NASA workforce, academia, small businesses, and the broader space enterprise to deliver innovative solutions that dramatically improve technological capabilities for NASA and the Nation. The rapid development and infusion of new technologies and capabilities are critical components to advancing the Nation's future in space. These activities fuel an emerging aerospace economy and build upon the space technology needs of other government agencies, as well as the overall aerospace enterprise. NASA supports these objectives and contributes to the demands of larger national technology goals by investing in Space Technology.

Using a broad investment strategy, NASA's Space Technology investments address the identified range of technology areas found in NASA's Space Technology Roadmaps as prioritized by the National Academies. Under the direction of STMD, NASA funds the development of pioneering technologies that will increase the Nation's capability to perform space science, operate in space, and enable deep space exploration. Significant progress in technology areas such as in-space power systems, solar electric propulsion, radiation protection, next generation life-support, human robotic systems, cryogenic fluid handling, and entry, descent and landing capabilities, are essential for future science and human exploration missions. Developing these solutions will stimulate the growth of the Nation's innovation economy by enabling new technology sectors in areas such as robotics, advanced manufacturing, and synthetic biology.

SBIR and STTR continue to support early-stage research and mid-TRL development performed by small businesses through competitively awarded contracts. These programs produce innovations for both Government and commercial applications. SBIR and STTR provide the high-technology small business sector with opportunities to develop technology for NASA, as well as commercialize those technologies to provide goods and services that address other national needs based on the products of NASA innovation.

9.1 Select Subtopics

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Aeronautics Research Mission Directorate Select Subtopics

A20.01 Air Traffic Management Research and Development

Lead Center: ARC

Participating Center(s): LaRC

The Airspace Systems Program (ASP) seeks innovative and feasible concepts and technologies to enable significant increases in the capacity and efficiency of the Next Generation Air Transportation System (NextGen) while maintaining or improving safety and environmental acceptability. There are two projects within ASP (Concepts and Technology Development, CTD and Systems Analysis, Integration and Evaluation, SAIE). The two projects address the following Technical Challenges:

- Develop tactical automation technologies for complex operational choke points including surface, arrival/departure, and dense terminal operations.
- Establish the basis for air/ground functional allocation for separation assurance including safe, graceful degradation of performance in response to off-nominal conditions.
- Develop strategic automation technologies that integrate probabilistic weather information and flow management capabilities.
- Conduct seamless integration of automation applications in a resilient, end-to-end Trajectory-Based Operations system.
- For the highest levels of NextGen performance and beyond, develop concepts, technologies, and system-wide evaluation and validation approaches.

In support of these technical challenges, ASP seeks proposals in the following areas:

- Address integrated arrival, departure, and surface traffic planning for reduced fuel consumption, noise, and emissions during congested flows through:
 - Balanced runway usage and runway configuration management.
 - Precision departure release scheduling.
 - Reduced fuel/noise/emissions continuous descent arrivals with precision scheduling.
 - Maintaining safety in ground operations through the development of concepts and algorithms for both aircraft- and ground-based surface conflict detection and resolution (CD&R) and integration of the two approaches.
 - Developing pilot display requirements and technologies for 4D taxi clearance compliance, and taxi clearance conformance monitoring algorithms and procedures.
 - Dynamic aircraft spacing/separation considering wake vortices. Environmental impacts will be considered as concepts are investigated.
- Develop a tool for air traffic management cost assessment addressing:
 - Aircraft line of flight impact to the airline and the NAS.
 - Quantify user costs on equipage and training along with benefits delivered by the related new concepts and capabilities.
 - Economic impact of policy decisions for new procedures on given concepts and technologies.
- Use of innovative data storage, data mining and big data analytics techniques to store, visualize and/or analyze large amounts of archived air traffic management data (radar data, weather data, traffic management initiatives, performance logs, etc.) for use by researchers.
- Develop Airline Operations Center simulation capability to enable conducting studies to assess integrated traffic/flow management and airline operations, collaborative decision making, and advanced automated concepts to support airline operations.
- Develop decision support capability requirements to enable Single Pilot Operations (SPO) that will substitute the crew resource management (CRM) or its parts that exists in current operations.
- Develop a functional description of airspace architectures and concepts that would enable all markets including but not limited to on-demand and scheduled mobility taking advantage of increased automation in the cockpit and on the ground through interconnected networks.

Human Exploration and Operations Mission Directorate Select Subtopics

H20.01 Human-Robotic Systems - Manipulation Subsystem and Human-System Interaction

Lead Center: JSC

Participating Center(s): ARC, JPL, KSC

The objective of this topic is to create human-robotic technologies (hardware and software) to improve the exploration of space.

Robots can perform tasks to assist and off-load work from astronauts. Robots may perform this work before, in support of, or after humans.

Ground controllers and astronauts will remotely operate robots using a range of control modes (tele-operation to supervised autonomy), over multiple spatial ranges (shared-space, line-of-sight, in orbit, and interplanetary), and with a range of time-delay and communications bandwidth.

Manipulation Subsystem - Proposals are sought that address subsystems that improve handling and maintenance of payloads and assets. Proposals that would directly benefit future ISS robotics (EVA dexterous mobile manipulation and IVA free-flying robot) are highly encouraged. Key technologies of interest include but are not limited to: tactile sensors, human-safe actuation, active structures, dexterous grasping, modular “plug and play” mechanisms for deployment and setup, small/lightweight excavation/drilling devices to enable subsurface access, and novel manipulation methods; as well as, sample handling by both humans and tele-operated robots for storage and in-situ utilization/evaluation.

Human-System Interaction - Proposals are sought that address subsystems that enable crew and ground controllers to better operate, monitor and supervise robots. Proposals that would directly benefit future ISS robotics (EVA dexterous mobile manipulation and IVA free-flying robot) are highly encouraged. Key technologies of interest include but are not limited to: robot user interfaces, automated performance monitoring, tactical planning software, ground data system tools, command planning and sequencing, real-time visualization/notification, and software for situational awareness.

Offerors are encouraged to consider all Technology Readiness Level efforts TRL 1-8 when considering proposals for the Phase I and Phase II Deliverables.

Phase I Deliverables may include - Feasibility studies, or they may support an entirely new and innovative potential solution to the Human, Robotics discipline. Demonstrations, taking adapted or targeted innovative solutions from concept through demonstrations in relevant environments and/or use case.

Phase II Deliverables may include but are not limited to - Prototype or Engineering Release products that have evolved from initial concept phases into designs of enough maturity to demonstrate confidence that the product remains viable and feasible for the intended use. The ability to mature concepts along the TRL lifecycle is highly desired and should be emphasized by the offeror.

Reference NASA Office of Chief Technologist Technology Roadmap OCT TA (4.3, 4.4 and 4.7)

<http://www.nasa.gov/offices/oct/home/roadmaps/index.html>

H20.02 International Space Station (ISS) Demonstration and Development of Improved Exploration Technologies

Lead Center: JSC

Participating Center(s): GRC, JPL, KSC, MSFC

NASA is investing in technologies and techniques geared towards advancing the state of the art of spacecraft systems through the utilization of the ISS as a technology test bed. Desired demonstrations designed to utilize the ISS as a test bed should focus on increasing the Technology Readiness Level (TRL) in the following fields:

- Power Generation and Energy Storage (e.g., regenerative fuel cells).
- Robotics Tele-robotics and Autonomous (RTA) Systems.
- Communication and Navigation (e.g., autonomous rendezvous and docking advancements).
- Human Health, Life Support and Habitation Systems (e.g., closed loop aspects of environmental control and life support systems).
- Environmental Control Systems.
- Radiation Protection and Mitigation.
- Science Instruments, Observatories and Sensor Systems.
- Materials, Structures, Mechanical Systems and Manufacturing.
- Thermal Management Systems.

Successful proposals in these fields are expected to advance the state of the art of spacecraft systems by:

- Increasing capability/operating time including overall operational availability.
- Reducing logistics and maintenance efforts.
- Reducing operational efforts, minimizing crew interaction with both systems and the ground.
- Reducing known spacecraft/spaceflight technical risks and needs.
- Providing information on the long term space environment needed in the development of future spacecraft technologies through model development, simulations or ground testing verified by on-orbit operational data.

For all above technologies, research should be conducted to demonstrate technical feasibility and prototype hardware development during Phase I and show a path toward Phase II hardware and software demonstration and delivering an engineering development unit or software package for NASA testing at the completion of the Phase II contract that could be turned into a proof-of-concept system which can be demonstrated in flight.

Phase I Deliverables - Research to identify and evaluate candidate technologies applications to demonstrate the technical feasibility and show a path towards a hardware/software demonstration. Bench or lab-level demonstrations are desirable. The technology concept at the end of Phase I should be at a TRL of 3-6.

Phase II Deliverables - Emphasis should be placed on developing and demonstrating hardware and/or software prototype that can be demonstrated on orbit (TRL 8), or in some cases under simulated flight conditions. The proposal shall outline a path showing how the technology could be developed into space-worthy systems. The contract should deliver an engineering development unit for functional and environmental testing at the completion of the Phase II contract. The technology at the end of Phase II should be at a TRL of 6-7.

Potential NASA Customers include:

- International Space Station Program (http://www.nasa.gov/mission_pages/station/main/index.html).
- Orion Multipurpose Crew Vehicle (<http://www.nasa.gov/exploration/systems/mpcv/index.html>).

Science Mission Directorate Select Subtopics

S20.01 Array Technologies for Microwave Remote Sensing

Lead Center: JPL

Participating Center(s): GSFC

Two of the key challenges for microwave remote sensing (active and passive) of the Earth's environment are:

- Obtaining measurements of sufficiently high resolution such that in-pixel averaging affects do not introduce errors or otherwise obscure the phenomena being measured.
- Providing wide-area coverage such large scale systems can be studied synoptically and revisit times are sufficiently small to study phenomena with relatively rapid changes.

Unfortunately, both are generally at odds with each other. For traditional fixed-beam antenna systems, improvement of resolution necessarily leads to a reduction in coverage. In order to achieve desired coverage and resolution array antenna and sensor technologies can be employed. This may take different forms, depending upon the application. For radar systems, active, electronically-steered phased arrays can provide beam agility that can be used to cover wide swaths with high resolution and can also be used to dynamically target phenomena of interest, maximizing the value of sampling time and on-orbit assets. For passive remote sensors, highly-thinned correlating radiometer arrays can provide high spatial resolutions over a wide areas and focal-plane arrays can be used to bring camera-like properties usually associated with visible-light and IR measurements to sub-millimeter wavelengths.

The range of techniques described above will enhance and enable a variety of important Earth science measurements including: Surface deformations (volcanos, fault motion, subsidence), ice sheet thickness and dynamics, atmospheric phenomena such as precipitation, clouds and atmospheric water vapor.

The specific technologies solicited are:

- *Ku/Ka-band electronically-scanned linear arrays* - The impacts of clouds and precipitation represent some of the greatest uncertainties in current climate models. The complex interactions in cloud and precipitation systems dictate that they be studied as a whole, whereas previous mission have only been able to study clouds and precipitation separately. To study the complete system at the appropriate spatial scales with adequate resolution requires simultaneous scanning array technology at a range of microwave and millimeter-wave wavelengths.
 - Frequencies (simultaneous): 13.4, 35.6, 94 GHz
 - Array element spacing (typ.): 0.65 wavelengths
 - Transmit power per element (Ku/Ka): 25/5/1 W
 - Transmit efficiency: as high as possible consistent with state-of-the-art
 - Front-end losses as low as possible
 - Manufacturing scalable to 2-3 m long arrays.
- *Low Frequency RF Tomography Technology for Global Biomass and Ice Sheet Investigations* - Global biomass and ice sheet investigations require a simple space borne low frequency (100-500 MHz) multi-channel altimeter that can measure 3-D tomography images of the Earth above ground biomass and ice sheet thickness. Doppler beam sharpening (SAR processing) will be used to obtain high spatial resolution along the track and multi-channel altimeters along the cross track will be used for obtaining high resolution in the cross track direction.

Phase I Studies Requirements:

- Design and feasibility study of low frequency array antenna mounted along the wings of NASAs P3 like aircraft. Design must satisfy both electromagnetic and aerodynamic performances. Frequency of operation: 300 MHz, Bandwidth 50 MHz, Linear/Dual polarized.
- Design of RF front end and base band processing units for each altimeter channel that are phase locked with each other.
- Feasibility study of using multi-channel altimeter for 3-D tomography imaging of biomass and ice sheets through simulated data.

Phase II Studies Requirements:

- Hardware realization of design completed in Phase I studies.
- Integration of antenna and other electronics with the selected aircraft (need not be NASAs P3).
- Field campaign to advance technology to TRL 6.
- P-, L-band Array Antennas:
 - Innovative designs for deployable lightweight antenna arrays for airborne and space borne SAR applications are required. The array designs should meet flatness requirements, minimize stowed volumes and provide robust deployment mechanisms. The array RF performance should support < 20% bandwidth, dual-polarization, high polarization isolation (> 30 dB) phased array radar

applications. The use of composite materials that can reduce the antenna weight and maintain surface flatness is desirable.

- Low Power Digital Correlator Systems for Synthetic Aperture Arrays:
 - Currently this is the key required element for the array on PATH. Several technology programs are under way, but a working, high TRL system is not yet available.

Phase I - Design and feasibility study of crosscorrelators with 2-bit resolution operating at 1 GHz clock speed. This includes the digitization and digital crosscorrelation functionality for correlation of 3x128 I-Q receiver outputs from three arms of the instrument.

Power consumption is a major driver for the system, most likely only to be achieved by using ASIC chips. The correlator design will include housing and thermal design to demonstrate feasibility for operation in vacuum.

Phase II - Implementation and testing of the correlator system. This includes desing, manufacture and functional and thermal testing of the correlator system. Testing of the system in a interferometer system, such as JPL GeoSTAR testbed will demonstrate the performance in a real instrument.

S20.02 Novel Spectroscopy Technology and Instrumentation

Lead Center: GSFC

Participating Center(s): JPL

In astrophysics, science instruments are “photon starved”. Every photon has to count. Efficient use of light and maximizing signal-to-noise is critical and there is always room for improvement. In many high-resolution spectroscopy systems as much as 50% of the light is lost in the spectrometer optics before it gets to the detectors. It is far more cost-efficient to improve detection systems in terms of throughput, efficiency, resolution, and noise than to compensate by making the payload larger. Spectroscopy is applicable in the UV, visible, IR. In terms of instrumentation, answers to higher photon efficiency can be answered through entire novel instrument (system designs) to single components (filters, grisms, gratings, etc.)

Transit Spectroscopy, multi-object spectrographs, slit and slit-less spectrographs and associated component and subsystem technologies such as grisms, filters, etalons, etc. enable higher performance and more efficient use of the light collected. High-resolution spectroscopy for galaxy evolution, exoplanet spectroscopy for deciphering the chemical composition of exoplanetary atmospheres. High resolution spectroscopy in UV, Visible, and IR.

Specific areas of research include:

- Image slicers. Imager slicers are stacks of optics that ‘slice’ a field into separate regions and remap them into a pseudo-slit (or slits) that are then fed into a traditional spectrograph. This design can be used to produce an efficient imaging spectrograph that has a high fill factor. Micromirror and lenslet-based integral field spectrographs have a very low fill factor by comparison (less efficient use of pixels by a factor of 4).
- Micromirror arrays. Micromirror arrays work similarly to lenslet arrays in that they compress the light from a single spatial location into a focused spot. UV wavelengths however require micromirror arrays because refractive optics will not work. In addition, micromirror arrays can operate over broad bandpasses without producing chromatic aberrations.
- Improved dichroic filters. Dichroic filters reflect a certain bandpass and transmit another wavelength. Improved dichroic filters would enable more efficient use of separate science instruments or a single multi-band imaging instrument.
- Lenslet-coupled fiber optics for space flight. Fiber-fed lenslet arrays could also be used to produce a pseudo-slit in a similar way to the image slicers. The fiber-coupling losses and problems with packing the fibers closely due to the cladding have precluded their use.
- Improved Fabry Perot etalons. Fabry Perot etalons are some of the highest resolution spectrometers that are used for instrumentation but they suffer from high loss and large size that make them difficult to implement for space. Improvements in size and efficiency are sought for Fabry Perot etalons.
- Improved gratings.

- On chip hyperspectral imaging systems. Hyperspectral imaging is an area of continued interest in particular to Earth Science for applications such as agriculture and land use. These systems tend to be complex and difficult to implement. Approaches to integrate the hyperspectral filtering with the detector are sought.

S20.03 Radiation Hardened Application Specific Integrated Circuit (ASIC) Platforms

Lead Center: GSFC

Participating Center(s): JPL, MSFC

Ambitious science goals along with budgetary constraints are driving the need to increase the science return from smaller mission classes. This has led to new interest in cubesats and smallsats as viable science platforms. To enable capable science with these smaller missions, there is a critical need to miniaturize instruments, as well as spacecraft subsystems. To this end, this subtopic solicits the development of a radiation hardened structured-ASIC platform to implement flexible instrument processing nodes. This technology would enable integration of all digital functions of an instrument onto a single device, and would also enable similar integration of spacecraft bus digital functions for a cubesat or a smallsat.

As flexible instrument processing nodes would reduce board-level assemblies into individual integrated circuits, the overall size/mass/power savings provided to a mission would be dramatic. A sampling of candidate mission applications for this technology includes:

- Miniaturized planetary instruments such as magnetometers and imagers.
- Highly capable heliophysics cubesats along with miniaturized instruments to measure field and particles.
- Earth observing smallsats and miniaturized instruments.
- Low power channel readout electronics for astrophysics mission concepts require data acquisition and processing for hundreds or even thousands of individual channels.

If broadly applied, the flexible instrument processing nodes may enable currently roadmapped science observations to be implemented in smaller mission classes than are currently planned.

To effectively support this broad array of applications, it is imperative that flexible instrument processing nodes be implemented such that customization for specific instruments and missions is both rapid and economical. Historically, the high cost and long development schedule of spaceflight ASICs has largely precluded them from use for mission specific applications. However, the emergence of radiation hardened structured-ASICs has the potential to change this paradigm, and as such, this is the specified platform for the flexible instrument processing node.

This processing node will require an aggressive adoption of System-On-a-Chip (SOC) technology, which will provide substantially more resources than are presently available. Target specifications for the platform are; embedded 32-bit processor, 50,000 logic cells, 4Mbit of embedded RAM, 500kbit embedded ROM, and 400 user I/O. While dependent on the user design, maximum clock rates of at least 200MHz and maximum power dissipation of less than 500mW are desirable. As previously stated, it is desired that the node be implemented as a high capacity radiation hardened structured-ASIC platform that can enable highly integrated, instrument specific device implementations, while offering up to a 10x reduction in development cost and schedule as compared to full custom ASICs. Environmental specifications are; radiation hard to at least 1 Mrad TID, latch up Immune to an LET of at least 80, and a device SEE rate of not greater than 0.01 event/day in Adams 90% worst case GEO environment. For descriptions of radiation effects in electronics, the proposer may visit (<http://radhome.gsfc.nasa.gov/radhome/background.htm>).

Proposals should clearly describe:

- The top-level device architecture.
- Individual circuit elements.
- The routing scheme.
- Methodologies for radiation hardening.
- Overall device capacity.
- Expected performance and power dissipation.

- Fabrication process and mask programming steps.
- Software tool flow for user designs.

Successful proposal concepts should significantly advance the state-of-the-art. If a Phase II proposal is awarded, the combined Phase I and Phase II developments should produce prototype devices that can be evaluated by NASA.

It should be noted that NASA can sponsor fabrication via the Trusted Access Program Office (TAPO) for this effort.

Space Technology Mission Directorate Select Subtopics

Z20.01 Deep Space Cubesat Technology

Lead Center: ARC

Although many small satellites have been developed and flown in low Earth orbit, significant technology challenges exist for their operation in the deep space environment. Small spacecraft, on the cubesat scale, could potentially perform science and exploration missions of great interest to NASA at a very low cost. Small spacecraft in deep space might also provide support services for other spacecraft and operations such as communications relays or space weather sensors.

NASA expects that there will be opportunities to fly several 6U cubesat spacecraft as secondary payloads on launch vehicles that could deploy these payloads on Earth escape trajectories that would take them past the Moon. One specific possibility for such an opportunity for small secondary spacecraft deployments is the first test flight of the Space Launch System (EM-1). EM-1 or similar missions would provide an excellent opportunity for testing innovative spacecraft technologies in the deep space environment.

Proposals are sought for integrated spacecraft bus technologies such as guidance, navigation, control, power, propulsion, communications, thermal control, and radiation protection to enable a technology flight demonstration mission in deep space. The integrated design should enable a flight demonstration of one or more of these technologies on a cubesat (6U or smaller) in the 2017 timeframe. The flight demonstration should include mission objectives that are relevant to a deep space mission such as remote sensing or in situ science data collection activities. The development of an appropriate propulsion system to enable maneuvers such as lunar orbit insertion is also of interest. In order to minimize development cost and schedule, the design of this deep space cubesat technology demonstrator should employ mature components where possible along with the necessary new technology to allow for this very small spacecraft to survive and operate effectively in the deep space environment and communicate with Earth from the distance of the Moon and beyond.

Phase I projects should focus on the definition and initial development of the needed technologies for a deep space cubesat technology demonstrator. In Phase II, the technologies should be further developed and demonstrated in relevant laboratory environments such as thermal-vacuum chambers. Projects showing sufficient merit will be considered for subsequent Phase II-E or II-X and Phase III funding to support development and qualification of a flight unit for a deep space technology demonstration mission.

Appendices

Appendix A: Technology Readiness Level (TRL) Descriptions

The Technology Readiness Level (TRL) describes the stage of maturity in the development process from observation of basic principals through final product operation. The exit criteria for each level documents that principles, concepts, applications or performance have been satisfactorily demonstrated in the appropriate environment required for that level. A relevant environment is a subset of the operational environment that is expected to have a dominant impact on operational performance. Thus, reduced-gravity may be only one of the operational environments in which the technology must be demonstrated or validated in order to advance to the next TRL.

TRL	Definition	Hardware Description	Software Description	Exit Criteria
1	Basic principles observed and reported.	Scientific knowledge generated underpinning hardware technology concepts/applications.	Scientific knowledge generated underpinning basic properties of software architecture and mathematical formulation.	Peer reviewed publication of research underlying the proposed concept/application.
2	Technology concept and/or application formulated.	Invention begins, practical application is identified but is speculative, no experimental proof or detailed analysis is available to support the conjecture.	Practical application is identified but is speculative, no experimental proof or detailed analysis is available to support the conjecture. Basic properties of algorithms, representations and concepts defined. Basic principles coded. Experiments performed with synthetic data.	Documented description of the application/concept that addresses feasibility and benefit.
3	Analytical and experimental critical function and/or characteristic proof of concept.	Analytical studies place the technology in an appropriate context and laboratory demonstrations, modeling and simulation validate analytical prediction.	Development of limited functionality to validate critical properties and predictions using non-integrated software components.	Documented analytical/experimental results validating predictions of key parameters.
4	Component and/or breadboard validation in laboratory environment.	A low fidelity system/component breadboard is built and operated to demonstrate basic functionality and critical test environments, and associated performance predictions are defined relative to the final operating environment.	Key, functionally critical, software components are integrated, and functionally validated, to establish interoperability and begin architecture development. Relevant Environments defined and performance in this environment predicted.	Documented test performance demonstrating agreement with analytical predictions. Documented definition of relevant environment.
5	Component and/or breadboard validation in relevant environment.	A medium fidelity system/component brassboard is built and operated to demonstrate overall performance in a simulated operational environment with realistic support elements that demonstrates overall performance in critical areas.	End-to-end software elements implemented and interfaced with existing systems/simulations conforming to target environment. End-to-end software system, tested in relevant environment, meeting predicted performance. Operational environment	Documented test performance demonstrating agreement with analytical predictions. Documented definition of scaling requirements.

		Performance predictions are made for subsequent development phases.	performance predicted. Prototype implementations developed.	
6	System/sub-system model or prototype demonstration in a relevant environment.	A high fidelity system/component prototype that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate operations under critical environmental conditions.	Prototype implementations of the software demonstrated on full-scale realistic problems. Partially integrate with existing hardware/software systems. Limited documentation available. Engineering feasibility fully demonstrated.	Documented test performance demonstrating agreement with analytical predictions.
7	System prototype demonstration in an operational environment.	A high fidelity engineering unit that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate performance in the actual operational environment and platform (ground, airborne, or space).	Prototype software exists having all key functionality available for demonstration and test. Well integrated with operational hardware/software systems demonstrating operational feasibility. Most software bugs removed. Limited documentation available.	Documented test performance demonstrating agreement with analytical predictions.
8	Actual system completed and "flight qualified" through test and demonstration.	The final product in its final configuration is successfully demonstrated through test and analysis for its intended operational environment and platform (ground, airborne, or space).	All software has been thoroughly debugged and fully integrated with all operational hardware and software systems. All user documentation, training documentation, and maintenance documentation completed. All functionality successfully demonstrated in simulated operational scenarios. Verification and Validation (V&V) completed.	Documented test performance verifying analytical predictions.
9	Actual system flight proven through successful mission operations.	The final product is successfully operated in an actual mission.	All software has been thoroughly debugged and fully integrated with all operational hardware/software systems. All documentation has been completed. Sustaining software engineering support is in place. System has been successfully operated in the operational environment.	Documented mission operational results.

Definitions

Proof of Concept: Analytical and experimental demonstration of hardware/software concepts that may or may not be incorporated into subsequent development and/or operational units.

Breadboard: A low fidelity unit that demonstrates function only, without respect to form or fit in the case of hardware, or platform in the case of software. It often uses commercial and/or ad hoc components and is not intended to provide definitive information regarding operational performance.

Brassboard: A medium fidelity functional unit that typically tries to make use of as much operational hardware/software as possible and begins to address scaling issues associated with the operational system. It does not have the engineering pedigree in all aspects, but is structured to be able to operate in simulated operational environments in order to assess performance of critical functions.

Proto-type Unit: The proto-type unit demonstrates form, fit, and function at a scale deemed to be representative of the final product operating in its operational environment. A subscale test article provides fidelity sufficient to permit validation of analytical models capable of predicting the behavior of full-scale systems in an operational environment

Engineering Unit: A high fidelity unit that demonstrates critical aspects of the engineering processes involved in the development of the operational unit. Engineering test units are intended to closely resemble the final product (hardware/software) to the maximum extent possible and are built and tested so as to establish confidence that the design will function in the expected environments. In some cases, the engineering unit will become the final product, assuming proper traceability has been exercised over the components and hardware handling.

Mission Configuration: The final architecture/system design of the product that will be used in the operational environment. If the product is a subsystem/component, then it is embedded in the actual system in the actual configuration used in operation.

Laboratory Environment: An environment that does not address in any manner the environment to be encountered by the system, subsystem, or component (hardware or software) during its intended operation. Tests in a laboratory environment are solely for the purpose of demonstrating the underlying principles of technical performance (functions), without respect to the impact of environment.

Relevant Environment: Not all systems, subsystems, and/or components need to be operated in the operational environment in order to satisfactorily address performance margin requirements. Consequently, the relevant environment is the specific subset of the operational environment that is required to demonstrate critical "at risk" aspects of the final product performance in an operational environment. It is an environment that focuses specifically on "stressing" the technology advance in question.

Operational Environment: The environment in which the final product will be operated. In the case of space flight hardware/software, it is space. In the case of ground-based or airborne systems that are not directed toward space flight, it will be the environments defined by the scope of operations. For software, the environment will be defined by the operational platform.

Appendix B: NASA SBIR/STTR Technology Taxonomy

Aeronautics/Atmospheric Vehicles
Aerodynamics
Air Transportation & Safety
Airship/Lighter-than-Air Craft
Avionics (see also Control and Monitoring)
Analysis
Analytical Instruments (Solid, Liquid, Gas, Plasma, Energy; see also Sensors)
Analytical Methods
Astronautics
Aerobraking/Aerocapture
Entry, Descent, & Landing (see also Planetary Navigation, Tracking, & Telemetry)
Navigation & Guidance
Relative Navigation (Interception, Docking, Formation Flying; see also Control & Monitoring; Planetary Navigation, Tracking, & Telemetry)
Space Transportation & Safety
Spacecraft Design, Construction, Testing, & Performance (see also Engineering; Testing & Evaluation)
Spacecraft Instrumentation & Astrionics (see also Communications; Control & Monitoring; Information Systems)
Tools/EVA Tools
Autonomous Systems
Autonomous Control (see also Control & Monitoring)
Intelligence
Man-Machine Interaction
Perception/Vision
Recovery (see also Vehicle Health Management)
Robotics (see also Control & Monitoring; Sensors)
Biological Health/Life Support
Biomass Growth
Essential Life Resources (Oxygen, Water, Nutrients)
Fire Protection
Food (Preservation, Packaging, Preparation)
Health Monitoring & Sensing (see also Sensors)
Isolation/Protection/Radiation Shielding (see also Mechanical Systems)
Medical
Physiological/Psychological Countermeasures
Protective Clothing/Space Suits/Breathing Apparatus
Remediation/Purification
Waste Storage/Treatment
Communications, Networking & Signal Transport
Ad-Hoc Networks (see also Sensors)
Amplifiers/Repeaters/Translators
Antennas

Architecture/Framework/Protocols
Cables/Fittings
Coding & Compression
Multiplexers/Demultiplexers
Network Integration
Power Combiners/Splitters
Routers, Switches
Transmitters/Receivers
Waveguides/Optical Fiber (see also Optics)
Control & Monitoring
Algorithms/Control Software & Systems (see also Autonomous Systems)
Attitude Determination & Control
Command & Control
Condition Monitoring (see also Sensors)
Process Monitoring & Control
Sequencing & Scheduling
Telemetry/Tracking (Cooperative/Noncooperative; see also Planetary Navigation, Tracking, & Telemetry)
Teleoperation
Education & Training
Mission Training
Outreach
Training Concepts & Architectures
Electronics
Circuits (including ICs; for specific applications, see e.g., Communications, Networking & Signal Transport; Control & Monitoring, Sensors)
Manufacturing Methods
Materials (Insulator, Semiconductor, Substrate)
Superconductance/Magnetics
Energy
Conversion
Distribution/Management
Generation
Sources (Renewable, Nonrenewable)
Storage
Engineering
Characterization
Models & Simulations (see also Testing & Evaluation)
Project Management
Prototyping
Quality/Reliability
Software Tools (Analysis, Design)
Support
Imaging

3D Imaging
Display
Image Analysis
Image Capture (Stills/Motion)
Image Processing
Radiography
Thermal Imaging (see also Testing & Evaluation)
Information Systems
Computer System Architectures
Data Acquisition (see also Sensors)
Data Fusion
Data Input/Output Devices (Displays, Storage)
Data Modeling (see also Testing & Evaluation)
Data Processing
Knowledge Management
Logistics
Inventory Management/Warehousing
Material Handling & Packaging
Transport/Traffic Control
Manufacturing
Crop Production (see also Biological Health/Life Support)
In Situ Manufacturing
Microfabrication (and smaller; see also Electronics; Mechanical Systems; Photonics)
Processing Methods
Resource Extraction
Materials & Compositions
Aerogels
Ceramics
Coatings/Surface Treatments
Composites
Fluids
Joining (Adhesion, Welding)
Metallics
Minerals
Nanomaterials
Nonspecified
Organics/Biomaterials/Hybrids
Polymers
Smart/Multifunctional Materials
Textiles
Mechanical Systems
Actuators & Motors
Deployment

Exciters/Igniters
Fasteners/Decouplers
Isolation/Protection/Shielding (Acoustic, Ballistic, Dust, Radiation, Thermal)
Machines/Mechanical Subsystems
Microelectromechanical Systems (MEMS) and smaller
Pressure & Vacuum Systems
Structures
Tribology
Vehicles (see also Autonomous Systems)
Microgravity
Biophysical Utilization
Optics
Adaptive Optics
Fiber (see also Communications, Networking & Signal Transport; Photonics)
Filtering
Gratings
Lenses
Mirrors
Telescope Arrays
Photonics
Detectors (see also Sensors)
Emitters
Lasers (Communication)
Lasers (Cutting & Welding)
Lasers (Guidance & Tracking)
Lasers (Ignition)
Lasers (Ladar/Lidar)
Lasers (Machining/Materials Processing)
Lasers (Measuring/Sensing)
Lasers (Medical Imaging)
Lasers (Surgical)
Lasers (Weapons)
Materials & Structures (including Optoelectronics)
Planetary Navigation, Tracking, & Telemetry
Entry, Descent, & Landing (see also Astronautics)
GPS/Radiometric (see also Sensors)
Inertial (see also Sensors)
Optical
Ranging/Tracking
Telemetry (see also Control & Monitoring)
Propulsion
Ablative Propulsion
Atmospheric Propulsion

Extravehicular Activity (EVA) Propulsion
Fuels/Propellants
Launch Engine/Booster
Maneuvering/Stationkeeping/Attitude Control Devices
Photon Sails (Solar; Laser)
Spacecraft Main Engine
Surface Propulsion
Tethers
Sensors/Transducers
Acoustic/Vibration
Biological (see also Biological Health/Life Support)
Biological Signature (i.e., Signs Of Life)
Chemical/Environmental (see also Biological Health/Life Support)
Contact/Mechanical
Electromagnetic
Inertial
Interferometric (see also Analysis)
Ionizing Radiation
Optical/Photonic (see also Photonics)
Positioning (Attitude Determination, Location X-Y-Z)
Pressure/Vacuum
Radiometric
Sensor Nodes & Webs (see also Communications, Networking & Signal Transport)
Thermal
Software Development
Development Environments
Operating Systems
Programming Languages
Verification/Validation Tools
Spectral Measurement, Imaging & Analysis (including Telescopes)
Infrared
Long
Microwave
Multispectral/Hyperspectral
Non-Electromagnetic
Radio
Terahertz (Sub-millimeter)
Ultraviolet
Visible
X-rays/Gamma Rays
Testing & Evaluation
Destructive Testing
Hardware-in-the-Loop Testing

Lifetime Testing
Nondestructive Evaluation (NDE; NDT)
Simulation & Modeling
Thermal Management & Control
Active Systems
Cryogenic/Fluid Systems
Heat Exchange
Passive Systems
Vehicle Health Management
Diagnostics/Prognostics
Recovery (see also Autonomous Systems)

Appendix C: SBIR/STTR and the Space Technology Roadmaps

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

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

TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA01	1.0.0 Launch Propulsion Systems,	N/A	N/A	N/A
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA02	2.0.0 In-Space Propulsion Technologies	N/A	N/A	N/A
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA03	3.0.0 Space Power and Energy Storage	N/A	N/A	N/A
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA04	4.0.0 Robotics, Telerobotics and Autonomous Systems	4.3.0 Manipulation	Human-Robotic Systems - Manipulation Subsystem and Human-System Interaction	H20.01
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA05	5.0.0 Communication and Navigation	N/A	N/A	N/A
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA06	6.0.0 Human Health, Life Support and Habitation Systems	6.1.0 Environmental Control Life Support & Habitation Systems	International Space Station (ISS) Demonstration and Development of Improved Exploration Technologies	H20.02
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA07	7.0.0 Human Exploration Destination Systems	N/A	N/A	N/A

TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA08	8.0.0 Science Instruments, Observatories & Sensor Systems	8.1.0 Science Instruments	Array Technologies for Microwave Remote Sensing	S20.01
			Novel Spectroscopy Technology and Instrumentation	S20.02
			Radiation Hardened Application Specific Integrated Circuit (ASIC) Platforms	S20.03
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA09	9.0.0 Entry, Descent and Landing Systems	N/A	N/A	N/A
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA10	10.0.0 Nanotechnology	N/A	N/A	N/A
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA11	11.0.0 Modeling, Simulation, Information Technology and Processing	N/A	N/A	N/A
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA12	12.0.0 Materials, Structures, Mechanical Systems and Manufacturing	12.5.0 Cross-Cutting	Deep Space Cubesat Technology	Z20.01
TA	STR Technology Area (TA) Level 1 Description	STR Technology Area (TA) Level 2 Description	Subtopic Description	Subtopic
TA14	14.0.0 Thermal MaN/Agement Systems	N/A	N/A	N/A
		Topic Title	Subtopic Title	Subtopic
	Aviation Research (ARMD)	N/A	Air Traffic Management Research and Development	A20.01

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