

**DEPARTMENT OF DEFENSE
SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM
SBIR 20.3 Program Broad Agency Announcement (BAA)**

AMENDMENT 2, October 27, 2020

The purpose of Amendment 2 is to extend the deadline for receipt of proposals to Thursday, November 5, 2020 at 12:00 PM ET. Changes are noted in red text below.

August 25, 2020: DoD BAA issued for pre-release

September 23, 2020: DoD begins accepting proposals

November 5, 2020: Deadline for receipt of proposals no later than 12:00 p.m. ET

Participating DoD Components:

- Department of the Navy
- Department of the Air Force
- Chemical and Biological Defense (CBD)
- Defense Logistics Agency (DLA)
- National Geospatial-Intelligence Agency (NGA)
- Office of the Secretary of Defense – Defense Human Resources Activity (OSD - DHRA)
- Office of the Secretary of Defense – Joint Service Small Arms Program (OSD - JSSAP)
- Office of the Secretary of Defense – ManTech (OSD - ManTech)
- Strategic Capabilities Office (SCO)
- United States Special Operations Command (USSOCOM)

IMPORTANT

Deadline for Receipt: Proposals must be **completely** submitted no later than **12:00 p.m. ET, November 5, 2020**. Proposals submitted after 12:00 p.m. will not be evaluated. The final proposal submission includes successful completion of all firm level forms, all required volumes, and electronic corporate official certification.

Classified proposals will not be accepted under the DoD SBIR Program.

This BAA and the Defense SBIR/STTR Innovation Portal (DSIP) sites are designed to reduce the time and cost required to prepare a formal proposal. The DSIP is the official portal for DoD SBIR/STTR proposal submission. Proposers are required to submit proposals via DSIP; proposals submitted by any other means will be disregarded. Proposers submitting through this site for the first time will be asked to register. Effective with this announcement, firms are required to register for a login.gov account and link it to their DSIP account. See section 4.14 for more information regarding registration.

The Small Business Administration, through its SBIR/STTR Policy Directive, purposely departs from normal Government solicitation formats and requirements and authorizes agencies to simplify the SBIR/STTR award process and minimize the regulatory burden on small business. Therefore, consistent with the SBA SBIR/STTR Policy Directive, the Department of Defense is soliciting proposals as a Broad Agency Announcement.

SBIR/STTR Updates and Notices: To be notified of SBIR/STTR opportunities and to receive e-mail updates on the DoD SBIR and STTR Programs, you are invited to subscribe to our Listserv by visiting <https://www.dodsbirsttr.mil/submissions/login> and clicking “DSIP Listserv” located under Quick Links.

Help Desk: If you have questions about the Defense Department's SBIR or STTR Programs, please call the DoD SBIR/STTR Help Desk at 1-703-214-1333, or email to DoDSBIRSupport@reisystems.com (Monday through Friday, 9:00 a.m. to 5:00 p.m. ET).

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1.0 INTRODUCTION

The Navy, Air Force, CBD, DLA, NGA, OSD – DHRA, OSD - ManTech, and USSOCOM hereafter referred to as DoD Components, invite small business firms to submit proposals under this BAA for the Small Business Innovation Research (SBIR) Program. Firms with the capability to conduct research and development (R&D) in any of the defense-related topic areas described in Section 12.0 and to commercialize the results of that R&D are encouraged to participate.

This BAA is for Phase I proposals only unless the Component is participating in the **Direct to Phase II Program**. DLA, NGA, OSD – JSSAP, SCO, and USSOCOM are offering Direct to Phase II topics for the SBIR 20.3 BAA – see the Component-specific instructions for more information.

This BAA is for Phase I proposals only. A separate BAA will not be issued requesting Phase II proposals, and unsolicited proposals will not be accepted. All firms that receive a Phase I award originating from this BAA will be eligible to participate in Phase II competitions and potential Phase III awards. DoD Components will notify Phase I awardees of the Phase II proposal submission requirements. Submission of Phase II proposals will be in accordance with instructions provided by individual Components. The details on the due date, content, and submission requirements of the Phase II proposal will be provided by the awarding DoD Component either in the Phase I award or by subsequent notification. If a firm submits their Phase II proposal prior to the dates provided by the individual Components, it may be rejected without evaluation.

DoD is not obligated to make any awards under Phase I, Phase II, or Phase III, and all awards are subject to the availability of funds. DoD is not responsible for any monies expended by the proposer before the issuance of any award.

2.0 PROGRAM DESCRIPTION

2.1 Objectives

The objectives of the DoD SBIR Program include stimulating technological innovation, strengthening the role of small business in meeting DoD research and development needs, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development results.

RT&L Technology Focus Area Definitions

Focus Area	Description
5G	Technologies enabling the 5G spectrum to increase speed over current networks, to be more resilient and less susceptible to attacks, and to improve military communication and situational awareness.
Artificial Intelligence (AI)/ Machine Learning (ML)	Systems that perceive, learn, decide, and act on their own. Machine-learning systems with the ability to explain their rationale, characterize their strengths and weaknesses, and convey understanding of how they will behave in the future.
Autonomy	Technology that can deliver value by mitigating operational challenges such as: rapid decision making; high heterogeneity and/or volume of data; intermittent communications; high complexity of coordinated action; danger to mission; and high persistence and endurance.
Biotechnology	Biotechnology is any technological application that harnesses cellular and biomolecular processes. Most current biotech research focuses on agent detection, vaccines, and treatment. Future advances in biotechnology will improve the protection of both the general public and military personnel from biological agents, among numerous other potential applications.
Cybersecurity	Prevention of damage to, protection of, and restoration of computers, electronic communications systems, electronic communications services, wire communication, and electronic communications, including information contained therein, to ensure its availability, integrity, authentication, confidentiality, and nonrepudiation.
Directed Energy (DE)	Technologies related to production of a beam of concentrated electromagnetic energy, atomic, or subatomic particles.
Hypersonics	Innovative concepts or technologies that enable, or directly support, weapons or aircraft that fly at or near hypersonic speeds and/or innovation that allows for enhancing defensive capability against such systems.
Microelectronics	Critical microcircuits used in covered systems, custom-designed, custom-manufactured, or tailored for specific military application, system, or environment.
Networked Command, Control, and Communications (C3)	Fully networked command control and communications including: command and control (C2) interfaces, architectures, and techniques (e.g., common software interfaces and functional architectures and improved C2 processing/decision making techniques); communications terminals (e.g., software-defined radio (SDRs)/apertures with multiple networks on the same band and multi-functional systems); and apertures and networking technologies (e.g., leveraging/managing a diverse set of links across multiple band and software defined networking/ network slicing).
Nuclear	Technologies supporting the nuclear triad-including nuclear command, control, and communications, and supporting infrastructure. Modernization of the nuclear force includes developing options to counter competitors' coercive strategies, predicated on the threatened use of nuclear or strategic non-nuclear attacks.
Quantum Science	Technologies related to matter and energy on the atomic and subatomic level. Areas of interest: clocks and sensors; networks; computing enabling technologies (e.g., low temperature amplifiers, cryogenics, superconducting circuits, photon detectors); communications (i.e., sending/receiving individual photons); and manufacturing improvements.
Space	Technologies supporting space, or applied to a space environment.
General Warfighting Requirements (GWR)	Warfighting requirements not meeting the descriptions above; may be categorized into Reliance 21 areas of interest.

The DoD SBIR/STTR Programs follow the policies and practices of the Small Business Administration (SBA) SBIR Policy Directive updated on May 2, 2019. The guidelines presented in this BAA incorporate and make use of the flexibility of the SBA SBIR/STTR Policy Directive to encourage proposals based on scientific and technical approaches most likely to yield results important to the DoD and the private sector. The SBIR Policy Directive is available at: https://www.sbir.gov/sites/default/files/SBIR-STTR_Policy_Directive_2019.pdf.

2.2 Three Phase Program

The SBIR Program is a three-phase program. Phase I is to determine, to the extent possible, the scientific, technical, and commercial merit and feasibility of ideas submitted under the SBIR Program. Phase I awards are made in accordance with the SBA Policy Directive guidelines, current version. The period of performance is generally between six to twelve months with twelve months being the maximum period allowable. Proposals should concentrate on research or research and development which will significantly contribute to proving the scientific and technical feasibility, and commercialization potential of the proposed effort, the successful completion of which is a prerequisite for further DoD support in Phase II. Proposers are encouraged to consider whether the research or research and development being proposed to DoD Components also has private sector potential, either for the proposed application or as a base for other applications.

Phase II awards will be made to firms on the basis of results of their Phase I effort and/or the scientific merit, technical merit, and commercialization potential of the Phase II proposal. Phase II awards are made in accordance with the SBA Policy Directive guidelines, current version. The period of performance is generally 24 months. Phase II is the principal research or research and development effort and is expected to produce a well-defined deliverable prototype. A Phase II contractor may receive up to one additional, sequential Phase II award for continued work on the project.

Under Phase III, the Proposer is required to obtain funding from either the private sector, a non-SBIR Government source, or both, to develop the prototype into a viable product or non-R&D service for sale in military or private sector markets. SBIR Phase III refers to work that derives from, extends, or completes an effort made under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Phase III work is typically oriented towards commercialization of SBIR research or technology.

3.0 DEFINITIONS

The following definitions from the SBA SBIR/STTR Policy Directive, the Federal Acquisition Regulation (FAR), and other cited regulations apply for the purposes of this BAA:

3.1 Performance Benchmarks for Progress toward Commercialization

In accordance with the SBA SBIR-STTR Policy Directive Sec 6(a)(7), DoD established a threshold for the application of a benchmark where it is applied only to Phase I applicants that have received more than twenty (20) awards over the prior five (5) fiscal years as determined by the Small Business Administration. The ratio of Phase II awards received to Phase I awards received during this period must be at least 0.25.

Additional information on performance benchmarking for Phase I applicants can be found at <https://www.sbir.gov/performance-benchmarks>.

3.2 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.

3.3 Cooperative Research and Development

Research and development conducted jointly by a small business concern and a research institution. For purposes of the STTR Program, 40% of the work is performed by the small business concern, and not less than 30% of the work is performed by the single research institution. For purposes of the SBIR Program, this refers to work conducted by a research institution as a subcontractor to the small business concern. At least two-thirds of the research and/or analytical work in Phase I must be conducted by the proposing firm.

3.4 Essentially Equivalent Work

Work that is substantially the same research, which is proposed for funding in more than one contract proposal or grant application submitted to the same Federal agency or submitted to two or more different Federal agencies for review and funding consideration; or work where a specific research objective and the research design for accomplishing the objective are the same or closely related to another proposal or award, regardless of the funding source.

3.5 Export Control

The International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, and the Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, will apply to all projects with military or dual-use applications that develop beyond fundamental research, which is basic and applied research ordinarily published and shared broadly within the scientific community. More information is available at https://www.pmddtc.state.gov/ddtc_public.

NOTE: Export control compliance statements found in the individual Component-specific proposal instructions are not meant to be all inclusive. They do not remove any liability from the submitter to comply with applicable ITAR or EAR export control restrictions or from informing the Government of any potential export restriction as fundamental research and development efforts proceed.

3.6 Federal Laboratory

As defined in 15 U.S.C. § 3703, means any laboratory, any federally funded research and development center (FFRDC), 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.

3.7 Foreign Nationals

Foreign Nationals (also known as Foreign Persons) as defined by 22 CFR 120.16 means any natural person who is not a lawful permanent resident as defined by 8 U.S.C. § 1101(a)(20) or who is not a protected individual as defined by 8 U.S.C. § 1324b(a)(3). It also means any foreign corporation, business association, partnership, trust, society or any other entity or group that is not incorporated or organized to do business in the United States, as well as international organizations, foreign governments and any agency or subdivision of foreign governments (e.g., diplomatic missions).

“Lawfully admitted for permanent residence” means the status of having been lawfully accorded the privilege of residing permanently in the United States as an immigrant in accordance with the immigration laws, such status not having changed.

"Protected individual" means an individual who (A) is a citizen or national of the United States, or (B) is an alien who is lawfully admitted for permanent residence, is granted the status of an alien lawfully admitted for temporary residence under 8 U.S.C. § 1160(a) or 8 U.S.C. § 1255a(a)(1), is admitted as a refugee under 8 U.S.C. § 1157, or is granted asylum under Section 8 U.S.C. § 1158; but does not include (i) an alien who fails to apply for naturalization within six months of the date the alien first becomes eligible (by virtue of period of lawful permanent residence) to apply for naturalization or, if later, within six months after November 6, 1986, and (ii) an alien who has applied on a timely basis, but has not been naturalized as a citizen within 2 years after the date of the application, unless the alien can establish that the alien is actively pursuing naturalization, except that time consumed in the Service's processing the application shall not be counted toward the 2-year period.

3.8 Fraud, Waste and Abuse

- a. **Fraud** includes any false representation about a material fact or any intentional deception designed to deprive the United States unlawfully of something of value or to secure from the United States a benefit, privilege, allowance, or consideration to which an individual or business is not entitled.
- b. **Waste** includes extravagant, careless or needless expenditure of Government funds, or the consumption of Government property, that results from deficient practices, systems, controls, or decisions.
- c. **Abuse** includes any intentional or improper use of Government resources, such as misuse of rank, position, or authority or resources.
- d. The SBIR Program training related to Fraud, Waste and Abuse is available at: <https://www.sbir.gov/tutorials/fraud-waste-abuse/>. See Section 4.17 for reporting Fraud, Waste and Abuse.

3.9 Funding Agreement

Any contract, grant, or cooperative agreement entered into between any Federal Agency and any small business concern for the performance of experimental, developmental, or research work, including products or services, funded in whole or in part by the Federal Government. Only the contract method will be used by DoD Components for all SBIR awards.

3.10 HBCU/MI - Historically Black Colleges and Universities and Minority Institutions

Listings for the Historically Black Colleges and Universities (HBCU) and Minority Institutions (MI) are available through the Department of Education Web site, <http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html>.

3.11 Certified HUBZone Small Business Concern

An SBC that has been certified by SBA under the Historically Underutilized Business Zones (HUBZone) Program (13 C.F.R. § 126) as a HUBZone firm listed in the Dynamic Small Business Search (DSBS).

3.12 Principal Investigator

The principal investigator/project manager is the one individual designated by the applicant to provide the scientific and technical direction to a project supported by the funding agreement.

For both Phase I and Phase II, the primary employment of the principal investigator must be with the small business firm at the time of award and during the conduct of the proposed project. Primary employment means that more than one-half of the principal investigator's time is spent in the employ of the small business. This precludes full-time employment with another organization. Occasionally, deviations from this requirement may occur, and must be approved in writing by the contracting officer after consultation with the agency SBIR/STTR Program Manager/Coordinator. Further, a small business firm or research institution may replace the principal investigator on an SBIR/STTR Phase I or Phase II award, subject to approval in writing by the contracting officer.

3.13 Proprietary Information

Proprietary information is information that you provide which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security.

3.14 Research Institution

Any organization located in the United States that is:

- a. A university.
- b. A nonprofit institution as defined in Section 4(5) of the Stevenson-Wydler Technology Innovation Act of 1980.
- c. A contractor-operated federally funded research and development center, as identified by the National Science Foundation in accordance with the government-wide Federal Acquisition Regulation issued in accordance with Section 35(c)(1) of the Office of Federal Procurement Policy Act. A list of eligible FFRDCs is available at: <https://www.nsf.gov/statistics/ffrdclist/>.

3.15 Research or Research and Development

Any activity that is:

- a. A systematic, intensive study directed toward greater knowledge or understanding of the subject studied.
- b. A systematic study directed specifically toward applying new knowledge to meet a recognized need; or
- c. A systematic application of knowledge 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.

3.16 Research Involving Animal Subjects

All activities involving animal subjects shall be conducted in accordance with DoDI 3216.01 "Use of Animals in DoD Programs," 9 C.F.R. parts 1-4 "Animal Welfare Regulations," National Academy of Sciences Publication "Guide for the Care & Use of Laboratory Animals," as amended, and the Department of Agriculture rules implementing the Animal Welfare Act (7 U.S.C. §§ 2131-2159), as well as other applicable federal and state law and regulation and DoD instructions.

"Animal use" protocols apply to all activities that meet any of the following criteria:

- a. Any research, development, test, evaluation or training, (including experimentation) involving an animal or animals.
- b. An animal is defined as any living or dead, vertebrate organism (non-human) that is being used or is intended for use in research, development, test, evaluation or training.

- c. A vertebrate is a member of the subphylum Vertebrata (within the phylum Chordata), including birds and cold-blooded animals.

See DoDI 3216.01 for definitions of these terms and more information about the applicability of DoDI 3216.01 to work involving animals.

3.17 Research Involving Human Subjects

All research involving human subjects shall be conducted in accordance with 32 C.F.R. § 219 “The Common Rule,” 10 U.S.C. § 980 “Limitation on Use of Humans as Experimental Subjects,” and DoDI 3216.02 “Protection of Human Subjects and Adherence to Ethical Standards in DoD-Supported Research,” as well as other applicable federal and state law and regulations, and DoD component guidance. Proposers must be cognizant of and abide by the additional restrictions and limitations imposed on the DoD regarding research involving human subjects, specifically as they regard vulnerable populations (DoDI 3216.02), recruitment of military research subjects (DoDI 3216.02), and informed consent and surrogate consent (10 U.S.C. § 980) and chemical and biological agent research (DoDI 3216.02). Food and Drug Administration regulation and policies may also apply.

“Human use” protocols apply to all research that meets any of the following criteria:

- a. Any research involving an intervention or an interaction with a living person that would not be occurring or would be occurring in some other fashion but for this research.
- b. Any research involving identifiable private information. This may include data/information/specimens collected originally from living individuals (broadcast video, web-use logs, tissue, blood, medical or personnel records, health data repositories, etc.) in which the identity of the subject is known, or the identity may be readily ascertained by the investigator or associated with the data/information/specimens.

See DoDI 3216.02 for definitions of these terms and more information about the applicability of DoDI 3216.02 to research involving human subjects.

3.18 Research Involving Recombinant DNA Molecules

Any recipient performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules shall comply with the National Institutes of Health Guidelines for Research Involving Recombinant DNA Molecules, dated January 2011, as amended. The guidelines can be found at: https://osp.od.nih.gov/wp-content/uploads/2016/05/NIH_Guidelines.pdf. Recombinant DNA is defined as (i) molecules that are constructed outside living cells by joining natural or synthetic DNA segments to DNA molecules that can replicate in living cells or (ii) molecules that result from the replication of those described in (i) above.

3.19 Service-Disabled Veteran-Owned Small Business (SDVOSB)

A small business concern owned and controlled by a Service-Disabled Veteran or Service-Disabled Veterans, as defined in Small Business Act 15 USC § 632(q)(2) and SBA’s implementing SDVOSB regulations (13 CFR 125).

3.20 Small Business Concern (SBC)

A concern that meets the requirements set forth in 13 C.F.R. § 121.702 (available [here](#)).

An SBC must satisfy the following conditions on the date of award:

- a. 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;
- b. Is in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that if the concern is a joint venture, each entity to the venture must meet the requirements set forth in paragraph (c) below;
- c. Is more than 50% directly owned and controlled by one or more individuals (who are citizens or permanent resident aliens of the United States), other small business concerns (each of which is more than 50% directly owned and controlled by individuals who are citizens or permanent resident aliens of the United States), or any combination of these; and
- d. Has, including its affiliates, not more than 500 employees. (For explanation of affiliate, see www.sba.gov/size.)

3.21 Subcontract

A subcontract is 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. This includes consultants.

3.22 United States

"United States" means the fifty states, the territories and possessions of the Federal Government, the Commonwealth of Puerto Rico, the Republic of the Marshall Islands, the Federated States of Micronesia, the Republic of Palau, and the District of Columbia.

3.23 Women-Owned Small Business Concern

An SBC that is at least 51% owned by one or more women, or in the case of any publicly owned business, at least 51% of the stock is owned by women, and women control the management and daily business operations.

4.0 PROPOSAL FUNDAMENTALS

4.1 Introduction

The proposal must provide sufficient information to demonstrate to the evaluator(s) that the proposed work represents an innovative approach to the investigation of an important scientific or engineering problem and is worthy of support under the stated criteria. The proposed research or research and development must be responsive to the chosen topic, although it need not use the exact approach specified in the topic. Anyone contemplating a proposal for work on any specific topic should determine that:

- a. The technical approach has a reasonable chance of meeting the topic objective,
- b. This approach is innovative, not routine, with potential for commercialization and
- c. The proposing firm has the capability to implement the technical approach, i.e., has or can obtain people and equipment suitable to the task.

4.2 Proposer Eligibility and Performance Requirements

- a. Each proposer must qualify as a small business concern as defined by 13 C.F.R §§ 701-705 at time of award and certify to this in the Cover Sheet section of the proposal. The eligibility requirements for the SBIR/STTR programs are unique and do not correspond to those of other

small business programs (see Section 3.15 of this BAA). Proposers must meet eligibility requirements for Small Business Ownership and Control (see 13 CFR § 121.702 and Section 4.4 of this BAA).

- b. A minimum of two-thirds of the research and/or analytical work in Phase I must be conducted by the proposing firm. For Phase II, a minimum of one-half (50%) of the research and/or analytical work must be performed by the proposing firm. The percentage of work is measured by both direct and indirect costs.
- c. For both Phase I and II, the primary employment of the principal investigator must be with the small business firm at the time of the award and during the conduct of the proposed effort. Primary employment means that more than one-half of the principal investigator's time is spent with the small business. Primary employment with a small business concern precludes full-time employment at another organization.
- d. For both Phase I and Phase II, all research or research and development work must be performed by the small business concern and its subcontractors in the United States.
- e. **Benchmarks.** Proposers with prior SBIR/STTR awards must meet two benchmark requirements for Progress towards Commercialization as determined by the Small Business Administration (SBA) on June 1 each year.
 - (1) Phase I to Phase II Transition Rate: For all proposers with greater than 20 Phase I awards over the past five fiscal years excluding the most recent year, the ratio of Phase II awards to Phase I awards must be at least 0.25.
 - (2) Commercialization Benchmark: For all proposers with greater than 15 Phase II awards over the last ten fiscal years excluding the last two years, the proposer must have received, to date, an average of at least \$100,000 of sales and/or investments per Phase II award received or have received a number of patents resulting from the SBIR work equal to or greater than 15% of the number of Phase II awards received during the period.

Consequence of failure to meet the benchmarks:

- SBA will identify and notify Agencies on June 1st of each year the list of companies which fail to meet minimum performance requirements. These companies will not be eligible to submit a proposal for a Phase I award for a period of one year from that date.
- Because this requirement only affects a company's eligibility for new Phase I awards, a company that fails to meet minimum performance requirements may continue working on its current ongoing SBIR/STTR awards and may apply for and receive new Phase II and Phase III awards.
- To provide companies with advance warning, SBA notifies companies on April 1st if they are failing the benchmarks. If a company believes that the information used was not complete or accurate, it may provide feedback through the SBA Company Registry at www.sbir.gov.
- In addition, SBA has posted a [Guide to SBIR/STTR Program Eligibility](#) to help small businesses understand program eligibility requirements, determine if they will be eligible at the time of award, and accurately complete necessary certifications.
- The benchmark information on the companies will not be available to the public.
- More detail is available at <https://www.sbir.gov/performance-benchmarks>.

4.3 Joint Ventures

Joint ventures and limited partnerships are permitted, provided that the entity created qualifies as a small business in accordance with the Small Business Act, 13 U.S.C. § 121.701.

4.4 Majority Ownership in Part

Majority ownership in part by multiple venture capital, hedge fund, and private equity firms: Small businesses that are owned in majority part by multiple venture capital operating companies (VCOs), hedge funds, or private equity funds are ineligible to submit applications or receive awards for opportunities in this BAA. Please check Component instructions for further information.

4.5 Conflicts of Interest

Contract awards to firms owned by or employing current or previous Federal Government employees could create conflicts of interest for those employees which may be a violation of federal law

4.6 Classified Proposals

Classified proposals will not be accepted under the DoD SBIR Program. If topics will require classified work during Phase II, the proposing firm must have a facility clearance in order to perform the Phase II work. For more information on facility and personnel clearance procedures and requirements, please visit the Defense Security Service Web site at: <http://www.dss.mil/index.html>.

4.7 Research Involving Human Subjects

All research involving human subjects, to include use of human biological specimens and human data, shall comply with the applicable federal and state laws and agency policy/guidelines for human subject protection (see Section 3.12).

Institutions to be awarded funding for research involving human subjects must provide documentation of a current Federal Assurance of Compliance with Federal regulations for human subject protection, for example a Department of Health and Human Services, Office for Human Research Protections Federal-wide Assurance (<http://www.hhs.gov/ohrp>). Additional Federal Assurance documentation may also be requested by the awarding DoD Component. All institutions engaged in human subject research, to include subcontractors, must also have a valid Assurance. In addition, personnel involved in human subjects research must provide documentation of completing appropriate training for the protection of human subjects. Institutions proposing to conduct human subject research that meets one of the exemption criteria in 32 CFR 219.101 are not required to have a Federal Assurance of Compliance. Proposers should clearly segregate research activities involving human subjects from other research and development activities in their proposal.

If selected, institutions must also provide documentation of Institutional Review Board (IRB) approval or a determination from an appropriate official in the institution that the work meets one of the exemption criteria with 32 CFR 219. As part of the IRB review process, evidence of appropriate training for all investigators should accompany the protocol. The protocol, separate from the proposal, must include a detailed description of the research plan, study population, risks and benefits of study participation, recruitment and consent process, data collection and data analysis.

The amount of time required for the IRB to review and approve the protocol will vary depending on such things as the IRB's procedures, the complexity of the research, the level of risk to study participants and the responsiveness of the Investigator. The average IRB approval process can last between one and three months. Once the IRB has approved the research, the awarding DoD Component will review the protocol and the IRB's determination to ensure that the research will be conducted in compliance with DoD and DoD Component policies. The DoD review process can last between three to six months. Ample time should be allotted to complete both the IRB and DoD approval processes prior to recruiting subjects.

No funding can be used towards human subject research until ALL approvals are granted. Submitters proposing research involving human and/or animal use are encouraged to separate these tasks in the technical proposal and cost proposal in order to avoid potential delay of contract award.

4.8 Research Involving Animal Subjects

All research, development, testing, experimentation, education or training involving the use of animals shall comply with the applicable federal and agency rules on animal acquisition, transport, care, handling, and use (see Section 3.11).

For submissions containing animal use, proposals should briefly describe plans for their Institutional Animal Care and Use Committee (IACUC) review and approval.

All Recipients must receive their IACUC's approval as well as secondary or headquarters-level approval by a DoD veterinarian who is trained or experienced in laboratory animal medicine and science. **No animal research may be conducted using DoD funding until all the appropriate DoD office(s) grant approval. Submitters proposing research involving human and/or animal use are encouraged to separate these tasks in the technical proposal and cost proposal in order to avoid potential delay of contract award.**

4.9 Research Involving Recombinant DNA Molecules

All research involving recombinant DNA molecules shall comply with the applicable federal and state law, regulation and any additional agency guidance. Research shall be approved by an Institutional Biosafety Committee.

4.10 Debriefing/Technical Evaluation Narrative

After final award decisions have been announced, the technical evaluations of the submitter's proposal may be provided to the submitter. Please refer to the Component-specific instructions of your topics of interest for Component debriefing processes.

4.11 Pre-Award and Post Award BAA Protests

Interested parties have the right to protest as prescribed in FAR 33.106(b) and FAR 52.233-2. For purposes of pre-award protests related to the terms of this BAA, protests should be served to the Contracting Officer (listed below). For the purposes of a protest related to a selection or award decision, protests should be served to the point-of-contact (POC) listed in the instructions of the DoD Component that authored the topic. For protests filed with the Government Accountability Office (GAO), a copy of the protest shall be submitted to the Contracting Officer listed below (pre-award ONLY) or DoD Component POC (selection/award decision ONLY) within one day of filing with the GAO. Protests of small business status of a selected firm may also be made to the Small Business Administration.

Washington Headquarters Services (WHS)
Acquisition Directorate
1155 Defense Pentagon
Washington, DC 20301-1155

Ms. Chrissandra Smith
DoD SBIR/STTR BAA Contracting Officer E-mail:
chrissandra.smith.civ@mail.mil

4.12 Phase I Award Information

All Phase I and Direct to Phase II proposals will be evaluated and judged on a competitive basis. Proposals will be initially screened to determine responsiveness. Proposals passing this initial screening will be technically evaluated by engineers or scientists to determine the most promising technical and scientific approaches. Each proposal will be judged on its own merit. DoD 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.

- a. **Number of Phase I Awards.** The number of Phase I awards will be consistent with the Component's RDT&E budget. No Phase I contracts will be awarded until evaluation of all qualified proposals for a specific topic is completed.
- b. **Type of Funding Agreement.** Each Phase I proposal selected for award will be funded under negotiated contracts or purchase orders and will include a reasonable fee or profit consistent with normal profit margins provided to profit-making firms for R/R&D work. Firm-Fixed-Price, Firm-Fixed-Price Level of Effort, Labor Hour, Time & Material, or Cost-Plus-Fixed-Fee type contracts can be negotiated and are at the discretion of the Component Contracting Officer.
- c. **Dollar Value.** The Phase I contract value varies among the DoD Components; it is therefore important for proposing firms to review Component-specific instructions for the Component to which they are applying for specific instructions regarding award size.
- d. **Timing.** The SBA SBIR Policy Directive, Section 7(c)(1)(ii), states that agencies should issue the Phase I award no more than 180 days after the closing date of the BAA. However, across DoD, the median time between the date that the SBIR BAA closes and the award of a Phase I contract is approximately four months. Normally proposing firms will be notified of selection or non-selection status for a Phase I award within 90 days of the closing date for this BAA.

4.13 Questions about this BAA and BAA Topics

a. General SBIR Questions/Information.

- (1) **Help Desk.** The DoD SBIR/STTR Help Desk is prepared to address general questions about this BAA, the proposal preparation and electronic submission process and other program-related areas. The Help Desk may be contacted from 9:00 a.m. to 5:00 p.m. ET Monday through Friday at:
 - Phone: 1-703-214-1333
 - E-mail: DoDSBIRSupport@reisystems.com
- (2) **Websites.** The Defense SBIR/STTR Innovation Portal (DSIP) Web site at <https://www.dodsbirsttr.mil/submissions/login> has information on the DoD SBIR/STTR Program, including:
 - SBIR and STTR Program opportunities
 - Topics Search engine
 - Topic Q&A (formerly SITIS)
 - All Electronic Proposal Submission for Phase I and Phase II Proposals. Firms submitting through this site for the first time will be asked to register on <https://www.dodsbirsttr.mil/submissions>.
- (3) **SBIR/STTR Updates and Notices:** To be notified of SBIR/STTR opportunities and to receive e-mail updates on the DoD SBIR and STTR Programs, you are invited to subscribe to our Listserv by visiting <https://www.dodsbirsttr.mil/submissions/login> and clicking "DSIP Listserv" located

under Quick Links.

- b. **General Questions about a DoD Component.** General questions pertaining to a particular DoD Component should be submitted in accordance with the instructions given at the beginning of that Component's topics, in Section 12.0 of this BAA.
- c. **Direct Contact with Topic Authors.** From **Aug 25, 2020 to Sep 22, 2020**, this BAA is issued for Pre-Release with the names of the topic authors and their phone numbers and e-mail addresses. During the pre-release period, proposing firms have an opportunity to contact topic authors by telephone or e-mail to ask technical questions about specific BAA topics. Questions should be limited to specific information related to improving the understanding of a particular topic's requirements. Proposing firms may not ask for advice or guidance on solution approach and you may not submit additional material to the topic author. If information provided during an exchange with the topic author is deemed necessary for proposal preparation, that information will be made available to all parties through Topic Q&A (formerly SITIS). After this period questions must be asked through Topic Q&A as described below.
- d. **Topic Q&A (formerly SITIS).** Once DoD begins accepting proposals on **Sep 23, 2020**, no further direct contact between proposers and topic authors is allowed unless the Topic Author is responding to a question submitted during the Pre-release period. However, proposers may submit written questions through Topic Q&A at <https://www.dodsbirsttr.mil/submissions/login>. In Topic Q&A, the questioner and respondent remain anonymous and all questions and answers are posted electronically for general viewing.

Questions are limited to technical information related to improving the understanding of a topic's requirements. Any other questions, such as those asking for advice or guidance on solution approach, will not receive a response. Proposing firms may locate the topic to which they want to submit a technical question by using the Topic Search feature on this Web site. Then, using the form at the bottom of the topic description, enter and submit the question. Answers are generally posted within seven (7) business days of question submission (answers will also be e-mailed directly to the inquirer).

The Topic Q&A for this BAA opens on **Aug 25, 2020** and closes to new questions on **Oct 8, 2020 at 12:00 PM ET**. Once the BAA closes to proposal submission, no communication of any kind with the topic author or through Topic Q&A regarding your submitted proposal is allowed.

Proposing firms are advised to monitor Topic Q&A during the BAA period for questions and answers. Proposing firms should also frequently monitor DSIP for updates and amendments to the topics.

4.14 Registrations and Certifications

Proposing firms must be registered in the Defense SBIR/STTR Innovation Portal (DSIP) in order to prepare and submit proposals. All users will be required to register for a login.gov account and link it to their DSIP account. To register in Login.gov, click the Login/Register button in the top right corner on the DSIP Submissions homepage and follow the steps to register. If you already have a Login.gov account, you can link your existing Login.gov account with your DSIP account. Job Aids and Help Videos to walk you through the process are in the Learning & Support section of DSIP, here: <https://www.dodsbirsttr.mil/submissions/learning-support/training-materials>.

Please note that the email address you use for Login.gov should match the email address associated with your existing DSIP account. If you do not recall the email address associated with your DSIP account, or if you already have an existing Login.gov account using a different email address, you will need your

Firm's DUNS number and your Firm PIN in order to link your Login.gov account with your DSIP account. If the email address associated with your existing DSIP account has been used for multiple DSIP accounts within your Firm, you will also need your Firm's DUNS number and your Firm PIN in order to link your Login.gov account with your DSIP account. The Firm PIN can be obtained from your Firm Admin. You can view the Firm Admin's contact information by entering your Firm's DUNS number when prompted. If you are the Firm Admin, please ensure that you contact all DSIP users in your Firm and provide them with the Firm PIN.

It is recommended that you complete your Login.gov setup as soon as possible to avoid any delays in your proposal submissions.

Before the DoD Components can award a contract, proposing firms must be registered in the System for Award Management (SAM). If you were previously registered in CCR, your information has been transferred to SAM. However, it is in the firm's interest to visit SAM and ensure that all of the firm's data is up to date from SAM and other databases to avoid delay in award. SAM replaced the Central Contractor Registration (CCR), Online Representations and Certifications Application (ORCA), and the Excluded Parties List System (EPLS). SAM allows firms interested in conducting business with the federal government to provide basic information on business capabilities and financial information. To register, visit www.sam.gov.

Follow instructions found on the SAM Web site on how to obtain a Commercial and Government Entry (CAGE) code and Data Universal Numbering System (DUNS) number. Once a CAGE code and DUNS number are obtained, update the firm's profile on the Defense SBIR/STTR Innovation Portal (DSIP) at <https://www.dodsbirsttr.mil/submissions/>.

In addition to the standard federal and DoD procurement certifications, the SBA SBIR Policy Directive requires the collection of certain information from firms at time of award and during the award life cycle. Each firm must provide this additional information at the time of the Phase I and Phase II award, prior to final payment on the Phase I award, prior to receiving 50% of the total award amount for a Phase II award, and prior to final payment on the Phase II award.

4.15 Promotional Materials

Promotional and non-project related discussion is discouraged, and additional information provided via Universal Resource Locator (URL) links or on computer disks, CDs, DVDs, video tapes or any other medium will not be accepted or considered in the proposal evaluation.

4.16 Prior, Current, or Pending Support of Similar Proposals or Awards

IMPORTANT -- While it is permissible, with proposal notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work (see Section 3.3) for consideration under numerous federal program BAAs or solicitations, it is unlawful to enter into contracts or grants requiring essentially equivalent effort. If there is any question concerning prior, current, or pending support of similar proposals or awards, it must be disclosed to the soliciting agency or agencies as early as possible. See Section 5.4.c(11).

4.17 Fraud and 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 Department of Defense, Office of Inspector General Hotline (“Defense Hotline”) is an important avenue for reporting fraud, waste, abuse, and mismanagement within the Department of Defense. The Office of Inspector General operates this hotline to receive and investigate complaints or information from contractor employees, DoD civilians, military service members and public citizens. Individuals who wish to report fraud, waste or abuse may contact the Defense Hotline at (800) 424-9098 between 8:00 a.m. and 5:00 p.m. Eastern Time or visit <http://www.dodig.mil/Components/Administrative-Investigations/DoD-Hotline/Hotline-Complaint/> to submit a complaint. Mailed correspondence should be addressed to the Defense Hotline, The Pentagon, Washington, DC 20301-1900, or e-mail addressed to hotline@dodig.mil.

4.18 State and Other Assistance Available

Many states have established programs to provide services to those small business firms and individuals wishing to participate in the Federal SBIR Program. These services vary from state to state, but may include:

- Information and technical assistance;
- Matching funds to SBIR recipients;
- Assistance in obtaining Phase III funding.

Contact your State SBIR/STTR Support office at https://www.sbir.gov/state_services?state=105813# for further information. Small Businesses may seek general administrative guidance from small and disadvantaged business utilization specialists located in various Defense Contract Management activities throughout the continental United States.

4.19 Discretionary Technical and Business Assistance (TAB A)

DoD is not mandating the use of TAB A pending further SBA guidance and establishment of a limit on the amount of technical and business assistance services that may be received or purchased by a small business concern that has received multiple Phase II SBIR or STTR awards for a fiscal year. However, proposers should carefully review individual component instructions to determine if TAB A is being offered and follow specific proposal requirements for requesting TAB A funding.

5.0 PHASE I PROPOSAL

5.1 Introduction

This BAA and the Defense SBIR/STTR Innovation Portal (DSIP) sites are designed to reduce the time and cost required to prepare a formal proposal. The DSIP is the official portal for DoD SBIR/STTR proposal submission. Proposers are required to submit proposals via DSIP; proposals submitted by any other means will be disregarded. Proposers submitting through this site for the first time will be asked to register. It is recommended that firms register as soon as possible upon identification of a proposal opportunity to avoid delays in the proposal submission process.

Since the guidance on allowable content may vary by Component, it is the proposing firm’s responsibility to consult the Component-specific instructions for detailed guidance.

DSIP provides a structure for providing the following proposal volumes:

- Volume 1: Proposal Cover Sheet
- Volume 2: Technical Volume
- Volume 3: Cost Volume

Volume 4: Company Commercialization Report – not in use for 20.3 BAA
Volume 5: Supporting Documents
Volume 6: Fraud, Waste and Abuse Training

A Phase I Proposal Template is available to provide helpful guidelines for completing each section of your Phase I technical proposal. This can be found at <https://www.dodsbirsttr.mil/submissions/learning-support/firm-templates>.

Detailed guidance on registering in DSIP and using DSIP to submit a proposal can be found at <https://www.dodsbirsttr.mil/submissions/learning-support/training-materials>. If the proposal status is “In Progress” or “Ready to Certify” it will NOT be considered submitted, even if all volumes are added prior to the BAA close date. The proposer may modify all proposal volumes prior to the BAA close date.

Although signatures are not required on the electronic forms at the time of submission the proposal must be certified electronically by the corporate official for it to be considered submitted. If the proposal is selected for award, the DoD Component program will contact the proposer for signatures at the time of award.

5.2 Summary of Component Programs

The tables below are provided for your convenience. Information provided in the Component instructions take precedence over any figures listed below. Please refer to the Component instructions for the topic of interest prior to proposal submission.

DoD Component	Cost	Duration	Phase I Option	Technical and Business Assistance
Navy	Base NTE \$140,000 + Phase I Option NTE \$100,000	6 Month Base + 6 Month Phase I Option	Required	\$6,500
Air Force	NTE \$50,000	3 months		Not Available
CBD	Base \$167,500	6 Month Base	Not Applicable	Not Available
DLA	See topics	See topics	See topics	Not Available
DLA Direct to Phase II	Base NTE \$1,000,000 + Phase II Option NTE \$600,000	12-18 Month Base + 6-12 Month Phase II Option	Required	Not Available
NGA	Base: \$100,000	9 Months		Not Available
NGA Direct to Phase II	Base \$1,000,000	24 Months		
OSD - DHRA				Not Available
OSD - JSSAP Direct to Phase II	Base NTE \$1,000,000 + Phase II Option NTE \$500,000	12 Month Base + 6 Month Phase II Option	Required	
OSD - ManTech	Base \$167,000	12 Months		Not Available
SCO Direct to Phase II	Base \$1,500,000	24 Months		Not Available
USSOCOM	Base \$150,000	6 Month Base	Not Applicable	\$6,500
USSOCOM Direct to Phase II	See topics	Typically 18 Month	Not Applicable	\$50,000

DoD Component	Volume 5 – Supporting Documents	Volume 6 – Fraud, Waste & Abuse	Technical Volume Page Limits
Navy	Accepted but Not Evaluated	Not Accepted	10 pages
Air Force	Required	Required	15 Pages
CBD	Accepted-	Accepted	20 pages
DLA	Accepted	Required	20 pages
NGA	Accepted but Not Evaluated	Accepted	20 pages
NGA Direct to Phase II	Accepted but Not Evaluated	Accepted	60 pages
DLA Direct to Phase II	Accepted	Required	60 pages
OSD - DHRA	Not Accepted	Not Accepted	Varies
OSD - JSSAP Direct to Phase II	Not Accepted		30 pages
OSD - ManTech	Not Accepted	Not Accepted	10 pages
SCO Direct to Phase II	Accepted	Not Accepted	20 pages
USSOCOM	15 page PowerPoint	Not Required	5 pages
USSOCOM Direct to Phase II	15 page PowerPoint	Not Required	10 pages

5.3 Marking Proprietary Proposal Information

Proposers that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall:

(1) Mark the first page of each Volume of the proposal submission with the following legend:

"This proposal includes data that 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 to evaluate this proposal. If, however, a contract is awarded to this proposer 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 resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in pages [insert numbers or other identification of sheets]"; and

(2) Mark each sheet of data it wishes to restrict with the following legend:

"Use or disclosure of data contained on this page is subject to the restriction on the first page of this volume."

The DoD assumes no liability for disclosure or use of unmarked data and may use or disclose such data for any purpose.

Restrictive notices notwithstanding, proposals and final reports submitted through the Defense

SBIR/STTR Innovation Portal (DSIP) may be handled, for administrative purposes only, by support contractors. All support contractors are bound by appropriate non-disclosure agreements.

5.4 Phase I Proposal Instructions

a. Proposal Cover Sheet (Volume 1)

On the Defense SBIR/STTR Innovation Portal (DSIP) at <https://www.dodsbirsttr.mil/submissions/>, prepare the Proposal Cover Sheet. The Cover Sheet must include a brief technical abstract of no more than 200 words that describes the proposed R&D project with a discussion of anticipated benefits and potential commercial applications. **Do not include proprietary or classified information in the Proposal Cover Sheet.** If your proposal is selected for award, the technical abstract and discussion of anticipated benefits may be publicly released on the Internet. Once the Cover Sheet is saved, the system will assign a proposal number. You may modify the cover sheet as often as necessary until the BAA closes.

b. Format of Technical Volume (Volume 2)

- (1) **Type of file:** The Technical Volume must be a single Portable Document Format (PDF) file, including graphics. Perform a virus check before uploading the Technical Volume file. If a virus is detected, it may cause rejection of the proposal. **Do not lock or encrypt the uploaded file. Do not include or embed active graphics such as videos, moving pictures, or other similar media in the document.**
- (2) **Length:** It is the proposing firm's responsibility to verify that the Technical Volume does not exceed the page limit after upload to DSIP. Please refer to Component-specific instructions for how a technical volume is handled if the stated page count is exceeded. Some Components will reject the entire technical proposal if the proposal exceeds the stated page count.
- (3) **Layout:** Number all pages of your proposal consecutively. Those who wish to respond must submit a direct, concise, and informative research or research and development proposal (no type smaller than 10-point on standard 8-1/2" x 11" paper with one-inch margins). The header on each page of the Technical Volume should contain your company name, topic number, and proposal number assigned by the Defense SBIR/STTR Innovation Portal (DSIP) site when the Cover Sheet was created. The header may be included in the one-inch margin.

c. Content of the Technical Volume (Volume 2)

The Technical Volume should cover the following items in the order given below:

- (1) **Identification and Significance of the Problem or Opportunity.** Define the specific technical problem or opportunity addressed and its importance.
- (2) **Phase I Technical Objectives.** Enumerate the specific objectives of the Phase I work, including the questions the research and development effort will try to answer to determine the feasibility of the proposed approach.
- (3) **Phase I Statement of Work (including Subcontractors' Efforts)**
 - a. Provide an explicit, detailed description of the Phase I approach. If a Phase I option is required or allowed by the Component, describe appropriate research activities

which would commence at the end of Phase I base period should the Component elect to exercise the option. The Statement of Work should indicate what tasks are planned, how and where the work will be conducted, a schedule of major events, and the final product(s) to be delivered. The Phase I effort should attempt to determine the technical feasibility of the proposed concept. The methods planned to achieve each objective or task should be discussed explicitly and in detail. This section should be a substantial portion of the Technical Volume section.

- b. This BAA may contain topics that have been identified by the Program Manager as research or activities involving Human/Animal Subjects and/or Recombinant DNA. In the event that Phase I performance includes performance of these kinds of research or activities, please identify the applicable protocols and how those protocols will be followed during Phase I. Please note that funds cannot be released or used on any portion of the project involving human/animal subjects or recombinant DNA research or activities until all of the proper approvals have been obtained (see Sections 4.7 - 4.9). **Submitters proposing research involving human and/or animal use are encouraged to separate these tasks in the technical proposal and cost proposal in order to avoid potential delay of contract award.**

- (4) **Related Work.** Describe significant activities directly related to the proposed effort, including any conducted by the principal investigator, the proposing firm, consultants, or others. Describe how these activities interface with the proposed project and discuss any planned coordination with outside sources. The technical volume must persuade reviewers of the proposer's awareness of the state-of-the-art in the specific topic. Describe previous work not directly related to the proposed effort but similar. Provide the following:

- a. Short description,
- b. Client for which work was performed (including individual to be contacted and phone number), and
- c. Date of completion.

- (5) **Relationship with Future Research or Research and Development**

- a. State the anticipated results of the proposed approach if the project is successful.
- b. Discuss the significance of the Phase I effort in providing a foundation for Phase II research or research and development effort.
- c. Identify the applicable clearances, certifications and approvals required to conduct Phase II testing and outline the plan for ensuring timely completion of said authorizations in support of Phase II research or research and development effort.

- (6) **Commercialization Strategy.** Describe in approximately one page your company's strategy for commercializing this technology in DoD, other Federal Agencies, and/or private sector markets. Provide specific information on the market need the technology will address and the size of the market. Also include a schedule showing the quantitative commercialization results from this SBIR project that your company expects to achieve.

- (7) **Key Personnel.** Identify key personnel who will be involved in the Phase I effort including information on directly related education and experience. A concise technical resume of the principal investigator, including a list of relevant publications (if any), must be included (Please do not include Privacy Act Information). All resumes will count toward the page limitations for Volume 2.

- (8) **Foreign Citizens.** Identify any foreign citizens or individuals holding dual citizenship expected to be involved on this project as a direct employee, subcontractor, or consultant.

For these individuals, please specify their country of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project. Proposers frequently assume that individuals with dual citizenship or a work permit will be permitted to work on an SBIR project and do not report them. This is not necessarily the case and a proposal will be rejected if the requested information is not provided. Therefore, firms should report any and all individuals expected to be involved on this project that are considered a foreign national as defined in Section 3.5 of the BAA. You may be asked to provide additional information during negotiations in order to verify the foreign citizen's eligibility to participate on a SBIR contract. Supplemental information provided in response to this paragraph will be protected in accordance with the Privacy Act (5 U.S.C. 552a), if applicable, and the Freedom of Information Act (5 U.S.C. 552(b)(6)).

- (9) **Facilities/Equipment.** Describe available instrumentation and physical facilities necessary to carry out the Phase I effort. Justify equipment purchases in this section and include detailed pricing information in the Cost Volume. State whether or not the facilities where the proposed work will be performed meet environmental laws and regulations of federal, state (name), and local Governments for, but not limited to, the following groupings: airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal practices, and handling and storage of toxic and hazardous materials.
- (10) **Subcontractors/Consultants.** Involvement of a university or other subcontractors or consultants in the project may be appropriate. If such involvement is intended, it should be identified and described according to the [Cost Breakdown Guidance](#). A minimum of two-thirds of the research and/or analytical work in Phase I, as measured by direct and indirect costs, must be conducted by the proposing firm, unless otherwise approved in writing by the Contracting Officer. SBIR efforts may include subcontracts with Federal Laboratories and Federally Funded Research and Development Centers (FFRDCs). A waiver is no longer required for the use of federal laboratories and FFRDCs; however, proposers must certify their use of such facilities on the Cover Sheet of the proposal.
- (11) **Prior, Current, or Pending Support of Similar Proposals or Awards.** If a proposal submitted in response to this BAA is substantially the same as another proposal that was funded, is now being funded, or is pending with another Federal Agency, or another or the same DoD Component, you must reveal this on the Proposal Cover Sheet and provide the following information:
- Name and address of the Federal Agency(s) or DoD Component to which a proposal was submitted, will be submitted, or from which an award is expected or has been received.
 - Date of proposal submission or date of award.
 - Title of proposal.
 - Name and title of principal investigator for each proposal submitted or award received.
 - Title, number, and date of BAA(s) or solicitation(s) under which the proposal was submitted, will be submitted, or under which award is expected or has been received.
 - If award was received, state contract number.
 - Specify the applicable topics for each SBIR proposal submitted or award received.

Note: If this does not apply, state in the proposal "No prior, current, or pending support for proposed work."

d. Content of the Cost Volume (Volume 3)

Complete the Cost Volume by using the on-line cost volume form on the Defense SBIR/STTR Innovation Portal (DSIP). Some items in the Cost Breakdown Guidance may not apply to the proposed project. If that is the case, there is no need to provide information on each and every item. What matters is that enough information be provided to allow us to understand how you plan to use the requested funds if a contract is awarded.

- (1) List all key personnel by name as well as by number of hours dedicated to the project as direct labor.
- (2) While special tooling and test equipment and material cost may be included under Phases I, the inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Component Contracting Officer, be advantageous to the Government and should be related directly to the specific topic. These may include such items as innovative instrumentation or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with the DoD Component, unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by the DoD Component.
- (3) Cost for travel funds must be justified and related to the needs of the project.
- (4) Cost sharing is permitted for proposals under this BAA; however, cost sharing is not required nor will it be an evaluation factor in the consideration of a Phase I proposal.
- (5) A Phase I Option (if applicable) should be fully costed separately from the Phase I (base) approach.
- (6) All subcontractor costs and consultant costs must be detailed at the same level as prime contractor costs in regard to labor, travel, equipment, etc. Provide detailed substantiation of subcontractor costs in your cost proposal. Enter this information in the Explanatory Material section of the on-line cost proposal form. The Supporting Documents Volume (Volume 5) may be used if additional space is needed.

When a proposal is selected for award, you must be prepared to submit further documentation to the Component Contracting Officer to substantiate costs (e.g., an explanation of cost estimates for equipment, materials, and consultants or subcontractors). For more information about cost proposals and accounting standards, see <http://www.dcaa.mil>. Click on “Guidance” and then click on “Audit Process Overview Information for Contractors.”

e. Company Commercialization Report (Volume 4)

The Company Commercialization Report (CCR) will NOT be available during the 20.3 BAA cycle for Phase I or Direct to Phase II proposals. No Commercialization Achievement Index (CAI) will be generated. The CCR will be available for future DoD BAA cycles. If the CCR is available at the time of the Phase II submission for any awarded Phase I efforts resulting from this BAA, the proposing firm is required to submit the CCR for its Phase II proposal.

f. Supporting Documents (Volume 5)

Volume 5 is provided for small businesses to submit additional documentation to support the Technical Volume (Volume 2), and the Cost Volume (Volume 5).

Documents that are acceptable and may be included in Volume 5 are:

1. Letters of Support
2. Additional Cost Information
3. Funding Agreement Certification
4. Technical Data Rights (Assertions)
5. Lifecycle Certification
6. Allocation of Rights
7. Other

Refer to the Component-specific instructions for Volume 5 requirements.

g. Fraud, Waste and Abuse Training (Volume 6)

Refer to the Component-specific instructions for the Fraud, Waste and Abuse Training (Volume 6) requirements.

6.0 PHASE I EVALUATION CRITERIA

Proposals will be evaluated based on the criteria outlined below, unless otherwise specified in the Component-specific instructions. Selections will be based on best value to the Government considering the following factors which are listed in descending order of importance:

- a. The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.
- b. The qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.
- c. The potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization.

Cost reasonableness and realism shall also be considered to the extent appropriate.

Technical reviewers will base their conclusions only on information contained in the proposal. It cannot be assumed that reviewers are acquainted with the firm or key individuals or any referenced experiments. Relevant supporting data such as journal articles, literature, including Government publications, etc., should be included based on requirements provided in Component-specific instructions.

7.0 PHASE II PROPOSAL INFORMATION

7.1 Introduction

Unless the Component is participating in the Direct to Phase II, Phase II proposals may only be submitted by Phase I awardees. Submission of Phase II proposals are not permitted at this time and, if submitted, may be rejected without evaluation. Phase II proposal preparation and submission instructions will be

provided by the DoD Components to Phase I awardees. See Component-specific instructions for more information on Direct to Phase II Program preparation and submission instructions.

If the Company Commercialization Report (CCR) is available at the time of Phase II submission for any awarded Phase I efforts resulting from this BAA, the proposing firm is required to submit the CCR for its Phase II proposal.

7.2 Proposal Provisions

IMPORTANT -- 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 BAAs and solicitations, it is unlawful to enter into contracts or grants requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies as early as possible. If a proposal submitted for a Phase II effort is substantially the same as another proposal that was funded, is now being funded, or is pending with another Federal Agency, or another or the same DoD Component, you must reveal this on the Cover Sheet and provide the information required in Section 5.4.c(11).

Due to specific limitations on the amount of funding and number of awards that may be awarded to a particular firm per topic using SBIR/STTR program funds, Head of Agency Determinations are now required before a different agency may make an award using another agency's topic. This limitation does not apply to Phase III funding. Please contact your original sponsoring agency before submitting a Phase II proposal to an agency other than the one who sponsored the original topic.

Section 4(b)(1)(i) of the SBIR and the STTR Policy Directives provide that, at the agency's discretion, projects awarded a Phase I under a solicitation for SBIR may transition in Phase II to STTR and vice versa. A firm wishing to transfer from one program to another must contact their designated technical monitor to discuss the reasons for the request and the agency's ability to support the request. The transition may be proposed prior to award or during the performance of the Phase II effort. Agency disapproval of a request to change programs shall not be grounds for granting relief from any contractual performance requirement. All approved transitions between programs must be noted in the Phase II award or award modification signed by the contracting officer that indicates the removal or addition of the research institution and the revised percentage of work requirements.

7.3 Commercialization Strategy

At a minimum, your commercialization strategy must address the following five questions:

- (1) What is the first product that this technology will go into?
- (2) Who will be the customers, and what is the estimated market size?
- (3) How much money will be needed to bring the technology to market, and how will that money be raised?
- (4) Does the company contain marketing expertise and, if not, how will that expertise be brought into the company?
- (5) Who are the proposing firm's competitors, and what is the price and/or quality advantage over those competitors?

The commercialization strategy must also include a schedule showing the anticipated quantitative commercialization results from the Phase II project at one year after the start of Phase II, at the completion of Phase II, and after the completion of Phase II (i.e., amount of additional investment, sales revenue, etc.). After Phase II award, the company is required to report actual sales and investment data in its Company Commercialization Report (see Section 5.4.e) at least annually. For information on formatting, page count and other details, please refer to the Component-specific instructions.

7.4 Phase II Evaluation Criteria

Phase II proposals will be evaluated based on the criteria outlined above in section 6.0, unless otherwise specified in the Component-specific instructions.

7.5 Phase II Award Information

DoD Components will notify Phase I awardees of the Phase II proposal submission requirements. Submission of Phase II proposals will be in accordance with instructions provided by individual Components. The details on the due date, content, and submission requirements of the Phase II proposal will be provided by the awarding DoD Component either in the Phase I award or by subsequent notification.

7.6 Adequate Accounting System

In order to reduce risk to the small business and avoid potential contracting delays, it is suggested that companies interested in pursuing Phase II SBIR contracts and other contracts of similar size with the Department of Defense (DoD), have an adequate accounting system per General Accepted Accounting Principles (GAAP), Generally Accepted Government Auditing Standards (GAGAS), Federal Acquisition Regulation (FAR) and Cost Accounting Standards (CAS) in place. The accounting system will be audited by the Defense Contract Audit Agency (DCAA). DCAA's requirements and standards are available on their Website at: <http://www.dcaa.mil> and click on "Guidance" and then click on "Audit Process Overview Information for Contractors," and also at: <http://www.dcaa.mil> and click on "Checklists and Tools" and then click on "Pre-award Accounting System Adequacy Checklist."

7.7 Phase II Enhancement Policy

To further encourage the transition of SBIR research into DoD acquisition programs as well as the private sector, certain DoD Components have developed their own Phase II Enhancement policy. Under this policy, the Component will provide a Phase II awardee with additional Phase II SBIR funding if the company can match the additional SBIR funds with non-SBIR funds from DoD acquisition programs or the private sector.

See component instructions for more details on Phase II Enhancement opportunities.

7.8 Commercialization Readiness Program (CRP)

The SBIR/STTR Reauthorization Act of 2011 established the Commercialization Pilot Program (CPP) as a long-term program titled the Commercialization Readiness Program (CRP).

Each Military Department (Army, Navy, and Air Force) has established a Commercialization Readiness Program. Please check the Component instructions for further information.

The Small Business and Technology Partnerships Office has established the OSD Transitions SBIR Technology (OTST) Pilot Program. The OTST pilot program is an interim technology maturity phase (Phase II), inserted into the SBIR development.

For more information contact:

Mr. Matthew B. Williams
OUSD (R&E) Technology Portfolio Manager
matthew.b.williams10.civ@mail.mil

Mr. Jason Talley
OUSD (R&E) Outreach/Education/Transition Specialist
jason.m.talley2.ctr@mail.mil

8.0 CONTRACTUAL REQUIREMENTS

8.1 Other Contract Requirements

Small Business Concerns (SBCs) are strongly encouraged to engage with their Contracting/Agreements Office to determine what measures can be taken in the event contract performance is affected due to the COVID-19 situation. SBCs are encouraged to monitor the CDC Website, engage with your employees to share information and discuss COVID-19 concerns employees may have. Please identify to your Contracting/Agreements Officer potential impacts to the welfare and safety of your workforce and any contract/OT performance issues. Most importantly, keep in mind that only your Contracting/Agreements Officer can affect changes to your contract/OT.

Upon award of a contract, the contractor will be required to make certain legal commitments through acceptance of Government contract clauses in the Phase I contract. The outline that follows is illustrative of the types of provisions required by the Federal Acquisition Regulation that will be included in the Phase I contract. This is not a complete list of provisions to be included in Phase I contracts, nor does it contain specific wording of these clauses. Copies of complete general provisions will be made available prior to award.

- a. **Standards of Work.** Work performed under the contract must conform to high professional standards.
- b. **Inspection.** Work performed under the contract is subject to Government inspection and evaluation at all reasonable times.
- c. **Examination of Records.** The Comptroller General (or a fully authorized representative) shall have the right to examine any directly pertinent records of the contractor involving transactions related to this contract.
- d. **Default.** The Government may terminate the contract if the contractor fails to perform the work contracted.
- e. **Termination for Convenience.** The contract may be terminated at any time by the Government if it deems termination to be in its best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.
- f. **Disputes.** Any dispute concerning the contract which cannot be resolved by agreement shall be decided by the contracting officer with right of appeal.
- g. **Contract Work Hours.** The contractor may not require an employee to work more than eight hours a day or forty hours a week unless the employee is compensated accordingly (that is, receives overtime pay).
- h. **Equal Opportunity.** The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.
- i. **Affirmative Action for Veterans.** The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran.

- j. **Affirmative Action for Handicapped.** The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.
- k. **Officials Not to Benefit.** No member of or delegate to Congress shall benefit from the contract.
- l. **Covenant Against Contingent Fees.** No person or agency has been employed to solicit or secure the contract upon an understanding for compensation except bona fide employees or commercial agencies maintained by the contractor for the purpose of securing business.
- m. **Gratuities.** The contract may be terminated by the Government if any gratuities have been offered to any representative of the Government to secure the contract.
- n. **Patent Infringement.** The contractor shall report each notice or claim of patent infringement based on the performance of the contract.
- o. **Military Security Requirements.** The contractor shall safeguard any classified information associated with the contracted work in accordance with applicable regulations.
- p. **American Made Equipment and Products.** When purchasing equipment or a product under the SBIR funding agreement, purchase only American-made items whenever possible.
- q. **Unique Identification (UID).** If your proposal identifies hardware that will be delivered to the government be aware of the possible requirement for unique item identification in accordance with DFARS 252.211-7003.
- r. **Publication Approval.** Government review and approval will be required prior to any dissemination or publication, except within and between the Contractor and any subcontractors, of classified and non-fundamental information developed under this contract or contained in the reports to be furnished pursuant to this contract.
- s. **Animal Welfare.** Contracts involving research, development, test, evaluation, or training on vertebrate animals will incorporate DFARS clause 252.235-7002.
- t. **Protection of Human Subjects.** Effective 29 July 2009, contracts that include or may include research involving human subjects in accordance with 32 CFR Part 219, DoD Directive 3216.02 and 10 U.S.C. 980, including research that meets exemption criteria under 32 CFR 219.101(b), will incorporate DFARS clause 252.235-7004.
- u. **E-Verify.** Contracts exceeding the simplified acquisition threshold may include the FAR clause 52.222-54 "Employment Eligibility Verification" unless exempted by the conditions listed at FAR 22.1803.
- v. **ITAR.** In accordance with DFARS 225.7901-4, Export Control Contract Clauses, the clause found at DFARS 252.225-7048, Export-Controlled Items (June 2013), must be included in all BAAs/solicitations and contracts. Therefore, all awards resulting from this BAA will include DFARS 252.225-7048. Full text of the clause may be found at <https://www.govinfo.gov/content/pkg/CFR-2013-title48-vol3/pdf/CFR-2013-title48-vol3-sec252-225-7048.pdf>.
- w. **Cybersecurity.** Any Small Business Concern receiving an SBIR award is required to provide adequate security on all covered contractor information systems. Specific security requirements are listed in DFARS 252.204.7012, and compliance is mandatory.

8.2 Prohibition on Contracting with Persons that have Business Operations with the Maduro Regime

Section 890 of the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2020 prohibits entering into a contract for the procurement of products or services with any person that has business operations with an authority of the government of Venezuela that is not recognized as the legitimate government of Venezuela by the United States Government, unless an exception applies. See [provision 252.225-7974 Class Deviation 2020-O0005](#) "Prohibition on Contracting with Persons that have Business Operations with the Maduro Regime.

8.3 Copyrights

With prior written permission of the Contracting Officer, the awardee may copyright (consistent with appropriate national security considerations, if any) material developed with DoD support. DoD receives a royalty-free license for the Federal Government and requires that each publication contain an appropriate acknowledgment and disclaimer statement.

8.4 Patents

Small business firms normally may retain the principal worldwide patent rights to any invention developed with Government support. The Government receives a royalty-free license for its use, reserves the right to require the patent holder to license others in certain limited circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must normally manufacture it domestically. To the extent authorized by 35 USC 205, the Government will not make public any information disclosing a Government-supported invention for a period of five years to allow the awardee to pursue a patent. See also Invention Reporting in Section 11.6.

8.5 Technical Data Rights

Rights in technical data, including software, developed under the terms of any contract resulting from proposals submitted in response to this BAA generally remain with the contractor, except that the Government obtains a royalty-free license to use such technical data only for Government purposes during the period commencing with contract award and ending twenty years after completion of the project under which the data were generated. This data should be marked with the restrictive legend specified in DFARS 252.227-7018 Class Deviation 2020-O0007. Upon expiration of the twenty-year restrictive license, the Government has unlimited rights in the SBIR data. During the license period, the Government may not release or disclose SBIR data to any person other than its support services contractors except: (1) For evaluation purposes; (2) As expressly permitted by the contractor; or (3) A use, release, or disclosure that is necessary for emergency repair or overhaul of items operated by the Government. See [DFARS clause 252.227-7018 Class Deviation 2020-O0007](#) "Rights in Noncommercial Technical Data and Computer Software – Small Business Innovation Research (SBIR) Program."

If a proposer plans to submit assertions in accordance with DFARS 252.227-7017 Class Deviation 2020-O0007, those assertions must be identified and assertion of use, release, or disclosure restriction MUST be included with your proposal submission. The contract cannot be awarded until assertions have been approved.

8.6 Invention Reporting

SBIR awardees must report inventions to the Component within two months of the inventor's report to the awardee. The reporting of inventions may be accomplished by submitting paper documentation, including fax, or through the Edison Invention Reporting System at www.iedison.gov for those agencies participating in iEdison.

8.7 Final Technical Reports - Phase I through Phase III

- a. **Content:** A final report is required for each project phase. The reports must contain in detail the project objectives, work performed, results obtained, and estimates of technical feasibility. A completed SF 298, "Report Documentation Page," will be used as the first page of the report. submission resources at http://www.dtic.mil/dtic/submit/guidance_on_submitting_docs_to_dtic.html. In addition, monthly status and progress reports may be required by the DoD Component.

b. **SF 298 Form “Report Documentation Page” Preparation:**

- (1) If desirable, language used by the company in its Phase II proposal to report Phase I progress may also be used in the final report.
- (2) For each unclassified report, the company submitting the report should fill in Block 12 (Distribution/Availability Statement) of the SF 298, "Report Documentation Page," with the following statement: "Distribution authorized to U.S. Government only; Proprietary Information, (Date of Determination). Other requests for this document shall be referred to the Component SBIR Program Office." *Note: Data developed under a SBIR contract is subject to SBIR Data Rights which allow for protection under DFARS 252.227-7018 Class Deviation 2020-00007 (see Section 11.5, Technical Data Rights). The sponsoring DoD activity, after reviewing the company's entry in Block 12, has final responsibility for assigning a distribution statement.*

For additional information on distribution statements see the following Defense Technical Information Center (DTIC) Web site: https://discover.dtic.mil/wp-content/uploads/2018/09/distribution_statements_and_reasonsSept2018.pdf

- (3) Block 14 (Abstract) of the SF 298, "Report Documentation Page" must include as the first sentence, "Report developed under SBIR contract for topic [insert BAA topic number. [Follow with the topic title, if possible.]]" The abstract must identify the purpose of the work and briefly describe the work conducted, the findings or results and the potential applications of the effort. **Since the abstract will be published by the DoD, it must not contain any proprietary or classified data and type "UU" in Block 17.**
 - (4) Block 15 (Subject Terms) of the SF 298 must include the term "SBIR Report".
- c. **Submission:** In accordance with DoD Directive 3200.12 and DFARS clause 252.235-7011, a copy of the final report shall be submitted (electronically or on disc) to:

Defense Technical Information Center
ATTN: DTIC-OA (SBIR)
8725 John J Kingman Road, Suite 0944
Ft. Belvoir, VA 22060-6218

Delivery will normally be within 30 days after completion of the Phase I technical effort.

Other requirements regarding submission of reports and/or other deliverables will be defined in the Contract Data Requirements List (CDRL) of each contract.

Special instructions for the submission of CLASSIFIED reports will be defined in the delivery schedule of the contract.

DO NOT E-MAIL Classified or controlled unclassified reports, or reports containing SBIR Data Rights protected under DFARS 252.227-7018 Class Deviation 2020-00007.

DEPARTMENT OF THE NAVY (DON)
20.3 Small Business Innovation Research (SBIR)
Proposal Submission Instructions

IMPORTANT

- **The following instructions apply to SBIR topics only:**
 - **N203-148 through N203-152**
- **The information provided in the DON Proposal Submission Instruction document takes precedence over the DoD Instructions posted for this Broad Agency Announcement (BAA).**
- **DON Phase I Technical Volume (Volume 2) page limit is not to exceed 10 pages.**
- **Proposers that are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF) or any combination of these are eligible to submit proposals in response to DON topics advertised in this BAA. Information on Majority Ownership in Part and certification requirements at time of submission for these proposers are detailed in the section titled ADDITIONAL NOTES.**
- A Phase I proposal template specific to DON topics will be available to assist small businesses to generate a Phase I Technical Volume (Volume 2). The template will be located on https://www.navysbir.com/links_forms.htm.
- The DON provides notice that Basic Ordering Agreements (BOAs) may be used for Phase I awards, and BOAs or Other Transaction Agreements (OTAs) may be used for Phase II awards.
- The optional Supporting Documents Volume (Volume 5) is available for the SBIR 20.3 BAA cycle. The optional Supporting Documents Volume is provided for small businesses to submit additional documentation to support the Technical Volume (Volume 2) and the Cost Volume (Volume 3). Volume 5 is available for use when submitting Phase I and Phase II proposals. DON will not be using any of the information in Volume 5 during the evaluation.

INTRODUCTION

The Director of the DON SBIR/STTR Programs is Mr. Robert Smith. For program and administrative questions, contact the SYSCOM Program Manager listed in Table 1; **do not** contact them for technical questions. For technical questions about a topic, contact the Topic Authors listed within each topic during the period **25 August 2020 through 22 September 2020**. Beginning **23 September 2020**, the DoD SBIR/STTR Topic Q&A platform (<https://www.dodsbirsttr.mil/submissions>) listed in Section 4.13.d of the Department of Defense (DoD) SBIR/STTR Program Broad Agency Announcement (BAA) must be used for any technical inquiry. For general inquiries or problems with electronic submission, contact the DoD SBIR/STTR Help Desk at 1-703-214-1333 (Monday through Friday, 9:00 a.m. to 5:00 p.m. ET) or via email at dodsbirsupport@reisystems.com.

TABLE 1: DON SYSTEMS COMMAND (SYSCOM) SBIR PROGRAM MANAGERS

<u>Topic Numbers</u>	<u>Point of Contact</u>	<u>SYSCOM</u>	<u>Email</u>
N202-148	Mr. Jeffrey Kent	Marine Corps Systems Command (MCSC)	jeffrey.a.kent@usmc.mil
N202-149 to N202-152	Mr. Shadi Azoum	Naval Information Warfare Systems Command (NAVWAR)	shadi.azoum@navy.mil

The DON SBIR/STTR Programs are mission-oriented programs that integrate the needs and requirements of the DON's Fleet through research and development (R&D) topics that have dual-use potential, but primarily address the needs of the DON. More information on the programs can be found on the DON SBIR/STTR website at www.navysbir.com. Additional information pertaining to the DON's mission can be obtained from the DON website at www.navy.mil.

PHASE I GUIDELINES

Follow the instructions in the DoD SBIR/STTR Program BAA at <https://www.dodsbirsttr.mil/submissions> for requirements and proposal submission guidelines. Please keep in mind that Phase I must address the feasibility of a solution to the topic. It is highly recommended that proposers follow the Phase I Proposal Template that is specific to DON topics as a guide for structuring proposals. The template will be located on https://navysbir.com/links_forms.htm. Inclusion of cost estimates for travel to the sponsoring SYSCOM's facility for one day of meetings is recommended for all proposals.

Proposals that are not successfully certified in the Defense SBIR/STTR Innovation Portal (DSIP) prior to BAA Close will NOT be considered submitted. Please refer to Section 5.1 of the DoD SBIR/STTR Program BAA for further information.

PHASE I PROPOSAL SUBMISSION REQUIREMENTS

The following MUST BE MET or the proposal will be deemed noncompliant and may be REJECTED.

- **Proposal Cover Sheet (Volume 1).** As specified in DoD SBIR/STTR Program BAA section 5.4(a).
- **Technical Proposal (Volume 2).** Technical Proposal (Volume 2) must meet the following requirements:
 - Content is responsive to evaluation criteria as specified in DoD SBIR/STTR Program BAA section 6.0
 - Not to exceed **10** pages, regardless of page content
 - Single column format, single-spaced typed lines
 - Standard 8 ½" x 11" paper
 - Page margins one-inch on all sides. A header and footer may be included in the one-inch margin.
 - No font size smaller than 10-point*

- Include, within the **10-page limit of Volume 2**, an Option that furthers the effort in preparation for Phase II and will bridge the funding gap between the end of Phase I and the start of Phase II. Tasks for both the Phase I Base and the Phase I Option must be clearly identified.

*For headers, footers, listed references, and imbedded tables, figures, images, or graphics that include text, a font size smaller than 10-point is allowable; however, proposers are cautioned that the text may be unreadable by evaluators.

Volume 2 is the technical proposal. Additional documents may be submitted to support Volume 2 in accordance with the instructions for Supporting Documents Volume (Volume 5) as detailed below.

Disclosure of Information (DFARS 252.204-7000)

In order to eliminate the requirements for prior approval of public disclosure of information (in accordance with DFARS 252.204-7000) under this or any subsequent award, the proposer shall identify and describe all fundamental research to be performed under its proposal, including subcontracted work, with sufficient specificity to demonstrate that the work qualifies as fundamental research. Fundamental research means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons. Simply identifying fundamental research in the proposal does NOT constitute acceptance of the exclusion. All exclusions will be reviewed and noted in the award. NOTE: Fundamental research included in the technical proposal that the proposer is requesting be eliminated from the requirements for prior approval of public disclosure of information, must be uploaded in a separate document (under “Other”) in the Supporting Documents Volume (Volume 5).

Phase I Options are typically exercised upon selection for Phase II. Option tasks should be those tasks that would enable rapid transition from the Phase I feasibility effort into the Phase II prototype effort.

- **Cost Volume (Volume 3).** The Phase I Base amount must not exceed \$140,000 and the Phase I Option amount must not exceed \$100,000. Costs for the Base and Option must be separated and clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3.
- **Period of Performance.** The Phase I Base Period of Performance must be exactly six (6) months and the Phase I Option Period of Performance must be exactly six (6) months.
- **Company Commercialization Report (Volume 4).** Volume 4 is not available for the 20.3 BAA. Please refer to the DoD SBIR/STTR Program BAA section 5.4(e) for further information.
- **Supporting Documents (Volume 5).** The optional Volume 5 is provided for small businesses to submit additional documentation to support the Technical Proposal (Volume 2) and the Cost Volume (Volume 3). Volume 5 is available for use when submitting Phase I and Phase II proposals. A template for Volume 5 is available on https://navysbir.com/links_forms.htm. DON will not be using any of the information in Volume 5 during the evaluation.

Note: Even if you are not providing documentation within Volume 5, DSIP will require you to respond to a “yes” or “no” question regarding the volume. Failure to respond may stop you from submitting and certifying your proposal.

- Letters of Support relevant to this project
- Additional Cost Information
- SBIR/STTR Funding Agreement Certification
- Technical Data Rights (Assertions)
- Allocation of Rights between Prime and Subcontractor
- Disclosure of Information (DFARS 252.204-7000)
- Prior, Current, or Pending Support of Similar Proposals or Awards
- Foreign Citizens
- Majority-Owned VCOC, HF, and PEF Certification, if applicable

NOTE: The inclusion of documents or information other than that listed above (e.g., resumes, test data, technical reports, publications) may result in the proposal being deemed “Non-compliant” and REJECTED.

A font size smaller than 10-point is allowable for documents in Volume 5; however, proposers are cautioned that the text may be unreadable.

- **Fraud, Waste and Abuse Training Certification (Volume 6).** DoD has implemented the optional Fraud, Waste and Abuse Training Certification (Volume 6). DON does not require evidence of Fraud, Waste and Abuse Training at the time of proposal submission. Therefore, DON will not require proposers to use Volume 6.

DON SBIR PHASE I PROPOSAL SUBMISSION CHECKLIST

- **Subcontractor, Material, and Travel Cost Detail.** In the Cost Volume (Volume 3), proposers must provide sufficient detail for subcontractor, material and travel costs. Enter this information in the “Explanatory Material” field in the online DoD Volume 3. Subcontractor costs must be detailed to the same level as the prime contractor. Material costs must include a listing of items and cost per item. Travel costs must include the purpose of the trip, number of trips, location, length of trip, and number of personnel. When a proposal is selected for award, be prepared to submit further documentation to the SYSCOM Contracting Officer to substantiate costs (e.g., an explanation of cost estimates for equipment, materials, and consultants or subcontractors).
- **Performance Benchmarks.** Proposers must meet the two benchmark requirements for progress toward Commercialization as determined by the Small Business Administration (SBA) on June 1 each year. Please note that the DON applies performance benchmarks at time of proposal submission, not at time of contract award.
- **Discretionary Technical and Business Assistance (TAB A).** If TAB A is proposed, the information required to support TAB A (as specified in the TAB A section below) must be added in the “Explanatory Material” field of the online DoD Volume 3. If the supporting information exceeds the character limits of the Explanatory Material field of Volume 3, this information must be included in Volume 5 as “Additional Cost Information” as noted above. Failure to add the required information in the online DoD Volume 3 and, if necessary, Volume 5 will result in the denial of TAB A. TAB A may be proposed in the Base and/or Option periods, but the total value may not exceed \$6,500 in Phase I.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The SBIR and STTR Policy Directive section 9(b) allows the DON to provide TABA (formerly referred to as DTA) to its awardees. The purpose of TABA is to assist awardees in making better technical decisions on SBIR/STTR projects; solving technical problems that arise during SBIR/STTR projects; minimizing technical risks associated with SBIR/STTR projects; and commercializing the SBIR/STTR product or process, including intellectual property protections. Firms may request, in their Phase I Cost Volume (Volume 3) and Phase II Cost Volume, to contract these services themselves through one or more TABA providers in an amount not to exceed the values specified below. The Phase I TABA amount is up to \$6,500 and is in addition to the award amount. The Phase II TABA amount is up to \$25,000 per award. The TABA amount, of up to \$25,000, is to be included as part of the award amount and is limited by the established award values for Phase II by the SYSCOM (i.e. within the \$1,700,000 or lower limit specified by the SYSCOM). As with Phase I, the amount proposed for TABA cannot include any profit/fee application by the SBIR/STTR awardee and must be inclusive of all applicable indirect costs. A Phase II project may receive up to an additional \$25,000 for TABA as part of one additional (sequential) Phase II award under the project for a total TABA award of up to \$50,000 per project.

Approval of direct funding for TABA will be evaluated by the DON SBIR/STTR Program Office. A detailed request for TABA must include:

- TABA provider(s) (firm name)
- TABA provider(s) point of contact, email address, and phone number
- An explanation of why the TABA provider(s) is uniquely qualified to provide the service
- Tasks the TABA provider(s) will perform
- Total TABA provider(s) cost, number of hours, and labor rates (average/blended rate is acceptable)

TABA must NOT:

- Be subject to any profit or fee by the SBIR applicant
- Propose a TABA provider that is the SBIR applicant
- Propose a TABA provider that is an affiliate of the SBIR applicant
- Propose a TABA provider that is an investor of the SBIR applicant
- Propose a TABA provider that is a subcontractor or consultant of the requesting firm otherwise required as part of the paid portion of the research effort (e.g., research partner, consultant, tester, or administrative service provider)

TABA must be included in the Cost Volume (Volume 3) as follows:

- Phase I: The value of the TABA request must be included on the TABA line in the online DoD Volume 3 and, if necessary, Volume 5 as described above. The detailed request for TABA (as specified above) must be included in the “Explanatory Material” field of the online DoD Volume 3 and be specifically identified as “Discretionary Technical and Business Assistance”.
- Phase II: The value of the TABA request must be included on the TABA line in the DON Phase II Cost Volume (provided by the DON SYSCOM). The detailed request for TABA (as specified above) must be included as a note in the Phase II Cost Volume and be specifically identified as “Discretionary Technical and Business Assistance”.

TABA may be proposed in the Base and/or Option periods. Proposed values for TABA must NOT exceed:

- Phase I: A total of \$6,500
- Phase II: A total of \$25,000 per award, not to exceed \$50,000 per Phase II project

NOTE: Section 9(b)(5) of the SBIR and STTR Policy Directive requires that a firm receiving technical or business assistance from a vendor during a fiscal year submit a report with a description of the technical or business assistance received and the benefits and results of the technical or business assistance

provided. More information on the reporting requirements of awardees that receive TABA funding through the DON can be found on https://www.navysbir.com/links_forms.htm. Awardees that receive TABA funding through the DON will upload the report to <https://www.navysbirprogram.com/navydeliverables/>.

If a proposer requests and is awarded TABA in a Phase II contract, the proposer will be eliminated from participating in the DON SBIR/STTR Transition Program (STP), the DON Forum for SBIR/STTR Transition (FST), and any other assistance the DON provides directly to awardees.

All Phase II awardees not receiving funds for TABA in their awards must attend a one-day DON STP meeting during the first or second year of the Phase II contract. This meeting is typically held in the spring/summer in the Washington, D.C. area. STP information can be obtained at: <https://navystp.com>. Phase II awardees will be contacted separately regarding this program. It is recommended that Phase II cost estimates include travel to Washington, D.C. for this event.

EVALUATION AND SELECTION

The DON will evaluate and select Phase I and Phase II proposals using the evaluation criteria in Sections 6.0 and 7.0 of the DoD SBIR/STTR Program BAA respectively, with technical merit being most important, followed by qualifications of key personnel and commercialization potential of equal importance. As noted in the sections of the aforementioned Announcement on proposal submission requirements, proposals exceeding the total costs established for the Base and/or any Options as specified by the sponsoring DON SYSCOM will be rejected without evaluation or consideration for award. Due to limited funding, the DON reserves the right to limit the number of awards under any topic.

Approximately one week after the Phase I BAA closing, e-mail notifications that proposals have been received and processed for evaluation will be sent. Consequently, the e-mail address on the proposal Cover Sheet must be correct.

Requests for a debrief must be made within 15 calendar days of select/non-select notification via email as specified in the select/non-select notification. Please note debriefs are typically provided in writing via email to the Corporate Official identified in the firm proposal within 60 days of receipt of the request. Requests for oral debriefs may not be accommodated. If contact information for the Corporate Official has changed since proposal submission, a notice of the change on company letterhead signed by the Corporate Official must accompany the debrief request.

Protests of Phase I and II selections and awards must be directed to the cognizant Contracting Officer for the DON Topic Number, or filed with the Government Accountability Office (GAO). Contact information for Contracting Officers may be obtained from the DON SYSCOM Program Managers listed in Table 1. If the protest is to be filed with the GAO, please refer to instructions provided in section 4.11 of the DoD SBIR/STTR Program BAA.

Protests to this BAA and proposal submission must be directed to the DoD SBIR/STTR Program BAA Contracting Officer, or filed with the GAO. Contact information for the DoD SBIR/STTR Program BAA Contracting Officer can be found in section 4.11 of the DoD SBIR/STTR Program BAA.

CONTRACT DELIVERABLES

Contract deliverables for Phase I are typically a kick-off brief, progress reports, and a final report. Required contract deliverables must be uploaded to <https://www.navysbirprogram.com/navydeliverables/>.

AWARD AND FUNDING LIMITATIONS

Awards. The DON typically awards a Firm Fixed Price (FFP) contract or a small purchase agreement for Phase I. In addition to the negotiated contract award types listed in Section 4.12.b of the DoD SBIR/STTR Program BAA, for Phase II awards the DON may (under appropriate circumstances) propose the use of an Other Transaction Agreement (OTA) as specified in 10 U.S.C. 2371/10 U.S.C. 2371b and related implementing policies and regulations. The DON may choose to use a Basic Ordering Agreement (BOA) for Phase I and Phase II awards.

Funding Limitations. In accordance with the SBIR and STTR Policy Directive section 4(b)(5), there is a limit of one sequential Phase II award per firm per topic. Additionally, to adjust for inflation DON has raised Phase I and Phase II award amounts. The maximum Phase I proposal/award amount including all options (less TABA) is \$240,000. The Phase I Base amount must not exceed \$140,000 and the Phase I Option amount must not exceed \$100,000. The maximum Phase II proposal/award amount including all options (including TABA) is \$1,700,000 (unless non-SBIR/STTR funding is being added). Individual SYSCOMs may award amounts, including Base and all Options, of less than \$1,700,000 based on available funding. The structure of the Phase II proposal/award, including maximum amounts as well as breakdown between Base and Option amounts will be provided to all Phase I awardees either in their Phase I award or a minimum of 30 days prior to the due date for submission of their Initial Phase II proposal.

PAYMENTS

The DON makes three payments from the start of the Phase I Base period, and from the start of the Phase I Option period, if exercised. Payment amounts represent a set percentage of the Base or Option value as follows:

Days From Start of Base Award or Option	Payment Amount
15 Days	50% of Total Base or Option
90 Days	35% of Total Base or Option
180 Days	15% of Total Base or Option

TRANSFER BETWEEN SBIR AND STTR PROGRAMS

Section 4(b)(1)(i) of the SBIR and STTR Policy Directive provides that, at the agency's discretion, projects awarded a Phase I under a BAA for SBIR may transition in Phase II to STTR and vice versa. Please refer to instructions provided in section 7.2 of the DoD SBIR/STTR Program BAA.

ADDITIONAL NOTES

Majority Ownership in Part. Proposers which are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF), or any combination of these as set forth in 13 C.F.R. § 121.702, are eligible to submit proposals in response to DON topics advertised within this BAA.

The following must be satisfied for proposals to be accepted and evaluated:

- Prior to submitting a proposal concerns must register with the SBA Company Registry Database.
- The proposer within its submission must submit the Majority-Owned VCOC, HF, and PEF Certification. The SBIR VC Certification must be included in the Supporting Documents Volume (Volume 5). A copy of the SBIR VC Certification can be found on https://navysbir.com/links_forms.htm.
- Should a proposer become a member of this ownership class after submitting its application and prior to any receipt of a funding agreement, the proposer must immediately notify the Contracting Officer, register in the appropriate SBA database, and submit the required certification which can be found on https://navysbir.com/links_forms.htm.

Human Subjects, Animal Testing, and Recombinant DNA. Due to the short timeframe associated with Phase I of the SBIR/STTR process, the DON does not recommend the submission of Phase I proposals that require the use of Human Subjects, Animal Testing, or Recombinant DNA. For example, the ability to obtain Institutional Review Board (IRB) approval for proposals that involve human subjects can take 6-12 months, and that lengthy process can be at odds with the Phase I goal for time-to-award. Before the DON makes any award that involves an IRB or similar approval requirement, the proposer must demonstrate compliance with relevant regulatory approval requirements that pertain to proposals involving human, animal, or recombinant DNA protocols. It will not impact the DON's evaluation, but requiring IRB approval may delay the start time of the Phase I award and if approvals are not obtained within two months of notification of selection, the decision to award may be terminated. If the use of human, animal, and recombinant DNA is included under a Phase I or Phase II proposal, please carefully review the requirements at: <http://www.onr.navy.mil/About-ONR/compliance-protections/Research-Protections/Human-Subject-Research.aspx>. This webpage provides guidance and lists approvals that may be required before contract/work can begin.

Government Furnished Equipment (GFE). Due to the typical lengthy time for approval to obtain GFE, it is recommended that GFE is not proposed as part of the Phase I proposal. If GFE is proposed and it is determined during the proposal evaluation process to be unavailable, proposed GFE may be considered a weakness in the proposal.

International Traffic in Arms Regulation (ITAR). For topics indicating ITAR restrictions or the potential for classified work, limitations are generally placed on disclosure of information involving topics of a classified nature or those involving export control restrictions, which may curtail or preclude the involvement of universities and certain non-profit institutions beyond the basic research level. Small businesses must structure their proposals to clearly identify the work that will be performed that is of a basic research nature and how it can be segregated from work that falls under the classification and export control restrictions. As a result, information must also be provided on how efforts can be performed in later phases if the university/research institution is the source of critical knowledge, effort, or infrastructure (facilities and equipment).

Support Contract Personnel for Administrative Functions. Proposers are advised that support contract personnel will be used to carryout administrative functions and may have access to proposals, contract award documents, contract deliverables, and reports. All support contract personnel are bound by appropriate non-disclosure agreements.

PHASE II GUIDELINES

All Phase I awardees can submit an **Initial** Phase II proposal for evaluation and selection. The Phase I Final Report, Initial Phase II Proposal, and Transition Outbrief (as applicable) will be used to evaluate the proposer's potential to progress to a workable prototype in Phase II and transition technology to Phase III. Details on the due date, content, and submission requirements of the Initial Phase II Proposal will be provided by the awarding SYSCOM either in the Phase I contract or by subsequent notification.

NOTE: All SBIR/STTR Phase II awards made on topics from solicitations prior to FY13 will be conducted in accordance with the procedures specified in those solicitations (for all DON topics, this means by invitation only).

The DON typically awards a Cost Plus Fixed Fee contract for Phase II; but, may consider other types of agreement vehicles. Phase II awards can be structured in a way that allows for increased funding levels based on the project's transition potential. To accelerate the transition of SBIR/STTR-funded technologies to Phase III, especially those that lead to Programs of Record and fielded systems, the Commercialization

Readiness Program was authorized and created as part of section 5122 of the National Defense Authorization Act of Fiscal Year 2012. The statute set-aside is 1% of the available SBIR/STTR funding to be used for administrative support to accelerate transition of SBIR/STTR-developed technologies and provide non-financial resources for the firms (e.g., the DON STP).

PHASE III GUIDELINES

A Phase III SBIR/STTR award is any work that derives from, extends, or completes effort(s) performed under prior SBIR/STTR funding agreements, but is funded by sources other than the SBIR/STTR programs. This covers any contract, grant, or agreement issued as a follow-on Phase III award or any contract, grant, or agreement award issued as a result of a competitive process where the awardee was an SBIR/STTR firm that developed the technology as a result of a Phase I or Phase II award. The DON will give Phase III status to any award that falls within the above-mentioned description, which includes assigning SBIR/STTR Technical Data Rights to any noncommercial technical data and/or noncommercial computer software delivered in Phase III that was developed under SBIR/STTR Phase I/II effort(s). Government prime contractors and/or their subcontractors must follow the same guidelines as above and ensure that companies operating on behalf of the DON protect the rights of the SBIR/STTR firm.

NAVY SBIR 20.3 Phase I Topic Index

N203-148	Crawling Amphibious Breacher (CRAB)
N203-149	Advanced Radio Frequency (RF) Photonic Integrated Circuit (PIC)
N203-150	Frequency Hopping Optimization (FHO) for Tactical Data Links
N203-151	Machine Learning Detection of Source Code Vulnerability
N203-152	Platform Is The Antenna

RT&L FOCUS AREA(S): Autonomy

TECHNOLOGY AREA(S): Ground Sea

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop a submersible autonomous amphibious breaching vehicle capable of proofing assault lanes from the surf zone (<10 feet depth) through the beach zone, reducing explosive and non-explosive obstacles, and clearing craft landing zones.

DESCRIPTION: The CRAB (Crawling Amphibious Breacher) would be a small, inexpensive, (>\$100K per system) submersible autonomous vehicle that will operate in concert with other CRABs. They would be capable of being deployed off-shore, from a depth of approximately 40 feet. CRABs would drop from surface craft to the seafloor and maneuver toward the beach, clearing a lane in a formation. As they move toward the shore, they will neutralize buried and proud (i.e., bottom) sea mines along the way. Mines would be neutralized by targeting the fuze types: pressure fuze mines by rolling over them; magnetic mines by the heavy metal construction of the CRAB, and tilt-rod fuze mines by driving into the tilt-rod itself. Once the CRABs exit the surf zone, they will continue up the assault lane, neutralizing land mines by targeting the fuze types, as listed above. CRABs would be small enough that their wreckage can be driven over by an Amphibious Combat Vehicle (ACV) or other large assault vehicles. Once the CRABs reach their limit of advance, they would move out of the assault lane and remain there until the breach is complete. As the CRABs move through the lane, they would drop markers (GPS or other) that landing forces can see on a screen to indicate the cleared lane. These markers would be picked up by receivers in the amphibious force vehicle's common operating picture systems and generate a visible path on the driver display. The CRAB will not be designed to neutralize moored or floating sea mines and will operate without prior Intelligence, surveillance and reconnaissance (ISR) targeting information. The Marine Corps would like the CRAB to be capable of reducing submerged man-made obstacles using a clamshell type of arm, like that of an excavator, but realizes this may make each CRAB too expensive. This SBIR topic is looking for an innovative way to also reduce man-made obstacles using the most inexpensive means.

Key Performance Parameters (required) of the CRAB:

- Error rate of <3 ft.
- Autonomous underwater operation
- Operating in depths of <40 ft of saltwater
- Capable of deployment from surface or subsurface watercraft near shoreline <400m from shore
- Must be able to self-right or operate in any orientation (if flipped over, can still maneuver or turnover)
- Must be capable of operating in sand, mud, and shell soil sea floor
- Must detonate pressure fuze buried and bottom sea mines (~500lbs PSI)
- Must detonate pressure fuze buried and surface laid land mines (~500lbs PSI)

- Overall size must not exceed (LxW) 12'7" x 5'0"
- Overall weight must not exceed 14,000 lbs

Key System Attributes (desired) of the CRAB:

- Capable of remote or waypoint operation
- Capable of using targeting data (potentially IS2OPS) to target identified buried mines
- Capable of swarming or moving in formation
- Capable of communication within swarm while underwater
- Capable of communication to surface craft
- Mark cleared lane with dropped sensor in water and land (example; dropped RFI pucks along outer edge of breached lane)
- Battery operated with enough operation time to conduct an eight hour mission
- Capable of reducing submerged man-made obstacles (pushing hedgehogs, tetrahedrons, cutting concertina wire)
- Capable of detonating tilt-rod fuzed mines
- Capable of detonating magnetic influence mines

PHASE I: Develop concepts for a CRAB vehicle that meets the requirements described above. Demonstrate the feasibility of the concepts in meeting Marine Corps needs and establish that the concepts can be developed into a useful product for the Marine Corps. Establish feasibility by material testing and analytical modeling, as appropriate. Provide a Phase II development plan with performance goals and key technical milestones, and that addresses technical risk reduction.

PHASE II: Develop a scaled prototype for evaluation. Determine the prototype's capability in meeting the performance goals defined in the Phase II development plan and the Marine Corps requirements for the single amphibious integrated precision augmented-reality navigation system. Demonstrate system performance through prototype evaluation and modeling or analytical methods over the required range of parameters, including numerous deployment cycles. Use evaluation results to refine the prototype into an initial design that meets Marine Corps requirements. Prepare a Phase III development plan to transition the technology to Marine Corps use.

PHASE III DUAL USE APPLICATIONS: Support the Marine Corps in transitioning the technology through test and validation to certify and qualify the system for Marine Corps use. Develop a CRAB vehicle for evaluation to determine its effectiveness in an operationally relevant environment. Support the Marine Corps for test and validation to certify and qualify the system for Marine Corps use.

REFERENCES:

1. Daily, William, et al. "Initial Development of An Amphibious ROV for Use in Big Surf." Maritime Technology Society Journal; Volume 28, Number 1, Spring 1994.
https://www.researchgate.net/publication/293000294_Initial_development_of_an_amphibious_ROV_for_use_in_big_surf/link/5b37fc56aca2720785fd8c1b/download
2. South, Todd "Marines want to use artificial intelligence to help find and neutralize sea mines." Marine Corps Times, 14 September 2018, <https://www.marinecorptimes.com/news/your-marine-corps/2018/09/14/marines-want-to-use-artificial-intelligence-to-help-find-and-neutralize-sea-mines/>

KEYWORDS: Autonomous; Unmanned Underwater Vehicle; UUV; Mine Countermeasures; Swarming; Breaching; Amphibious

RT&L FOCUS AREA(S): Microelectronics

TECHNOLOGY AREA(S): Electronics

OBJECTIVE: Develop Photonic Integrated Circuits (PICs) that have high dynamic range (> 90 dB) and large instantaneous operational bandwidth (> 10 GHz), with digital signal processing at native Radio Frequency (RF) or Intermediate Frequency (IF). PICs are expected to operate from L to Ka bands (specifically, 950 MHz to 40 GHz); wider upper frequency range is also desired.

DESCRIPTION: The Wideband Anti-jam Modem System (WAMS) modem is the Navy's next generation software-defined wideband modem for both transponded and processed satellites and will be integrated with the Navy Multiband Terminal (NMT) on ships and submarines, Commercial Broadband Satellite Program (CBSP) on ships, and the Modernization of Enterprise Terminal (MET) on shore for communications. WAMS will enhance shipboard and submarine wideband functionality to provide resilient communications. The WAMS modem will provide protected communications through two waveforms: Protected Tactical Waveform (PTW) and Direct Sequence Spread Spectrum (DSSS). These waveforms require both wide bandwidth and high dynamic range, which requires relatively large Size, Weight, and Power (SWaP) with current conventional electronic circuits.

PICs offer numerous advantages such as greater operational bandwidth and reduced SWaP requirements. PICs may offer the ability to directly sample wide swaths of RF bandwidth and process them directly at the antenna. Optical transport of signals over relatively low cost and highly durable optical cables offer the potential to significantly reduce operational and maintenance costs. Further, optical transport is more immune to Electro-Magnetic Interference (EMI) and, complementarily, less likely to produce EMI. Unlike electronic integrated circuits where silicon (Si) is the dominant material, PICs have been fabricated from a variety of materials (e.g., gallium arsenide, lithium niobate). Each material provides different advantages. This SBIR topic will explore the variety of fabrication materials for PICs and develop an advanced signal processing system to yield high dynamic range and wide bandwidth capabilities for the WAMS modem.

This SBIR topic falls under the NDS Alignment of "Modernize Key Capabilities" and the DDR&E (RT&L) Tech Priority "Microelectronics."

PHASE I: Explore a variety of fabrication materials for PICs and investigate their performance in regard to bandwidth and dynamic range. As some materials used in PICs are considered rare earth materials, investigate the ease of acquiring and manufacturing for the materials explored.

Develop a concept for the architecture of an optical signal processing system that can directly capture and process wide band RF or IF at the antenna or up/down conversion subsystem, respectively. The optical signal processing system should perform all the necessary frequency translations in the optical domain and render the bands of interest in digital electronic form. Consider in the research that the ideal formatting for the electrical signals will be in VITA 49.2 or ANSI 5041 standard; however, contractor format is acceptable for Phase I. Ensure that the minimum analog – digital bit depth shall be 16 bits each for I and Q signals.

Describe the most promising technical solutions based on the investigations and technical trade-offs performed earlier in this phase.

For the identified technical solutions, develop the SBIR Phase II Project Plan to include a detailed schedule (in Gantt format), spend plan, performance objectives, and transition plan for the identified Program of Record (PoR).

PHASE II: Develop a set of performance specifications for the Advanced RF PIC and conduct a System Requirements Review (SRR).

Establish a working relationship with a candidate WAMS modem contractor to perform initial integration activities and identification/development of any necessary Pre-Planned Product Improvement (P3I) requirements on the candidate WAMS modem. Engage with the Program Office to assist in the identification, introduction, and collaboration with the candidate WAMS modem contractor.

Develop the prototype Advanced RF PIC for demonstration and validation in the candidate WAMS modem or equivalent development environment. Conduct Preliminary Design Review (PDR) for the Advanced RF PIC prototype and commence development of an Engineering Development Model (EDM) system. Conduct Critical Design Review (CDR) prior to building the EDM.

Develop the lifecycle support strategies and concepts for the Advanced RF PIC.

Develop SBIR Phase III Project Plan to include a detailed schedule (in Gantt format) and spend plan, performance requirements, and revised transition plan for the identified PoR.

PHASE III DUAL USE APPLICATIONS: Refine and fully develop the Phase II EDM to produce a Production Representative Article (PRA) of the Advanced RF PIC and integrate into the final target WAMS modem.

Perform Formal Qualification Tests (FQT) (e.g., field testing, operational assessments) of the PRA Advanced RF PIC with the WAMS modem and associated terminal.

Provide life-cycle support strategies and concepts for Advanced RF PIC with the WAMS modem contractor by developing a Life-Cycle Sustainment Plan (LCSP).

Investigate the dual use of the developed technologies for commercial applications such as in telecommunications. With 5G, new waveforms must be capable of supporting a greater density of users (e.g., up to a million devices per square kilometer) and higher data throughput (speeds in the Gbps), and provide more efficient utilization of available spectrum. Advanced RF PICs can potentially provide the high dynamic range and spectral processing power to meet these needs. Another potential commercial application is optical or photonic computing where high performance computer systems are required to process and transport petabyte scale data within and among distributed computing environments.

REFERENCES:

1. "Photonic Integrated Circuit." Wikipedia, the Free Encyclopedia, March 3, 2020. https://en.wikipedia.org/wiki/Photonic_integrated_circuit
2. "Photonic Integrated Circuit." Circuits Today, 2020. <http://www.circuitstoday.com/photonic-integrated-circuit>
3. "Direct-Sequence Spread Spectrum." Wikipedia, the Free Encyclopedia, May 1, 2020. https://en.wikipedia.org/wiki/Direct-sequence_spread_spectrum

KEYWORDS: Navy Multiband Terminal; NMT; Commercial Broadband Satellite Program; CBSP; Wideband Anti-jam Modem System; WAMS; WAM; Satellite Communications, SATCOM; Military

Satellite Communications; MILSATCOM; Photonic Integrated Circuit; PIC; RF; Radio Frequency;
Operating Systems Design and Implementation; OSDI; VITA 49.2; Communications Satellite

RT&L FOCUS AREA(S): Network Command, Control and Communications, 5G
TECHNOLOGY AREA(S): Battlespace; Electronics; Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop and utilize modern receiver digital compensations algorithms to increase tactical network capacity for tactical data links.

DESCRIPTION: Over the past two decades, algorithms have been developed that allow for multi-user detection, cancellation, and signal separation enabling overlapping channel condition such that network capacity could be effectively doubled. Overlapping channel techniques can provide significant improvements in spectrum utilization and application performance; however, such techniques or algorithms have not been used for tactical data link applications [Refs 1-4].

The goal of this SBIR topic is to increase tactical data links network capacity and throughput (i.e., node to node) by employing partially overlapping channels using leveraging techniques or algorithms that can significantly suppresses adjacent channel interference. A key aspect of this effort to achieve a higher network capacity in tactical data links is analyzing, simulating, and documenting the feasibility of implementing efficiencies on a given channel. In performing design trades, the overlapping channel solution should be implementable within the current Software Interface Specification (SiS) and not degrade current network capacity or performance (e.g., anti-jam, sensitivity, throughput). The Navy seeks innovative overlapping channel algorithms solutions for tactical data links application that can be implemented in a Field Programmable Gated Array (FPGA). Desired solutions should be software and/or firmware solutions. Trades affecting hardware receiver resources utilization (e.g., FPGA resources) and any other system software impacts are required.

Implementing this type of capability would provide greater spectral efficiency and bandwidth for tactical data links. The attributes cited above would provide substantial network improvements in reducing overall spectral access requirements while simultaneously increasing warfighter communication and data network capacity.

Work produced in Phase II may become classified. Note: The prospective contractor(s) must be U.S. owned and operated with no foreign influence as defined by DoD 5220.22-M, National Industrial Security Program Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence Security Agency (DCSA). The selected contractor and/or subcontractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances, in order to perform on advanced phases of this project as set forth by DCSA and NAVWAR in order to gain access to classified information pertaining to the national defense of the United States and its allies; this will be an inherent requirement. The selected company will be required to safeguard classified material IAW DoD 5220.22-M during the advanced phases of this contract.

PHASE I: Demonstrate the feasibility of new or existing partial overlapping channel techniques and/or algorithms for tactical data links application within the intended radio subsystem. Evaluate the feasibility of potential solutions through the analysis inclusive of simulations of Physical Layer (PHY)-level changes. Evaluate key metrics including channel capacity (i.e., this number depends on modulation and throughput but typically it will be about 20-30% improvement), channel overlap (20-30%), node-to-node throughput (20% improvement) and network capacity (1.2x # of nodes). Include simulations to establish feasibility basis for the proposed techniques. Assume parameters outlined in the Description. Detail the feasibility, development and integration challenges of the proposed technology solutions as well as any other technical risks. The Phase I effort will include prototype plans for a Multifunctional Information Distribution Systems (MIDS) Joint Tactical Radio System (JTRS) TRL 6 - integration and demonstration of solution on a relevant operational laboratory environment - to be developed under Phase II. Note: Partnership with MIDS prime vendors is encouraged during Phase I efforts.

PHASE II: Prototype and demonstrate a MIDS JTRS TRL6 partial overlapping channel solution(s), encompassing both the design of the algorithms and anticipated effects. Conduct evaluations by testing the algorithms against baseline network performance, receiver sensitivity and A/J metrics on a MIDS JTRS TRL 6 relevant operational laboratory environment to test and validate performance and/or any adverse impact. Prepare and document a report that discusses the results, analysis of the performance, challenges and/or shortfalls, and risks and recommendations for transition. Prepare a Phase III development plan to transition the technology for Navy and potential commercial use.

Note: The expected TRL for this project is TRL 6 (i.e., prototype demonstrated in a relevant laboratory environment). Partnership with MIDS prime vendors is encouraged to support tasks for this Phase II effort and enable potential transition. MIDS JTRS is a National Security Agency-certified type 1 encryption system; hence, information assurance (IA) compliance will apply during Phase II and subsequent transition efforts. Work produced in Phase II and subsequent efforts will be classified (see Description section for details).

PHASE III DUAL USE APPLICATIONS: Support the Navy in transitioning the algorithms and solutions to Navy use. Refine the algorithms, software code, validation, documentation, and IA compliance. Perform test and validation to certify and qualify software and firmware components for Navy use. Implement the capability in the form of fast, efficient algorithms that, once proven, can be coded in software-defined radios.

Partial overlapping channel algorithms have tremendous application in the area of dense enterprise wireless local area networks and commercial cellular communication. Partial overlapping channel technology has wide commercial applications to address LTE, 5G, and WIFI technology deployment due proximity with other interferences, spectrum challenges, etc.

REFERENCES:

1. Mishra, A., Shrivastava, V., Banerjee, S., and Arbaugh, W. "Partially Overlapped Channels Not Considered Harmful." University of Wisconsin and University of Maryland, 2006.
<http://pages.cs.wisc.edu/~suman/pubs/poverlap.pdf>
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<https://pdfs.semanticscholar.org/b19d/4ed1f91e4ccadc2cf96b9bd540f64665a915.pdf>
3. Meyer, Raimund; Gerstacker, Wolfgang H.; Schober, Robert; and Huber, Johannes B. "A Single Antenna Interference Cancellation Algorithm for GSM." University of British Columbia, 2005.
<https://www.aminer.cn/pub/53e9ad72b7602d97037639c7/a-single-antenna-interference-cancellation-algorithm-for-gsm>

4. Gardner, William A. "Suppression of Cochannel Interference in GSM by Pre-demodulation Signal Processing." Statistical Signal Processing, Inc., 2013.
https://faculty.engineering.ucdavis.edu/gardner/wp-content/uploads/sites/146/2013/02/Suppression_of_cochannel_in_GSM.pdf

KEYWORDS: Partial Overlapping Channels; Spectrum Utilization; Tactical Data Links; MIDS; Multifunctional Information Distribution Systems; Network Capacity

RT&L FOCUS AREA(S): Artificial Intelligence/ Machine Learning, General Warfighting Requirements
TECHNOLOGY AREA(S): Information Systems

OBJECTIVE: Develop and demonstrate a software capability that utilizes machine-learning techniques to scan source code for its dependencies; trains cataloging algorithms on code dependencies and detection of known vulnerabilities, and scales to support polyglot architectures.

DESCRIPTION: Nearly every software library in the world is dependent on some other library, and the identification of security vulnerabilities on the entire corpus of these dependencies is an extremely challenging endeavor. As part of a Development, Security, and Operations (DevSecOps) process, this identification is typically accomplished using the following methods: (a) Using static code analyzers. This can be useful but is technically challenging to implement in large and complex legacy environments. They typically require setting up a build environment for each version to build call and control flow graphs, and are language-specific and thus do not work well when there are multiple versions of software using different dependency versions. (b) Using dynamic code review. This is extremely costly to implement, as it requires a complete setup of an isolated environment, including all applications and databases a project interacts with. (c) Using decompilation to perform static code analysis. This is again dependent on software version and is specific to the way machine-code is generated.

The above methods by themselves generate statistically significant numbers of false positives and false negatives: False positives come from the erroneous detection of vulnerabilities and require a human in the loop to discern signal from noise. False negatives come from the prevalence of undetected altered dependent software (e.g., copy/paste/change from external libraries).

Promising developments from commercial vendors provide text mining services for project source trees and compare them against vulnerability databases, such as Synopsis/Blackduck Hub, IBM AppScan, and Facebook's Infer. However, these tools are costly to use and require the packaging of one's code to be uploaded to a third-party service.

Work produced in Phase II may become classified. Note: The prospective contractor(s) must be U.S. owned and operated with no foreign influence as defined by DoD 5220.22-M, National Industrial Security Program Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence Security Agency (DCSA). The selected contractor and/or subcontractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances, in order to perform on advanced phases of this project as set forth by DCSA and NAVWAR in order to gain access to classified information pertaining to the national defense of the United States and its allies; this will be an inherent requirement. The selected company will be required to safeguard classified material IAW DoD 5220.22-M during the advanced phases of this contract.

PHASE I: Develop a concept for a design for a software utility that:

- Performs text mining on source trees so that it (a) accurately identifies all declared and undeclared dependencies, and (b) does not require a setup of the build environment.
- Trains algorithms to catalog multiple vulnerability databases, both public and internal to the Defense and Intelligence communities, to detect known vulnerabilities, and delineate recommended fixes for the software developer.
- Trains algorithms to catalog the libraries that many projects depend upon (e.g., OpenSSL), mapping their correct version, identifying known vulnerabilities in that version, and reconciling

against the current project so that scanning the entire corpus of external dependencies is an efficient and scalable process (note: these parameters must also be able to be tuned for each project).

- Detects if code was extracted from external libraries and manipulated to make it look as if it was organically produced (presumably using the above cataloging features).
- Scales to support polyglot architectures.
- Performs the above services for every version in a code repository so that vulnerabilities across multiple versions can be comprehensively tracked.

The feasibility study must show that the software utility can easily integrate into existing Continuous Integration/Continuous Development (CI/CD) DevSecOps tools. Metrics for accuracy, scalability, and speed must also be provided. Develop integration plans for Phase II.

NOTE: Detailed knowledge of Navy data sources may not be necessary during Phase I if the performer can show the above. It is recommended to use publicly available open-source software repositories. For example, the Linux kernel, or the Chromium project, and leverage, for example, the National Vulnerability Database or Common Vulnerabilities and Exposures databases.

PHASE II: Develop, demonstrate, validate, and mature the Phase I-developed concepts into prototype software. Work with the Government to establish metrics and acceptance testing for the bullets listed in Phase I.

- Demonstrate that the cataloging of dependent software packages can scale to internal and external dependent software packages.
- Demonstrate that the number of source vulnerability databases can be expanded to include internal and external sources.
- Demonstrate that the service can scan for vulnerabilities in more than two languages, to include Java, C++, and Python.
- Demonstrate that the service can ingest custom vulnerability information using a known specification (e.g., SCAP, CWE).
- Provide interfaces to ingest, process, and validate a user's custom source code and custom security bug information.
- Establish/document a lifecycle maintenance plan for the Navy.

It is probable that the work under this effort will be classified under Phase II (see Description for details).

PHASE III DUAL USE APPLICATIONS: Integrate the service into an existing Navy CI/CD DevSecOps process:

- Provide methods to rapidly ingest security and software package information.
- Implement data procurement and on-boarding processes.
- Develop product/service to a maturity level that allows it to enter the third party market as dependent software package management and security vulnerability identification tools in both the commercial and government sector.

Any commercial organization, private or public (e.g., Transportation, Medical Device Development, and/or the FDA), that does software verification and validation should be able to leverage the service.

REFERENCES:

1. Kratkiewicz, K. "Evaluating Static Analysis Tools for Detecting Buffer Overflows in C Code." Harvard University, Cambridge, MA, 2005. <https://apps.dtic.mil/dtic/tr/fulltext/u2/a511392.pdf>
2. Meng, et al. "Assisting in Auditing of Buffer Overflow Vulnerabilities via Machine Learning." Mathematical Problems in Engineering, 2017. <http://downloads.hindawi.com/journals/mpe/2017/5452396.pdf>
3. Jaspan, et al. "Advantages and Disadvantages of a Monolithic Repository: A Case Study at Google." Proceedings of the 40th International Conference on Software Engineering: Software Engineering in Practice, 2018, pp. 225-234. <https://dl.acm.org/doi/pdf/10.1145/3183519.3183550>
4. Lopes, et al. "Déjà Vu: A Map of Code Duplicates on GitHub." Proceedings of the ACM on Programming Languages, 1(OOPSLA), 2017, pp. 1-28. <http://dl.acm.org/doi/pdf/10.1145/3133908>
5. Russell, et al. "Automated Vulnerability Detection in Source Code Using Deep Representation Learning." 2018 17th IEEE International Conference on Machine Learning and Applications (ICMLA), pp. 757-762. <http://arxiv.org/pdf/1807.04320.pdf>
6. Website of the National Institute of Standards and Technology, Information Technology Laboratory, Software and Systems Division. "Source Code Security Analyzers." https://samate.nist.gov/index.php/Source_Code_Security_Analyzers.html

KEYWORDS: DevSecOps; Continuous Integration; Continuous Deployment; Software; Vulnerabilities; Legacy Code; Software Scanning; Vulnerability Databases; Development, Security and Operations

RT&L FOCUS AREA(S): Network Command, Control and Communications
TECHNOLOGY AREA(S): Electronics

OBJECTIVE: Develop a conformal printed or applique antenna system to be placed directly on the platform to yield Electro Magnetic (EM) transmit, receive, and absorptive capabilities. If possible, ensure that the antenna system maximally utilize the platform as the conductive medium with appropriate current probes and shunting mechanisms. Design an antenna system that covers the military High Frequency (HF) operational frequencies.

DESCRIPTION: With the recent advances in digital communications, the ability to perform highly complex signal processing has almost become a commodity. However, a ship's limited topside offers little space to host the complementary antennas. In addition to limited topside space, the confluence of apertures severely challenges the ship designer's ability to yield low overall Radar Cross Section (RCS) ship designs.

This SBIR topic focuses on solving both communications and RCS problems by combining novel reduced Size, Weight, and Power (SWaP) conformal antenna systems that can perform at or near (within 3 dB) the same level of performance as antennas currently fielded in the High Frequency (HF) (2 MHz to 30 MHz) as a threshold and Very High Frequency (VHF) (30 MHz to 88 MHz) to Ultra High Frequency (UHF) (225 MHz to 3 GHz) as objective bands. Note: It is acceptable to divide the UHF operational frequencies in to two bands: 225 MHz to 512 MHz and 500 MHz to 3 GHz. Further, this antenna system must provide beam forming capabilities in support of new "massive Multiple In and Multiple Out (MIMO)" multi-carrier waveforms in the HF domain. Platform Is The Antenna (PITA) can be the primary (objective) or supplemental (threshold) HF massive MIMO antenna system.

This SBIR topic falls under the NDS Alignment of "Modernize Key Capabilities" and the DDR&E (RT&L) Tech Priority "Networked Command, Control, and Communications (C3)."

PHASE I: Conduct a study to determine the technical feasibility of a conformal and/or applique antenna system that covers the operational frequencies of 2 MHz to 3 GHz. Determine the Effective Radiated Power (ERP) and antenna gain to noise temperature (G/T) necessary to perform at or near the same level of performance (within 3 dB) as antennas currently in the HF to UHF bands.

Describe the technical solution based on the investigations and technical trade-offs.

For the identified solution, develop the SBIR Phase II Project Plan to include a detailed schedule (in Gantt format), spend plan, performance objectives, and transition plan for the identified Program of Records (PoRs).

PHASE II: Develop a set of performance specifications for the PITA system and conduct a System Requirements Review (SRR).

Establish a working relationship with Naval Information Warfare Center (NIWC) Pacific engineers to perform initial integration activities and identification/development of any necessary engineering changes to the current HF, VHF, and UHF systems. Engage with the Program Office in its introduction and collaboration with NIWC Pacific engineers.

Develop the prototype antenna for demonstration and validation in a laboratory environment. The antenna will meet the relevant Environmental Qualification Testing (EQT) and Electromagnetic Environment

Effects (E3) testing for shipboard installation (e.g., MIL-STD-810H, MIL-STD-1399, MIL-HDBK-2036, NAVSEA Instruction 9700.2, etc.). Conduct a Preliminary Design Review (PDR) for the antenna and commence development of an Engineering Development Model (EDM) system. Conduct a Critical Design Review (CDR) prior to building the EDM.

Develop the life-cycle support strategies and concepts for the antenna.

Develop a SBIR Phase III Project Plan to include a detailed schedule (in Gantt format) and spend plan, performance requirements, and revised transition plan for the identified PoRs.

PHASE III DUAL USE APPLICATIONS: Refine and fully develop the EDM to build upon and produce a Production Representative Article (PRA) of the antenna and integrate with the targeted systems. Perform Formal Qualification Tests (FQT) (e.g., field testing, operational assessments, ship-to-ship testing) of the antenna with a ship or an equivalent representation.

Provide life-cycle support strategies and concepts for PITA by developing a Life-Cycle Sustainment Plan (LCSP).

Investigate the dual use of the developed technologies for commercial applications such as in the automotive industry. A conformal antenna, printed or applied, on a vehicle (e.g., bumper) could be used for vehicular communications, allowing for vehicles to become communicating nodes that can provide information (e.g., safety warnings, traffic information) between vehicles, which can be effective in avoiding accidents and traffic congestion. Other applications of this technology include on trains as an antenna and/or communications relay; cellular base station antennas conformed to various existing surfaces; commercial aircraft antenna system whereby the aircraft is the antenna; and commercial ship antennas where the developed conformal antennas could be directly utilized in the same manner as suggested in this topic.

REFERENCES:

1. Law, Preston E. Jr. "Shipboard Antennas." Artech House Antenna Library, August 1, 1986, ISBN-13: 978-0890062111 or ISBN-10: 0890062110.
2. "Conformal Antennas." Wikipedia, the Free Encyclopedia, May 10, 2020. https://en.wikipedia.org/wiki/Conformal_antenna
3. MAST Clamp Current Probe (MCCP), <https://patents.google.com/patent/US8111205B1/en>

KEYWORDS: DMR; Digital Modular Radio; Battle Force Tactical Network; BFTN; BFTN Resilient Command and Control System Enhancements; BRSE; Tactical Communications; TACCOM; Antenna; 3D Printing; Additive Manufacturing; Subtractive Manufacturing; Current Probes; current Clamps; HF; High Frequency; VHF; Very High Frequency; UHF; Ultra High Frequency

AIR FORCE
20.3 Small Business Innovation Research (SBIR) Phase I
Proposal Submission Instructions
Revision 1, 21 September 2020

Revisions to these instructions are in red. Read and follow carefully.

INTRODUCTION

The Air Force (AF) proposal submission instructions are intended to clarify the Department of Defense (DoD) instructions as they apply to AF requirements. **Firms must ensure their proposal meets all requirements of the Broad Agency Announcement currently posted on the DoD website at the time the announcement closes.**

For questions related to AF topics or instructions, contact the Air Force SBIR/STTR One Help Desk at usaf.team@afsbirsttr.us. For general inquiries or problems with the Defense SBIR/STTR Innovation Portal (DSIP) electronic submission system, contact the DoD SBIR/STTR Help Desk via email at dodsbirsupport@reisystems.com (9:00 a.m. to 5:00 p.m. ET, Monday through Friday). For technical questions about the topics during the pre-announcement period (25 August 2020 to 23 September 2020), contact the identified Topic Author. To obtain answers to technical questions during the formal announcement period (23 September 2020 through **05 November 2020**), go to dodsbirsupport@reisystems.com. Your complete proposal **must** be submitted to <https://www.dodsbirsttr.mil/submissions/> on or before the **noon ET, 05 November 2020 deadline**.

General information related to the AF Small Business Program can be found at the AF Small Business website, <http://www.airforcesmallbiz.af.mil/>. The site contains information related to contracting opportunities within the AF, as well as business information and upcoming outreach events. Other informative sites include those for the Small Business Administration (SBA), www.sba.gov, and the Procurement Technical Assistance Centers, <http://www.ptac.us.org>. These centers provide Government contracting assistance and guidance to small businesses, generally at no cost.

CHART 1: Consolidated SBIR Topic Information

Applicable Topics	Phase I					Phase II			
	Technical Volume (Vol 2)	Additional Info (Vol 5)	Award Amount	*Technical Duration	*Final Reporting Period	Technical Volume (Vol 2)	Additional Info (Vol 5)	Technical & Reporting	Initial Award Amount
AF203-001	NTE 5 pages	Pitch deck NTE 15 slides	NTE \$50,000	2 months	1 month	NTE 15 pages	Pitch deck NTE 15 slides	15 months; 12 technical and 3 for reporting	NTE \$750,000

PHASE I PROPOSAL SUBMISSION

Read the DoD program announcement <https://www.dodsbirsttr.mil/submissions/baa-schedule/active-baa-announcements> for program requirements. Phase I efforts should address the feasibility of a solution to the topic. For the AF, the contract period of performance for a Phase I shall be three months, including two months technical performance and one month for reporting. The proposal value shall not exceed \$50,000.

Limitations on Length of Proposal

The Phase I Technical Volume has a five page –limit, excluding the Cover Sheet, Cost Volume, Cost Volume Itemized Listing (a-j). The Technical Volume must be no smaller than 10-point on standard 8-1/2" x 11" paper with one inch margins. Only the Technical Volume and any enclosures or attachments count toward the five page limit. In the interest of equity, pages in excess of five will not be considered for review or award. The documents required for upload into Volume 5, "Other", do not count towards the five page limit.

NOTE: The Fraud, Waste and Abuse Certificate of Training Completion (Volume 6) is required to be completed prior to proposal submission. More information concerning this requirement is provided below under "**PHASE I PROPOSAL SUBMISSION CHECKLIST**".

Phase I Proposal Format

Proposal Cover Sheet: If selected for funding, the proposal's technical abstract and discussion of anticipated benefits will be publicly released. Therefore, do not include proprietary information in these sections.

Technical Volume: The Technical Volume should include all graphics and attachments but should not include the Cover Sheet, which is completed separately. Phase I proposals shall include a technical volume (uploaded in Volume 2) not exceeding five pages and a pitch/slide deck not exceeding 15 slides (uploaded in Volume 5). The technical volume and slide deck will be reviewed holistically. It is recommended (but not required) more detailed information be included in the technical volume and higher level information is included in the pitch deck. Make sure all graphics are distinguishable in black and white. Typically, your completed, uploaded file will be virus checked and converted to a .pdf document within an hour of submission. If it does not appear after an hour, please contact the DoD SBIR/STTR Help Desk via email at dodsbirsupport@reisystems.com or (703) 214-1333. (9:00 a.m. to 5:00 p.m. ET. Monday – Friday. Closed Federal holidays.)

Key Personnel: Identify in the Technical Volume all key personnel who will be involved in this project; include information on directly related education, experience, and citizenship. A technical resume of the principal investigator, including a list of publications, if any, must be part of that information. Concise technical resumes for subcontractors and consultants, if any, are also useful. Identify all U.S. permanent residents to be involved in the project as direct employees, subcontractors, or consultants. Identify all non-U.S. citizens expected to be involved in the project as direct employees, subcontractors, or consultants. For all non-U.S. citizens, in addition to technical resumes, please provide countries of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project, as appropriate. You may be asked to provide additional information during negotiations in order to verify the foreign citizen's eligibility to participate on a contract issued as a result of this announcement.

Phase I Work Plan Outline

NOTE: THE AF USES THE WORK PLAN OUTLINE AS THE INITIAL DRAFT OF THE PHASE I STATEMENT OF WORK (SOW). THEREFORE, DO NOT INCLUDE PROPRIETARY INFORMATION IN THE WORK PLAN OUTLINE. TO DO SO WILL NECESSITATE A REQUEST FOR REVISION AND MAY DELAY CONTRACT AWARD.

At the beginning of the proposal work plan section, include an outline of the work plan in the following format:

Scope: List the major requirements and specifications of the effort.

Task Outline: Provide a brief outline of the work to be accomplished over the span of the Phase I effort.

Milestone Schedule

Deliverables

Progress reports

Final report with SF 298

Cost Volume

Cost Volume information should be provided by completing the on-line Cost Volume and including the Cost Volume Itemized Listing specified below. The Cost Volume detail must be adequate to enable Air Force personnel to determine the purpose, necessity and reasonability of each cost element. Provide sufficient information (a-j below) on how funds will be used if the contract is awarded. The on-line Cost Volume and Itemized Cost Volume Information will not count against the five page limit. The itemized listing may be placed in the "Explanatory Material" section of the on-line Cost Volume (if enough room), or may be submitted in Volume 5 under the "Other" dropdown

option. (Note: Only one file can be uploaded to the DoD Submission Site). Ensure that this file includes the complete Technical Volume and the information below.

a. Special Tooling and Test Equipment and Material: The inclusion of equipment and materials will be carefully reviewed relative to need and appropriateness of the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the Government and relate directly to the specific effort. They may include such items as innovative instrumentation and/or automatic test equipment.

b. Direct Cost Materials: Justify costs for materials, parts, and supplies with an itemized list containing types, quantities, and price and where appropriate, purposes.

c. Other Direct Costs: This category of costs includes specialized services such as machining or milling, special testing or analysis, costs incurred in obtaining temporary use of specialized equipment. Proposals, which include leased hardware, must provide an adequate lease vs. purchase justification or rationale.

d. Direct Labor: Identify key personnel by name if possible or by labor category if specific names are not available. The number of hours, labor overhead and/or fringe benefits and actual hourly rates for each individual are also necessary.

e. Travel: Travel costs must relate to the needs of the project. Break out travel cost by trip, with the number of travelers, airfare, per diem, lodging, etc. The number of trips required, as well as the destination and purpose of each trip should be reflected. Recommend budgeting at least one (1) trip to the Air Force location managing the contract.

f. Subcontracts: Involvement of university or other consultants in the planning and/or research stages of the project may be appropriate. If the offeror intends such involvement, describe in detail and include information in the Cost Volume. The proposed total of all consultant fees, facility leases or usage fees, and other subcontract or purchase agreements may not exceed one-third of the total contract price or cost, unless otherwise approved in writing by the Contracting Officer. Support subcontract costs with copies of the subcontract agreements. The supporting agreement documents must adequately describe the work to be performed. At a minimum, an offeror must include a Statement of Work (SOW) with a corresponding detailed Cost Volume for each planned subcontract.

g. Consultants: Provide a separate agreement letter for each consultant. The letter should briefly state what service or assistance will be provided, the number of hours required and hourly rate.

NOTE: If no exceptions are taken to an offeror's proposal, the Government may award a contract without discussions (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. If selected for award, the award contract or P.O. document received by your firm may vary in format/content from the model P.O. reviewed. If there are questions regarding the award document, contact the Phase I Contracting Officer listed on the selection notification. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary.

j. DD Form 2345: For proposals submitted under export-controlled topics (either International Traffic in Arms (ITAR) or Export Administration Regulations (EAR)), a copy of the certified DD Form 2345, Militarily Critical Technical Data Agreement, or evidence of application submission must be included. The form, instructions, and FAQs may be found at the United States/Canada Joint Certification Program website,

<http://www.dla.mil/HQ/InformationOperations/Offers/Products/LogisticsApplications/JCP/DD2345Instructions.aspx>. Approval of the DD Form 2345 will be verified if proposal is chosen for award.

NOTE: Restrictive notices notwithstanding, proposals may be handled for administrative purposes only, by support contractors: Peerless Technologies, Engineering Services Network, HPC-COM, Mile Two, REI Systems, MacB (an Alion company), Infinite Management Solutions, LLC, and Mile Two. In addition, only Government employees and technical personnel from Federally Funded Research and Development Centers (FFRDCs) MITRE and Aerospace Corporations working under contract to provide technical support to AF Life Cycle Management Center and Space and Missiles Centers may evaluate proposals. All support contractors are bound by appropriate non-disclosure agreements. If you have concerns about any of these contractors, contact the AF SBIR/STTR Contracting Officer, Kris Croake, kristina.croake@us.af.mil.

k. The Air Force does not participate in the Discretionary Technical and Business Assistance (TABAs) program. Contractors should not submit proposals that include Discretionary Technical and Business Assistance.

PHASE I PROPOSAL SUBMISSION CHECKLIST

NOTE: If you are not registered in the System for Award Management, <https://www.sam.gov/>, at the time of proposal submission, you will not be eligible for award. Additionally, verify you are registered to receive contracts (not just grants) and the addresses in the proposal and SAM are consistent.

- 1) The Air Force Phase I proposal shall be a three month effort, and the cost shall not exceed \$50,000.
- 2) The Air Force will accept only those proposals, including all required volumes, submitted electronically via DSIP, <https://www.dodsbirsttr.mil/submissions/>. Hard copies or email copies sent outside the system will not be accepted.

Please note that the Fraud, Waste and Abuse Training must be completed prior to submission of your proposal. When the training has been completed and certified, the DoD Submission Website will indicate completion of the Volume 6 requirement. If the training has not been completed, you will receive an error message. Your proposal cannot be submitted until this training has been completed. The Fraud, Waste and Abuse Certificate of Training website can be found under Section 3.6 of the DoD 20.3 SBIR BAA Instructions.

The AF recommends that you complete your submission early, as computer traffic gets heavy near the announcement closing and could slow down the system. Do not wait until the last minute. The AF will not be responsible for proposals being denied due to servers being “down” or inaccessible. Please assure that your e-mail address listed in your proposal is current and accurate. The AF is not responsible for ensuring notifications are received by firms changing mailing address/e-mail address/company points of contact after proposal submission without proper notification to the AF. Changes of this nature that occur after proposal submission or award (if selected) for Phase I and II shall be sent to the Air Force SBIR/STTR site address, afsbirsttr-info@us.af.mil.

AIR FORCE PROPOSAL EVALUATIONS

The AF will utilize the Phase I proposal evaluation criteria in section 6.0 of the DoD announcement in descending order of importance with technical merit being most important, followed by the

qualifications of the principal investigator (and team), followed by the potential for commercialization as detailed in the Commercialization Plan.

The AF will utilize the Phase II proposal evaluation criteria in section 8.0 of the DoD announcement in descending order of importance with technical merit being most important, followed by the potential for commercialization as detailed in the Commercialization Plan, followed by the qualifications of the principal investigator (and team).

Proposal Status and Feedback

The Principal Investigator (PI) and Corporate Official (CO) indicated on the Proposal Cover Sheet will be notified by e-mail regarding proposal selection or non-selection. Small Businesses will receive a notification for each proposal submitted. Please read each notification carefully and note the Proposal Number and Topic Number referenced. **If changes occur to the company mail or email address(es) or company points of contact after proposal submission, the information should be provided to the AF at support@afwerx.af.mil.**

Feedback requests must be submitted in writing within 30 days after non-selection notification receipt. Feedback will only be provided to offerors with Not Selectable proposals; only one feedback is provided per proposal. Written requests for feedback must be submitted to AFRL.SBIR.STTR_FeedbackRequest@us.af.mil. Requests for feedback should include the company name and telephone number/email address for a company point of contact and alternate. Also include the topic number under which the proposal(s) was submitted, and the proposal number(s). Feedback requests received more than 30 days after non-selection notification receipt will be fulfilled at the Contracting Officers' discretion.

We anticipate having all the proposals evaluated and our Phase I contract decisions within approximately **90 days** of proposal receipt.

PHASE II PROPOSAL SUBMISSIONS

Phase II is the demonstration of the technology found feasible in Phase I. Only Phase I awardees are eligible to submit a Phase II proposal. All Phase I awardees will be sent a notification with the Phase II proposal submittal date and instructions. Phase II efforts are typically 15 months in duration (12 months technical performance and three months for reporting), with an initial value not to exceed \$750,000.

All proposals must be submitted electronically at <https://www.dodsbirsttr.mil/submissions/> by the date indicated in the notification. The Technical Volume is **limited to 15 pages** (unless a different number is specified in the notification; any advocacy letters, SBIR Environment Safety and Occupational Health (ESOH) Questionnaire, and Cost Volume Itemized Listing (a-j) will not count against the 15-page limitation and should be placed as the last pages of the Technical Volume file that is uploaded. The Phase II proposals shall also include a pitch/slide deck not to exceed 15 slides (uploaded in Volume 5). The technical volume and slide deck will be reviewed holistically and there is no set format requirements for the two documents. It is recommended (but not required) that more detailed information is included in the technical volume and higher level information is included in the pitch deck. (Note: For Phase II applications only one file can be uploaded to the DoD Submission Site. Ensure that this single file includes your complete Technical Volume and the additional Cost Volume information.) The preferred format for submission of proposals is Portable Document Format (.pdf). Graphics must be distinguishable in black and white. Please virus-check your submissions.

AIR FORCE SBIR PROGRAM MANAGEMENT IMPROVEMENTS

The AF reserves the right to modify the Phase II submission requirements. Should the requirements change, all Phase I awardees will be notified. The AF also reserves the right to change any administrative procedures at any time that will improve management of the AF SBIR Program.

AIR FORCE SUBMISSION OF FINAL REPORTS

All Final Reports will be submitted to the awarding AF organization in accordance with the Contract. Companies will not submit Final Reports directly to the Defense Technical Information Center (DTIC).

AIR FORCE SBIR 20.3 Topic Index

AF203-001 Weapons Pitch Day

AF203-001 TITLE: Weapons Pitch Day

RT&L FOCUS AREA(S): Cybersecurity; Network Command, Control and Communications; General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Weapons, Sensors, Electronics

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This topic seeks technologies supporting development of novel weapons capabilities for the United States Air Force. Following the completion of a Phase I effort, vendors may be invited to participate in a Phase II Pitch Day, hosted by AFLCMC/EB, tentatively scheduled for March 2021 in the Fort Walton Beach, FL area.

DESCRIPTION: The Armament Directorate is in search of technologies that support the Air Force's priorities of Reach, Affordable Mass, Autonomous Collaboration, Sensing and Communications, Non-Kinetic Effects, and Digital Engineering. The Armament Directorate is seeking solutions that do not exceed the procurement cost of current weapons to allow inventories to be created and maintained within current projected anticipated budgets. As such, cost reducing/minimizing technologies across the board are of interest. Tactics, techniques, and procedures (TTP) and associated additional enabling technologies are also a critical aspect. It is anticipated that TTPs in conjunction with innovative technologies will be needed to meet the Air Force's goals. Reach - The Armament Directorate is in search of concepts that are focused on allowing Blue aircraft to effectively prosecute targets (either both air and ground) with increased standoff range. Targets of interest include fighters, soft stationary ground targets, hardened targets, moving ground targets, and maritime targets.

Affordable Mass - The Armament Directorate is in search of concepts that are focused concepts under exploration on allowing blue forces to utilize large numbers of relatively low cost weapons systems. Technologies of interest include low cost materials and manufacturing processes, low cost propulsion systems and technologies, modular open-system payload architectures and technologies, disposable or re-usable dispenser vehicles, miniaturized, reliable electronics, and electronic warfare concepts and capabilities.

Autonomous Collaboration - The Armament Directorate is in search of concepts that are focused on allowing blue forces to utilize numbers of collaborative weapons systems to employ coordinated tactics to ensure mission success, employ automated, adaptive and collaborative tactics in a fluid battlespace, support blue forces multi-domain command and control strategies. Specific technologies under analysis include: Artificial intelligence algorithms with "dialable" human influence; Target identification schema; Target prioritization algorithms; Collaborative weapons playbook scripts; Datalink technologies/concepts; Miniaturized, reliable electronics to include flight controls, mission computers, seekers, etc).

Sensing and Communications - The Armament Directorate is in search of concepts focused on enabling blue forces to utilize weapons as major contributors to multi-domain command and control (MDC2) space. Specific technologies of interest include: Low-cost, multi spectral seekers; Datalinks

technologies/concepts; Data transmission and evaluation software/algorithms; Air deliverable ground communications/sensing packages.

Non-Kinetic Effects - The Armament Directorate is in search of concepts focused on either/both increasing Blue forces' magazine depth and/or presenting new armament delivered capabilities to the battlefield. Many non-kinetic weapons are electric power derived and therefore afford the potential of multiple "shots" per weapon engagement v. a traditional kinetic weapon with one "bang." Other non-kinetic effects provide different effects than kinetic weapons that may be as effective on the battle space as a kinetic weapon with lower cost and/or in a smaller package.

Digital Engineering - The Armament Directorate is in search of concepts focused on digital/digital engineering to employ new technologies faster. The Armament Directorate looking for digital solutions to utilize Weapons Open Systems Architecture (WOSA) to the maximum extent possible. Specific areas of interest include: Model Base Systems Engineering; Weapon Open Systems Architectures; Databases; Data mining/optimization tools; Armament unique modeling and simulation; Multi-security level solutions.

PHASE I: Phase I efforts will focus on technical feasibility. This may include but is not limited to: analysis of existing technologies, conceptualization of new technologies, prototyping activities, user needs identification, and systems integration requirements.

PHASE II: Phase II efforts will focus on prototyping, demonstration, integration, and analysis of innovative technologies.

PHASE III DUAL USE APPLICATIONS: Phase III efforts will focus on transitioning the developed technology to a working commercial or warfighter solution.

REFERENCES:

- Lorell, M. (2000). Cheaper, faster, better? Commercial approaches to weapons acquisition (No. RAND/MR-1147-AF). RAND CORP SANTA MONICA CA.

KEYWORDS: armament, munitions, weapons

CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM
FY20.3 Small Business Innovation Research (SBIR)
Proposal Submission Instructions

The approved FY20.3 topics included in the Chemical and Biological Defense (CBD) Small Business Innovation Research (SBIR) Program are listed below. Offerors responding to this Announcement must follow all general instructions provided in the Department of Defense (DoD) Program Announcement. Specific CBD SBIR requirements that add to or deviate from the DoD Program Announcement instructions are provided below.

General Information

In response to Congressional interest in the readiness and effectiveness of U.S. Nuclear, Biological and Chemical (NBC) warfare defenses, Title XVII of the National Defense Authorization Act for Fiscal Year 1994 (Public Law 103-160) requires the Department of Defense (DoD) to consolidate management and oversight of the Chemical and Biological Defense (CBD) Program into a single office – Office of the Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs. The Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD), located at the Defense Threat Reduction Agency (DTRA), provides the management for the Science and Technology component of the Chemical and Biological Defense Program. Technologies developed under the Small Business Innovation Research (SBIR) Program have the potential to transition to the Joint Program Executive Office for Chemical Biological Radiological and Nuclear Defense (JPEO-CBRND) if the appropriate level of technology maturity is demonstrated. The JSTO-CBD Science & Technology programs and initiatives improve defensive capabilities against Chemical and Biological Weapons of Mass Destruction. The SBIR portion of the CBD Program is managed by the JSTO-CBD.

The mission of the Chemical and Biological Defense Program is to ensure that the U.S. Military has the capability to operate effectively and decisively in the face of chemical or biological warfare threats at home or abroad. Numerous factors continually influence the program and its technology development priorities. Improved defensive capabilities are essential in order to mitigate the impact of Chemical and Biological Weapons. The U.S. military requires the finest state-of-the-art equipment and instrumentation available to permit our warfighters to ‘detect to warn’ and avoid contamination, if possible – and to be able to sustain operations in a potentially contaminated environment. Further information is available at the Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs homepage at <https://www.acq.osd.mil/ncbdp/cbd/>

The overall objective of the CBD SBIR Program is to improve the transition or transfer of innovative Chem-Bio technologies to the end user – the warfighter – in addition to commercializing technologies within the private sector for mutual benefit. The CBD SBIR Program targets those technology efforts that maximize a strong defensive posture in a biological or chemical environment using passive and active means as deterrents. These technologies include chemical and biological detection for both point and stand-off capabilities; individual and collective protection; hazard mitigation (decontamination); medical pre-treatments (e.g., vaccine development and delivery); medical therapeutics (chemical countermeasures and biological countermeasures); medical diagnostics; Digital Battlespace Management (aka information systems technology) to include but not limited to modeling and simulation (e.g., meteorological dispersion), disease surveillance, data fusion, and health & human effects.

Submitting Your Phase I CBD SBIR Proposal

Your entire proposal submission must be submitted electronically through the Defense

SBIR/STTR Innovation Portal (DSIP) located at: <https://www.dodsbirsttr.mil>
A hardcopy is NOT required and will not be accepted by the Chemical and Biological Defense SBIR Program. Hand or electronic signature on the proposal is NOT required.

The Proposal Technical Volume must be 20 pages or less in length. No other information included in the other proposal volumes counts against the 20-page Proposal Technical Volume page limit. Pages provided in excess of this length will not be evaluated or considered for review. The proposal must not contain any type smaller than 10-point font size (except as legend on reduced drawings, but not tables).

The maximum dollar amount for a Phase I proof-of-concept/feasibility study is \$167,500 for a period of performance of up to six (6) months. **The CBD SBIR Program will not accept Phase I proposals which exceed \$167,500 for the Phase I effort.** The total SBIR funding amount available for Phase II activities from a resulting Phase II contract is not to exceed \$1,100,000.

Selection of Phase I proposals will be based upon the three evaluation criteria discussed in this Program Announcement. The CBD SBIR Program reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality in the judgment of the technical evaluation team will be funded. All SBIR contract awards, both Phase I and Phase II, are subject to availability of funding.

Companies should plan carefully for any research involving animal or human subjects, chemical agents, biological agents, etc. The brief Period of Performance available for a Phase I project precludes plans that include these elements, as all DoD requirements and necessary approvals associated with animal and/or human use must be strictly adhered to, and require considerable coordination and significant time for final protocol approvals. See Section below for further information regarding all research that will include animal and/or human subjects.

Proposals not conforming to the terms of this Announcement, and any unsolicited proposals, will not be considered. All awards are subject to the availability of funding and successful completion of contract negotiations. The Chemical and Biological Defense Program is not responsible for any funds expended by the proposer prior to contract award.

CBD Program Phase II Proposal Guidelines

Phase II is the demonstration of the technology that was found feasible in Phase I. Phase I awardees may submit a Phase II proposal without invitation; however, it is strongly encouraged that a Phase II proposal not be submitted until sufficient Phase I progress can be evaluated and assessed based on results of the Phase I proof-of-concept/feasibility study. Therefore, it is suggested that a Phase II proposal be submitted no sooner than five months from date of Phase I contract award. **All Phase II proposal submissions must be submitted electronically through the Defense SBIR/STTR Innovation Portal system at: <https://www.dodsbirsttr.mil>**

At the proposal submission website, Phase II proposals MUST be submitted to ‘CBD SBIR’ regardless of which DoD contracting office negotiated and awarded the Phase I contract. Additional instructions regarding the Phase II proposal submission process including submission key dates will be provided to Phase I awardees after the Phase I contract is awarded; additional information may also be found at <http://www.cbdsbir.net>.

All proposers are required to develop and submit a commercialization plan describing feasible approaches for marketing and manufacturing the developed technology. Proposers are required to submit

a budget for the entire 24-month Phase II Period of Performance. During contract negotiation, the Contracting Officer may require a Cost Volume for a base year and an option year; thus, proposers are advised to be aware of this possibility. These costs must be submitted using the Cost Volume format (accessible electronically on the DoD SBIR/STTR submission site). The total proposed amount should be indicated on the Proposal Cover Sheet as the Proposed Cost. At the Contracting Officer's discretion, Phase II projects may be evaluated for technical progress prior to the end of the base year, prior to extending funding for the option (second) year.

The CBD SBIR Program is committed to minimizing the funding gap between Phase I and Phase II activities. The CBD SBIR Program typically funds a cost plus fixed fee Phase II award, but may award a firm fixed price contract at the discretion of the Contracting Officer.

Technical Assistance

At this time, the CBD SBIR Program is not participating in the Technical and Business Assistance (TABA) Program.

Protest Procedures

Refer to the DoD SBIR Program Announcement for procedures to protest the Announcement.

As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to: Mr. Larry Pollack, Chemical and Biological Defense (CBD) SBIR Program Manager, Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD), lawrence.p.pollack2.civ@mail.mil

CBD SBIR Projects Requiring Animal and Human Subjects

Companies should plan carefully for any research involving animal and/or human subjects in addition to the use of any chemical or biological warfare agents, and use of any agents associated with "Dual Use Research of Concern (DURC)". The brief Phase I Period of Performance precludes plans requiring the use of many of these materials as well as animal and/or human subjects prior to obtaining all necessary DoD approvals.

The offeror is expressly forbidden to use or subcontract for the use of laboratory animals in any manner without the express written approval of the U.S. Army Medical Research and Development Command's (USAMRDC), Animal Care and Use Review Office (ACURO). Written authorization to begin research under the applicable protocol(s) proposed as part of the CBD SBIR program will be issued after contract award in the form of an approval letter from the USAMRDC ACURO to the recipient. Furthermore, modifications to already approved protocols require approval by ACURO prior to implementation.

Research under CBD SBIR awards involving the use of human subjects, to include the use of human anatomical substances or human data, shall not be proposed for any Phase I Period of Performance. If Human Subjects research is proposed during the Phase II Period of Performance, the studies may not begin until the DTRA Research Oversight Board (ROB) provides authorization that the research protocol may proceed. Written approval to begin research protocol will be issued from the ROB, under separate notification to the recipient. Written approval from the ROB is also required for any sub-recipient that will use funds obtained from any CBD SBIR awards to conduct research involving human subjects.

Changes in research involving human subjects shall be conducted in accordance with the protocol submitted to and approved by the ROB. Non-compliance with any provision may result in withholding of funds and or termination of the award.

CBD SBIR FY20.3 Topic Index

- CBD203-001 CBRN Gloves with Improved Tactility and Touch-Screen Capability
- CBD203-002 On-Demand Generation of Hydrogen Peroxide for Vaporous Decontamination Systems
- CBD203-003 Plasma Decontamination of Biological Warfare Agents

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Chemical/Biological Defense; Materials / Processes; Human Systems

OBJECTIVE: Current, state-of-the-art Chemical, Biological, Radioactive, and Nuclear (CBRN) protective gloves are highly protective (butyl rubber) and durable [1], but are bulky and induce an elevated thermal burden when worn for extended periods. The fit, sizing, and physical bulk of gloves is critical to avoid restricting user dexterity, which is needed to perform tasks in high risk environments [2, 3]. The increased thermal burden associated with wear decreases user comfort and acceptance [4]. Additionally, current systems cannot be used while operating capacitive-based touch screen systems that are increasingly necessary in military operations. This topic addresses the technical challenges and innovative solutions needed to create protective, durable, and conformal gloves that can be integrated into novel CBRN protective ensembles while allowing higher tactility and touch-screen capabilities

DESCRIPTION: Chemical, Biological, Radioactive, and Nuclear (CBRN) protective ensembles provide the first line of defense for personnel exposed to victims and/or materials during assessment, extrication, rescue, triage, decontamination, treatment, site security, crowd management, and force protection operations at incidents involving CBRN agents. Gloves are an integral part of the ensemble that allow users to perform critical tasks. There is a need for gloves that allow for high levels of function, without trade-off between protection and dexterity, tactility, or thermal burden. Commercially available CBRN protective gloves are bulky and not sufficiently conformal or tactile to the wearer. Additionally, these gloves cannot be used with electronic touch-screen systems. This topic solicits the following innovative technology requirements for a CBRN glove.

Test	Threshold	Objective
Chemical permeation resistance: NFPA 1994 Class 1	20 g/m ² challenge over 1 hours	20 g/m ² challenge over 6 hours
Puncture Resistance: ASTM F1342/F1342M	Puncture resistance of ≥ 9 N (≥ 2 lbf) (threshold)	Puncture resistance of ≥ 15 N (≥ 3.8 lbf) (objective)
Cut Resistance: ASTM F1790	Blade travel distance of ≥ 20 mm	Blade travel distance of ≥ 20 mm
Stretch recovery: ASTM D2594	20% stretch, 90% recovery	20% stretch, 90% recovery
Tensile Strength (durability): ASTM D5034 or equivalent test for breaking strength (N or lbf) and Elongation Break (%)	An objective of 90% resistance to break of butyl rubber	An objective resistance to break equal to butyl rubber
Conductivity: 4 point probe	N/A	$\geq 10^{-10}$ S/cm
Moisture vapor transport (MVTR) ASTM E96	Equal to butyl rubber	An objective of higher MVTR than butyl rubber

Table 1. Phase I threshold and objectives.

ACRONYMS:

ASTM	American Society for Testing and Materials
° C	degrees Celsius
NFPA	National Fire Protection Association
g/m ²	grams per meter squared
lbf	pounds of force

N	Newtons
N·m	Newton meters
S/cm	Siemens per centimeter

PHASE I: Conduct research on novel concepts for Chem-Bio protective glove materials to achieve both conformal, tactical properties and barrier functions. Upon completion of Phase I, samples of the glove material or materials in swatch/sheet form will be made available for independent evaluation of barrier properties, physical properties, and conductivity. The material(s) should meet the threshold goals outlined above (Table 1) and the detailed conditions for testing must be provided to and be approved by the Government Technical Points of Contact (POCs). The threshold level of chemical permeation resistance should be cumulative permeation mass of less than 6 micrograms/cm² for industrial chemicals, 1.25 micrograms/cm² for Soman (GD) and 4.0 micrograms/cm² for distilled mustard (HD) when challenged with 20 grams per meter squared (g/m²) of liquid chemical agent or 1% agent in gas phase [5,6]. An assessment of capability to form or mold materials into gloves will be provided to the Government Technical POCs. In addition, it is highly encouraged that additional physical property testing be performed on the glove material, such as weight (ASTM D3776, option C), stiffness (ASTM D 747) and thickness (ASTM D 1777), and the results sent to the Government Technical POCs. There is no threshold for these values because while they are indicative of glove tactility, which will be measured in Phase II, they are not determinant.

Test	Threshold	Objective
Chemical permeation resistance: NFPA 1994 Class 1	20 g/m ² challenge over 1 hour	20 g/m ² challenge over 6 hours
Liquid tight integrity: ASTM D5151	No liquid penetration	No liquid penetration
Puncture Resistance: ASTM F1342/F1342M	Puncture resistance of ≥ 9 N (≥ 2 lbf) (threshold)	Puncture resistance of ≥ 15 N (≥ 3.8 lbf) (objective)
Cut Resistance: ASTM F1790	Blade travel distance of ≥ 20 mm	Blade travel distance of ≥ 20 mm
Stretch recovery: ASTM D2594	20% stretch, 90% recovery	20% stretch, 90% recovery
Cold Temperature Performance: ASTM D747	Bending moment of <0.057 N·m at an angular deflection of 60° at -25° C.	Bending moment of <0.057 N·m at an angular deflection of 60° at -25° C.
Flammability Resistance: ASTM F1358	Afterflame time of ≤ 2.0 seconds, does not melt or drip	Afterflame time of ≤ 2.0 seconds, does not melt or drip
Moisture vapor transport ASTM E96	Equal to butyl rubber	MVTR higher than butyl rubber
Tensile Strength (durability): ASTM D5034 or equivalent test for breaking strength (N or lbf) and Elongation Break (%)	An objective of 90% resistance to break of butyl rubber	An objective of resistance to break equal to butyl rubber
Conductivity: 4 point probe	$\geq 10^{-10}$ S/cm at fingertip region	$\geq 10^{-10}$ S/cm, entire glove
Glove hand function: ASTM F2010/F2010M	Average % increase over barehanded control $<300\%$	Average % increase over barehanded control $<300\%$

Table 2. Phase II thresholds and objectives.

PHASE II: Conduct development and assessment of forming or molding the materials into gloves and system level assessment for liquid tight integrity. Further improvements in the material properties should be made to reach as high of a value as possible, near the objectives for permeation (NFPA 1994 Class 1), stretch (20%), and durability resistance to break (90% of butyl rubber), outlined above (Table 2). The threshold level of chemical permeation resistance should be cumulative permeation mass of less than 6 micrograms/cm² for industrial chemicals, 1.25 micrograms/cm² for Soman, and 4.0 micrograms/cm² for distilled mustard when challenged with 20 grams per meter squared (g/m²) of liquid chemical agent or 1% chemical agent in the gas phase. Additional testing such as viral penetration (ASTM F1671) tests are encouraged, with the results sent to the Government Technical POCs. There is no threshold for performance against viral penetration for Phase II performance or NFPA 1994 Class 1 gloves, and results will not be determinant. However, viral testing is required for both NFPA 1994 Class 2 and 3 gloves, and the result may be considered for Phase III Dual Use Applications. The detailed conditions for testing must be provided to and approved by the Government Technical POCs. With approval by the Government Technical POCs, gloves will be integrated into CBRN protective ensembles and system level testing will be completed in the second half of Phase II. User acceptability, form, fit, function, capability on resistive and capacitive touchscreen, thermal burden, thermal and evaporative resistance will be assessed and considered. Upon completion of Phase II, molded samples of the glove, material swatches of the improved upon material(s), and a complete cost analysis for glove production will have been provided to the Government Technical POCs.

PHASE III: The gloves demonstrated in Phase II will be commercialized for production and integration into CBRN protective ensembles. The Government Technical POCs will be available to advise on possible partners and paths forward in both government and industry, with an end goal to deliver glove prototypes able to integrate into an appropriate Chem-Bio ensemble for the intended end-user.

PHASE III DUAL USE APPLICATIONS: First responder and anti-terrorism personnel would also benefit from the use of improved protective gloves that are more conformal, allowing for improved dexterity, tactility and comfort, with touch screen capability. The barrier material can be used not only in protective gloves, but also in other formed/molded applications such as protective socks.

REFERENCES:

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2. Schumacher, J., Arlidge, J., Garnham, F. and Ahmad, I. 2017. A randomised crossover simulation study comparing the impact of chemical, biological, radiological or nuclear substance personal protection equipment on the performance of advanced life support interventions. *Anaesthesia*. 72: 592-597. doi:10.1111/anae.13842;
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6. NFPA 1994 Standard on Protective Ensembles for Chemical/Biological Terrorism Incidents 2001 Edition, National Fire Protection Association (NFPA), Quincy, MA 02269, USA.
http://www.disaster-info.net/lideres/english/jamaica/bibliography/ChemicalAccidents/NFPA_1994_StandardonProtectiveEnsemblesforChemicalBiologicalTerrorismIncidents.pdf;

NOTE: Ref 5 (above) provides free access and allows the entire document to be viewed on the NFPA website, but cannot be downloaded.;

Ref 6 is an older version but links directly to a downloadable PDF document.;

KEYWORDS: Barrier Materials; Chem-Bio Protection; Gloves, Durability; Permeation Resistance; Elastic Stretching; Elastic Relaxation; dexterity

CBD203-002 TITLE: On-Demand Generation of Hydrogen Peroxide for Vaporous Decontamination Systems

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Chemical/Biological Defense; Materials/Processes

OBJECTIVE: Develop a mobile system capable of providing on-demand generation of aqueous hydrogen peroxide (H₂O₂) for Service Equipment Decontamination System (SEDS).

DESCRIPTION: The ability to decontaminate mission critical equipment is necessary to minimize exposure risks and maintain operations after a chemical agent attack or release. Vaporous hydrogen peroxide (VHP) has been explored as a methodology for decontamination of sensitive, mission critical equipment.¹ Although VHP technologies are promising, generation of VHP requires a supply of liquid solutions of hydrogen peroxide at high concentrations (35 percent). Concentrated hydrogen peroxide is hazardous, unstable, has a short shelf-life, and is restricted to ground transport. A mobile system capable of providing hydrogen peroxide on demand would significantly increase the feasibility of VHP-based decontamination systems. For this objective, and for this topic, the hydrogen peroxide will be generated "On Demand" from air and potable water, with power. Consumables are to be kept to an absolute bare minimum.²⁻⁵ The desired system will have the lowest obtainable Size, Weight and Power demand (SWaP). The final system will be capable of generating at least 0.2 liters of 35 percent aqueous hydrogen peroxide per hour for a minimum of 14 hours. The final system will be powered from an external source such as 12-24 volt vehicle power, or conventional military generator. The final system will weigh no more than 40 pounds.

PHASE I: Design and develop an "On Demand" process to generate 10%-15% concentrations of aqueous hydrogen peroxide. Demonstrate "proof of concept" of hydrogen peroxide generation adhering to constraints in the topic description (above). Construct a "breadboard prototype" and demonstrate the system can generate aqueous solutions of hydrogen peroxide that meet the above description. Identify scale-up limitations and determine which factors can be optimized to increase peroxide output concentration and throughput. Estimate the logistic requirements of the proposed process.

PHASE II: Refine the design to a higher fidelity prototype that provides the form, fit and function of the targeted end-product as described. The system will be capable of delivering food grade 35 percent aqueous solution of hydrogen peroxide. Verify performance by comparing "on demand" H₂O₂ against reagent grade H₂O₂. Demonstrate that the system will be stable for a minimum of 14 hours of continuous operation per day. Consumption rate of items such as power and consumables will be determined. The system will be modular and/or tunable to meet different peroxide generation requirements for both small and large-scale decontamination systems.

PHASE III: Refine the design to meet size, weight, and power requirements. Demonstrate system integration with existing VHP decontamination platforms. Test throughput and peroxide concentration. Provide military users prototype systems for field-testing. Obtain user feedback based on test & evaluation to further refine the design.

PHASE III DUAL USE APPLICATIONS: This technology will be useful to civilian and military first responders, and may also be applied to sterilize medical equipment, and facilitate water treatment in remote locations.

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KEYWORDS: decontamination; hydrogen peroxide; chemical warfare agent; hazardous materials; in-situ; oxidation

CBD203-003 TITLE: Plasma Decontamination of Biological Warfare Agents

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR); Biotechnology
TECHNOLOGY AREA(S): Chemical/Biological Defense; Materials/Processes

OBJECTIVE: Develop a hand-held plasma decontamination system for biological warfare agents.

DESCRIPTION: The ability to decontaminate mission critical equipment is necessary to minimize exposure risks and maintain operations after a biological agent attack. Plasma is currently used in industrial cleaning applications¹ and technology has been shown to rapidly decontaminate a wide range of biological contaminants, with little damage to the asset.^{2,3} Plasma sources have also been used to effectively decontaminate and sterilize medical equipment and have been shown to be a promising method for disinfection of surfaces in hospital settings.⁴ To limit the spread of contamination and restore combat operations, there is an essential need for a man-portable system which rapidly decontaminates items, such as sensitive equipment, etc., so that a warfighter's mission can continue. The hand-held system will decontaminate a broad spectrum of biological agents (spores, bacteria, and virus) from a variety of equipment within minutes while not compromising the integrity or function of the equipment, allowing it return to normal operations without limitations. Performance threshold for the plasma decontamination system is 99.9 percent reduction of biological agents with an objective of 99.9999 percent inactivation of detectable pathogens. Examples of gear to decontaminate include, but are not limited to, helmets, tactical vests, and sensitive equipment such as radios and night-vision goggles. For the purposes of this topic, sensitive equipment will be modeled on a military-style, multi-channeled, hand-held radio that the vendor will use (and acquire) to verify and validate performance of the decontamination system. The plasma sources should be able to operate in the open atmosphere, and be able to decontaminate the model system within 10 minutes. The final system must be man-portable (< 40 lbs), include an internal rechargeable battery to provide a minimum of 1-hour of operation, and be compatible for operating on an external power source. Consideration will be given for affordable approaches that minimize Size, Weight, and Power (SWaP). Consideration also will be given to system designs that minimize or eliminate consumables.

PHASE I: Demonstrate proof-of-principle by constructing a "breadboard" prototype and demonstrate that the device achieves the necessary conditions to decontaminate the modeled system within 10 minutes. Demonstrate the effectiveness of the system on two representative test coupons: a coated metal surface and a polymer surface such as polycarbonate. Show effectiveness using surrogates for a range of biological agents: vegetative bacteria (e.g. *Francisella philomiragia*), enveloped virus (e.g. *vaccinia*) and endospore (e.g. *Bacillus thuringiensis*). From proof-of-principle experiments, demonstrate through design analysis that the required performance parameters can be achieved during Phase II.

PHASE II: Refine the design and construct a "brass-board" prototype that provides the form, fit and function of the targeted end-product. Demonstrate the decontamination effectiveness against a qualified *Bacillus anthracis* spore surrogate on the model sensitive item (i.e. military-style, multi-channeled, hand-held radio) within above description. Validate that total remaining biological agent (surrogate) is at or below performance objectives. Demonstrate and validate that the conditions of the process to decontaminate do not have a deleterious impact on the immediate or long-term function of the modeled sensitive equipment item. The prototype will include management of effluents to ensure agents or harmful chemicals are contained during the decontamination process. Estimate and outline the logistic requirements of the proposed process. Prior to the demonstration on the model sensitive equipment item, confirm performance on an expanded set of coupon testing, large panel, and/or complex surfaces for testing. Calculate extraction efficiency thru demonstrating proper titers and controls. Ensure surrogate agent titers adequately simulate environmental organic load as part of the test. Demonstrate reproducibility of tittered samples.

Provide military users prototype systems for field-testing. Obtain user feedback based on test & evaluation to further refine the design.

PHASE III: Refine the design to meet Size, Weight, and Power requirements. Demonstrate system integration with existing decontamination platforms. Provide military users with prototype systems for field-testing. Obtain user feedback based on test & evaluation to further refine the design.

PHASE III DUAL USE APPLICATIONS: This technology will be valuable to both military personnel and first responders for on-site decontamination.

REFERENCES:

1. What is Plasma Cleaning Used For? <https://tantec.com/what-is-plasma-cleaning-used-for.html>;
2. Bizzigotti, et. al. Handbook of Chemical and Biological Warfare Agent Decontamination; St Albans, ILM Publications, 2012.;
3. Herrmann, et. al. Decontamination of Chemical and Biological Warfare Agents Using an Atmospheric Pressure Plasma Jet, Physics of Plasmas, 1999, Volume 6, Number 5, 2284-2289.;
4. Thiyagarajan, et al. Atmospheric Pressure Resistive Barrier Cold Plasma for Biological Decontamination, IEEE Transactions on Plasma Science, April 2005.;
5. McCullers, J. A, et al. Use of atmospheric non-thermal plasma as a disinfectant for objects contaminated with methicillin-resistant Staphylococcus aureus, AJIC, 2009, vol 37, 9, 729-733.;
6. Sakudo, et. al. Disinfection and Sterilization using Plasma Technology: Fundamentals and Future Perspectives for Biological Applications; Int. J. Mol. Sci. 2019, 20, 5216.

KEYWORDS: decontamination; plasma; biological warfare agent; hazardous materials

SBIR 20.3 DEFENSE LOGISTICS AGENCY (DLA) SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM

Proposal Submission Instructions

GENERAL

The Defense Logistics Agency (DLA) implements, administers, and manages the SBIR/STTR Program as part of the Small Business Innovation Programs through DLA J68 Information Operations / Research, and Development (R&D) Division. Consult the program website at the following location:

<http://www.dla.mil/SmallBusiness/SmallBusinessInnovationPrograms> for general information about the DLA SBIP Program and its mission. If you have any questions regarding the administration of the Program, please contact the DLA SBIR Program Manager (PM):

Denise Price email: DLASBIR2@dlamail.mil

TECHNICAL QUESTIONS

For questions regarding the SBIR/STTR topics during the pre-release period, contact the Topic Technical Point of Contact (TPOC) listed for each topic on the SBIR/STTR website at <https://www.dodsbirsttr.mil/submissions/login> prior to the close of the pre-release. To obtain answers to technical questions during the open period; submit your questions through the online SBIR/STTR Q&A System <https://www.dodsbirsttr.mil/submissions/login>.

For general inquiries or problems with electronic submission, contact Department of Defense (DoD) SBIR Help Desk at DoDSBIRSupport@reisystems.com or 703.214.1333 between 9:00 am and 5:00 pm ET (Monday – Friday).

PHASE I KEY DATES

20.3 BAA (Pre-release)	25 August 2020 23	
20.3 BAA (Open period)	September 2020	
20.3 BAA Closes	05 November 2020	The countdown clock on the website is official

PROGRAM BROAD AGENCY ANNOUNCEMENT (BAA) 20.3

PHASE I GUIDELINES

DLA is committed to improving the time to award new projects. As such, all DLA Phase I topics are subject to pilot efforts intended to meet legislative goals.

A list of the topics currently eligible for proposal submission is included in the Topic Index, followed by full topic descriptions. Additional guidance is as follows:

- Proposal period of performance should follow the guidelines listed in the topic.
- Proposal Cost Estimates are topic dependent, and each topic has a specified ceiling.
- Phase I proposals may not exceed the 20-page limit.
- Volume 5 Proposal attachments, appendices, or references are not included in the Page count.
- Volume 6 FWA Training Certificate is required for proposal submission
- Notification of selection and non-selection occurs electronically via e-mail (NLT 15 Jan 2021).

For detailed proposal submission guidance, refer to U.S. Department of Defense (DoD) Instructions 20.3 SBIR at: <https://www.dodsbirsttr.mil/submissions/login>

Phase I Proposal Instructions

h. Proposal Cover Sheet (Volume 1)

On the Defense SBIR/STTR Innovation Portal (DSIP) at <https://www.dodsbirsttr.mil/submissions/>, prepare the Proposal Cover Sheet. The Cover Sheet must include a brief technical abstract of no more than 200 words that describes the proposed R&D project with a discussion of anticipated benefits and potential commercial applications. **Do not include proprietary or classified information in the Proposal Cover Sheet.** If your proposal is selected for award, the technical abstract and discussion of anticipated benefits may be publicly released on the Internet. Once the Cover Sheet is saved, the system will assign a proposal number. You may modify the cover sheet as often as necessary until the BAA closes.

i. Format of Technical Volume (Volume 2)

- (4) **Type of file:** The Technical Volume must be a single Portable Document Format (PDF) file, including graphics. Perform a virus check before uploading the Technical Volume file. If a virus is detected, it may cause rejection of the proposal. **Do not lock or encrypt the uploaded file. Do not include or embed active graphics such as videos, moving pictures, or other similar media in the document.**
- (5) **Length:** It is the proposing firm's responsibility to verify that the Technical Volume does not exceed the page limit after upload to DSIP. The DLA Page Limit is 20 Pages, anything beyond 20 pages will not be evaluated.
- (6) **Layout:** Number all pages of your proposal consecutively. Those who wish to respond must submit a direct, concise, and informative research or research and development proposal (no type smaller than 10-point on standard 8-1/2" x 11" paper with one-inch

margins). The header on each page of the Technical Volume should contain your company name, topic number, and proposal number assigned by the Defense SBIR/STTR Innovation Portal (DSIP) site when the Cover Sheet was created. The header may be included in the one-inch margin.

j. **Content of the Technical Volume (Volume 2)**

The Technical Volume should cover the following items in the order given below:

- (12) **Identification and Significance of the Problem or Opportunity.** Define the specific technical problem or opportunity addressed and its importance.
- (13) **Phase I Technical Objectives.** Enumerate the specific objectives of the Phase I work, including the questions the research and development effort will try to answer to determine the feasibility of the proposed approach.
- (14) **Phase I Statement of Work (including Subcontractors' Efforts)**
 - c. Provide an explicit, detailed description of the Phase I approach. If a Phase I option is required or allowed by the Component, describe appropriate research activities which would commence at the end of Phase I base period should the Component elect to exercise the option. The Statement of Work should indicate what tasks are planned, how and where the work will be conducted, a schedule of major events, and the final product(s) to be delivered. The Phase I effort should attempt to determine the technical feasibility of the proposed concept. The methods planned to achieve each objective or task should be discussed explicitly and in detail. This section should be a substantial portion of the Technical Volume section.
 - d. This BAA may contain topics that have been identified by the Program Manager as research or activities involving Human/Animal Subjects and/or Recombinant DNA. In the event that Phase I performance includes performance of these kinds of research or activities, please identify the applicable protocols and how those protocols will be followed during Phase I. Please note that funds cannot be released or used on any portion of the project involving human/animal subjects or recombinant DNA research or activities until all of the proper approvals have been obtained (see Sections 4.7 - 4.9). **Submitters proposing research involving human and/or animal use are encouraged to separate these tasks in the technical proposal and cost proposal in order to avoid potential delay of contract award.**
- (15) **Related Work.** Describe significant activities directly related to the proposed effort, including any conducted by the principal investigator, the proposing firm, consultants, or others. Describe how these activities interface with the proposed project and discuss any planned coordination with outside sources. The technical volume must persuade reviewers of the proposer's awareness of the state-of-the-art in the specific topic. Describe previous work not directly related to the proposed effort but similar. Provide the following:
 - d. Short description,
 - e. Client for which work was performed (including individual to be contacted and phone number), and
 - f. Date of completion.
- (16) **Relationship with Future Research or Research and Development**

- d. State the anticipated results of the proposed approach if the project is successful.
 - e. Discuss the significance of the Phase I effort in providing a foundation for Phase II research or research and development effort.
 - f. Identify the applicable clearances, certifications, and approvals required to conduct Phase II testing and outline the plan for ensuring timely completion of said authorizations in support of Phase II research or research and development effort.
- (17) **Commercialization Strategy.** Describe in approximately one page your company's strategy for commercializing this technology in DoD, other Federal Agencies, and/or private sector markets. Provide specific information on the market need the technology will address and the size of the market. Also include a schedule showing the quantitative commercialization results from this SBIR project that your company expects to achieve.
- (18) **Key Personnel.** Identify key personnel who will be involved in the Phase I effort including information on directly related education and experience. A concise technical resume of the principal investigator, including a list of relevant publications (if any), must be included (Please do not include Privacy Act Information). All resumes will count toward the page limitations for Volume 2.
- (19) **Foreign Citizens.** Identify any foreign citizens or individuals holding dual citizenship expected to be involved on this project as a direct employee, subcontractor, or consultant. For these individuals, please specify their country of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project. Proposers frequently assume that individuals with dual citizenship or a work permit will be permitted to work on an SBIR project and do not report them. This is not necessarily the case and a proposal will be rejected if the requested information is not provided. Therefore, firms should report any and all individuals expected to be involved on this project that are considered a foreign national as defined in Section 3.5 of the BAA. You may be asked to provide additional information during negotiations in order to verify the foreign citizen's eligibility to participate on a SBIR contract. Supplemental information provided in response to this paragraph will be protected in accordance with the Privacy Act (5 U.S.C. 552a), if applicable, and the Freedom of Information Act (5 U.S.C. 552(b)(6)).
- (20) **Facilities/Equipment.** Describe available instrumentation and physical facilities necessary to carry out the Phase I effort. Justify equipment purchases in this section and include detailed pricing information in the Cost Volume. State whether or not the facilities where the proposed work will be performed meet environmental laws and regulations of federal, state (name), and local Governments for, but not limited to, the following groupings: airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal practices, and handling and storage of toxic and hazardous materials.
- (21) **Subcontractors/Consultants.** Involvement of a university or other subcontractors or consultants in the project may be appropriate. If such involvement is intended, it should be identified and described according to the [Cost Breakdown Guidance](#). A minimum of two-thirds of the research and/or analytical work in Phase I, as measured by direct and indirect costs, must be conducted by the proposing firm, unless otherwise approved in writing by the Contracting Officer. SBIR efforts may include subcontracts with Federal Laboratories and Federally Funded Research and Development Centers (FFRDCs). A waiver is no

longer required for the use of federal laboratories and FFRDCs; however, proposers must certify their use of such facilities on the Cover Sheet of the proposal.

- (22) **Prior, Current, or Pending Support of Similar Proposals or Awards.** If a proposal submitted in response to this BAA is substantially the same as another proposal that was funded, is now being funded, or is pending with another Federal Agency, or another or the same DoD Component, you must reveal this on the Proposal Cover Sheet and provide the following information:
- h. Name and address of the Federal Agency(s) or DoD Component to which a proposal was submitted, will be submitted, or from which an award is expected or has been received.
 - i. Date of proposal submission or date of award.
 - j. Title of proposal.
 - k. Name and title of principal investigator for each proposal submitted or award received.
 - l. Title, number, and date of BAA(s) or solicitation(s) under which the proposal was submitted, will be submitted, or under which award is expected or has been received.
 - m. If award was received, state contract number.
 - n. Specify the applicable topics for each SBIR proposal submitted or award received.

Note: If this does not apply, state in the proposal "No prior, current, or pending support for proposed work".

k. Content of the Cost Volume (Volume 3)

Complete the Cost Volume by using the on-line cost volume form on the Defense SBIR/STTR Innovation Portal (DSIP). Some items in the Cost Breakdown Guidance may not apply to the proposed project. If that is the case, there is no need to provide information on each and every item. What matters is that enough information be provided to allow us to understand how you plan to use the requested funds if a contract is awarded.

- (7) List all key personnel by name as well as by number of hours dedicated to the project as direct labor.
- (8) While special tooling and test equipment and material cost may be included under Phases I, the inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Component Contracting Officer, be advantageous to the Government and should be related directly to the specific topic. These may include such items as innovative instrumentation or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with the DoD Component, unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by the DoD Component.
- (9) Cost for travel funds must be justified and related to the needs of the project.
- (10) Cost sharing is permitted for proposals under this BAA; however, cost sharing is not required nor will it be an evaluation factor in the consideration of a Phase I proposal.

- (11) A Phase I Option (if applicable) should be fully costed separately from the Phase I (base) approach.
- (12) All subcontractor costs and consultant costs must be detailed at the same level as prime contractor costs in regard to labor, travel, equipment, etc. Provide detailed substantiation of subcontractor costs in your cost proposal. Enter this information in the Explanatory Material section of the on-line cost proposal form. The Supporting Documents Volume (Volume 5) may be used if additional space is needed.

When a proposal is selected for award, you must be prepared to submit further documentation to the Component Contracting Officer to substantiate costs (e.g., an explanation of cost estimates for equipment, materials, and consultants or subcontractors). For more information about cost proposals and accounting standards, see <http://www.dcaa.mil>. Click on “Guidance” and then click on “Audit Process Overview Information for Contractors”.

l. Company Commercialization Report (Volume 4)

The Company Commercialization Report (CCR) will NOT be available during the 20.3 BAA cycle for Phase I or Direct to Phase II proposals. No Commercialization Achievement Index (CAI) will be generated. The CCR will be available for future DoD BAA cycles. If the CCR is available at the time of the Phase II submission for any awarded Phase I efforts resulting from this BAA, the proposing firm is required to submit the CCR for its Phase II proposal.

m. Supporting Documents (Volume 5)

Volume 5 is provided for small businesses to submit additional documentation to support the Technical Volume (Volume 2), and the Cost Volume (Volume 5).

Documents that are acceptable and may be included in Volume 5 are:

8. Letters of Support
9. Additional Cost Information
10. Funding Agreement Certification
11. Technical Data Rights (Assertions)
12. Lifecycle Certification
13. Allocation of Rights
14. Other

Refer to the Component-specific instructions for Volume 5 requirements.

n. Fraud, Waste and Abuse Training (Volume 6)

Complete the training within the DSIP system.

PHASE II GUIDELINES

Phase II eligibility is based on the following guidance:

- All Phase I awardees may submit a Phase II proposal without invitation.
- Proposal period of performance not to exceed 24 months, follow the guidelines listed in the original Phase I Topic

- Volume 2 of Phase II proposals may not exceed the 40-page limit.
- Volume 5 Proposal attachments, appendices, or references are not included in the Page count.
- Commercialization Strategy Requirements:
 - Business Case highlighting benefits to the DoD/DLA.
 - Transition Strategy and Key Tasks
 - Time-Phased Transition Plan
 - Projected Transition Cost Analysis

DLA Phase II proposals must follow the detailed proposal submission guidance in the original Phase I BAA. Refer to DoD Instructions at <https://rt.cto.mil/rtl-small-business-resources/past-announcements/>

Phase II Proposal format is the same as Phase I with the exception of the page limit in Volume 2. The Phase II Limit is 40 pages

EVALUATION CRITERIA

Phase I see Section 6 in the OSD BAA

Phase II see Section 7 in the OSD BAA

TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The DLA SBIR Program does not participate in the Technical and Business Assistance (formally the Discretionary Technical Assistance Program). Contractors should not submit proposals that include Technical and Business Assistance.

DELIVERABLES / REPORTS

All DLA SBIR and STTR awardees are required to submit reports in accordance with the deliverable schedule. The recipient must provide all reports to the individuals identified in Exhibit A of the contract. Milestones: Each phase of the project will be milestone driven. The Principal Investigator will propose milestones prior to starting any phase of the project.

Phase I Proposals should anticipate a combination of any or all of the following deliverables:

- Plan of Action and Milestones (POAM) with sufficient detail for monthly project tracking.
- Initial Project Summary: one-page, unclassified, non-sensitive, and non-proprietary summation of the project problem statement and intended benefits (must be suitable for public viewing).
- Monthly Status Report. A format will be provided at the PAC
- The TPOC and PM will determine a meeting schedule at the PAC. Phase I awardees can expect Monthly (or more frequent) Project Reviews C)
- Draft Final Report including major accomplishments, business case analysis, commercialization strategy, transition plan with timeline, and proposed path forward for Phase II.
- Final Report including major accomplishments, business case analysis, commercialization strategy and transition plan with timeline, and proposed path forward for Phase II

- Final Project Summary (one-page, unclassified, non-sensitive and non-proprietary summation of project results, high resolution photos or graphics intended for public viewing)
- Phase II Proposal is optional at the Phase I Awardee's discretion (as Applicable)
- Applicable Patent documentation
- Other Deliverables as defined in the Phase I Proposal

Phase II Proposals should anticipate a combination of any or all of the following deliverables:

- Plan of Action and Milestones (POAM) with sufficient detail for monthly project tracking
- Initial Project Summary: one-page, unclassified, non-sensitive, and non-proprietary summation of the project problem statement and intended benefits (must be suitable for public viewing)
- Monthly Status Report. A format will be provided at the PAC.
- Meeting schedule to be determined by the Technical Point of Contact (TPOC) and PM at the PAC
 - Phase II awardees expect Monthly (minimum) Project Reviews (format provided at the PAC)
- Draft Final Report including major accomplishments, commercialization strategy and transition plan and timeline.
- Final Report including major accomplishments, commercialization strategy, transition plan, and timeline.
- Final Project Summary (one-page, unclassified, non-sensitive and non-proprietary summation of project results, non-proprietary high resolution photos, or graphics intended for public viewing)
- Applicable Patent documentation.
- Other Deliverables as defined in the Phase II Proposal.

PRE-RELEASE COMMUNICATION: During the pre-release period it is highly recommended that applicants communicate with the Technical Points of Contacts (TPOCs) provided in this topic. Best method of scheduling the dialogue is via e-mail.

DLA SBIR 20.3 Phase I Topic Index

DLA203-001	Engaging the Manufacturing Industrial Base in Support of DLA's Critical Supply Chains
DLA203-002	Research and Testing of the Outdoor Autonomous Guided Vehicles (AGVs) Operating Between DLA Distribution Center Warehouses
DLA203-003	Advanced Battery Electrode Manufacturing Technologies
DLA203-004	Direct Production Methods for Battery Electrode Material Synthesis
DLA203-005	Hard Armor Ballistic Plate Boron Carbon (B4C) Recovery and Reclamation

DLA203-001 TITLE: Engaging the Manufacturing Industrial Base in Support of DLA's Critical Supply Chains

RT&L FOCUS AREA(S): Nuclear; Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Ground Sea; Nuclear; Weapons; Materials; Air Platform

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Build Small Business Manufacturer (SBM) base to address obsolescence and develop a qualified source of supply and ready to improve DLA product availability, provide competition for reduced lead time and cost, and address lifecycle performance issues. Through participation in DLA SBIR, SBMs will have an opportunity to collaborate with DLA Weapons System Program Managers (WSPMs) and our customer Engineering Support Activities (ESAs) to develop innovative solutions to DLA's most critical supply chain requirements. The intent of the topic is to develop SBMs who will economically produce NSNs with historically low demand utilizing innovative technologies resulting in reduced lead time and cost with enhanced life cycle performance. In the end, the SBM benefits from the experience by qualifying as a source of supply as well as from the business relationships and experience to further expand their product lines and readiness to fulfill DLA procurement requirements.

DESCRIPTION: Competitive applicants will have reviewed the parts list provided on DLA Small Business Innovation Program (SBIP) site, (Reference 4) as well as the technical data in the cFolders of DLA DiBBs, (Reference 3). Proposals can evolve in one of four ways depending on the availability of technical data and NSNs for reverse engineering as follows. Information on competitive status, RPPOB, and tech data availability will be provided on the website, Reference:

- a. Fully Competitive (AMC/AMSC-1G) NSNs where a full technical data package is available in cFolders. The SBM proposal should reflect timeline, statement of work and costs associated with the manufacturing and qualification of a representative article.
- b. Other than (AMC/AMSC-1G) NSNs where a full Technical Data Package (TDP) is available in cFolders. These items may also require a qualification of a Representative Article. The SBM proposal should reflect timeline, statement of work, and costs associated with producing a Source Approval Request (SAR) and (if applicable) qualification of a Representative Article. Contact the TPOC if necessary. The scope and procedures associated with development of a SAR package are provided in Reference 1.
- c. Repair Parts Purchase or Borrow (RPPOB) may be an option for other than 1G NSNs where partial or no technical data is available in cFolders. NSNs, if available, may be procured or borrowed through this program for the purposes of reverse engineering. The instructions for RPPOB can be found on the websites, Reference 5. The SBM proposal should reflect timeline, statement of work and costs associated with the procuring the part and reverse engineering of the NSN. Depending on complexity, producing both the TDP and SAR package may be included in Phase I.

- d. Reverse Engineering (RE) without RPPOB is when the NSN will be provided as Government Furnished Material (GFM) if available from the ESA or one of our Service customers. In this case, contact the TPOC to discuss the availability of the NSN prior to starting the proposal. The SBM proposal should reflect timeline, statement of work and costs associated with the reverse engineering of the NSN and depending on complexity producing a TDP and SAR package in Phase I.

Specific parts may require minor deviations in the process dependent on the Engineering Support Activity (ESA) preferences and requirements. Those deviations will be addressed post award.

Participating small businesses must have an organic manufacturing capability and a Commercial and Government Entity (CAGE) code and be Joint Certification Program (JCP) certified in order to access technical data if available.

Refer to “link 2” below for further information on JCP certification. Additionally, small businesses will need to create a DLA’s Internet Bid Board System (DIBBS) account to view all data and requirements in C Folders.

Refer to “links 3 and 4” below for further information on DIBBS and C Folders. All available documents and drawings are located in the C Folder location “SBIR203C”. If the data is incomplete, or not available, the effort will require reverse engineering.

PROJECT DURATION and COST:

- Phase I: NTE 18 Months \$250K- Base NTE \$100K base 6 Months, - Option 1 NTE \$100K 6 Months, - Option 2 NTE \$50K base 6 Months
- PHASE II: Phase II – NTE 24 Months \$1.6M - Base 18 months, \$1M Option 6 Months NTE \$.6M

PHASE I: The goal of phase I is for the SBM to qualify as a source of supply for DLA NSNs to improve DLA product availability, provide competition for reduced lead time and cost, and address lifecycle performance issues. In this phase, manufacturers will request TDP/SAR approval from the applicable Engineering Support Activity (ESA), if required, for the NSNs. At the Post Award Conference, the awardee will have the opportunity to collaborate with program, weapon system, and/or engineering experts on the technical execution and statement of work provided in their proposal. There are exceptions for more complex parts and the proposal should provide the rationale. All Phase I Proposals should demonstrate an understanding of the NSN(s) and the general challenges involved in their manufacture. Proposals that fail to demonstrate knowledge of the part will be rejected.

PHASE II: The Phase II proposal is optional for the Phase I awardee. Phase II selections are based on Phase I performance, SBM innovation and engineering capability and the availability of appropriate requirements. Typically the goal of Phase II is to expand the number of NSNs and/or to build capability to expand capacity to better fulfill DLA requirements.

PHASE III DUAL USE APPLICATIONS: No specific funding is associated with Phase III. Progress made in PHASE I and PHASE II should result in the manufacturer’s qualification as an approved source of supply enabling participation in future DLA procurement actions. Phase III for this project is defined by relevant procurement awards.

COMMERCIALIZATION: The SBM will pursue commercialization of the various technologies and processes developed in prior phases through participation in future DLA procurement actions on items identified but not limited to this BAA.

REFERENCES:

1. DLA Aviation SAR Package instructions. DLA Small Business Resources:
<http://www.dla.mil/Aviation/Business/IndustryResources/SBO.aspx>
2. JCP Certification: <https://public.logisticsinformationservice.dla.mil/PublicHome/jcp>
3. Access the web address for DIBBS at <https://www.dibbs.bsm.dla.mil> , then select the “Tech Data” Tab and Log into c-Folders. This requires an additional password. Filter for solicitation “SBIR203C”
4. DLA Small Business Innovation Programs web site:
<http://www.dla.mil/SmallBusiness/SmallBusinessInnovationPrograms>
5. DLA Aviation Repair Parts Purchase or Borrow (RPPOB) Program:
<https://www.dla.mil/Aviation/Offers/Services/AviationEngineering/Engineering/ValueEng.aspx>

KEYWORDS: Nuclear Enterprise Support (NESO), Source Approval, Reverse Engineering

DLA203-002 TITLE: Research and Testing of an Innovative and Ruggedized Autonomous Guided Vehicle (AGV) with State-of-the-Art Indoor-Outdoor Navigation Capability

RT&L FOCUS AREA(S): Autonomy; Artificial Intelligence/ Machine Learning;
TECHNOLOGY AREA(S): Sensors, Electronics; Information Systems

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop an innovative and ruggedized Autonomous Guided Vehicle (AGV) with a state-of-the-art indoor-outdoor navigation capability. The AGV may use a variety of sensors such as Global Positioning System (GPS), Light Detection and Ranging (LiDAR), and Wireless Fiber (Wi-Fi) where applicable, and should minimize the need for infrastructure modifications such as Augmented Reality (AR) tags to enable autonomous navigation in changing environments.

Objective 0: Indoor-Outdoor AGV. Develop an AGV that combines the features of both the outdoor and indoor AGVs described below. The goal of this objective is for the vendor to develop a capability for an AGV that addresses the requirements for a rugged Outdoor AGV, as described in Objective 1 below, with a state-of-the-art outdoor navigation solution and integrate this capability with an Indoor AGV design, as described in Objective 2 below, that provides for indoor GPS-denied navigation, and the capability to ascend and descend warehouse tunnel inclines while towing loaded warehouse carts, and can smoothly transition between warehouse floors, tunnels, and racks. If that proves too difficult, proposals for separate indoor and outdoor AGV will be considered.

Objective 1: Outdoor AGV. Develop an innovative and rugged Outdoor AGV with a state-of-the-art outdoor navigation solution integrated into warehouse communications systems (i.e., Warehouse Execution System (WES)). This integration allows Outdoor AGVs to receive tasking in an automated fashion to operate frequently and report success or failure at tasking. This research seeks to identify and test navigational technology that can be used uninterruptedly and continuously onboard AGVs in support of routine external warehouse operations throughout the DLA enterprise. This research effort addresses DLA identified cybersecurity requirements through the test and evaluation of government security controls. It leverages current technologies in the AGV industry combined with a suitable and robust external navigation solution to test the operation of AGVs when operating externally between distribution warehouses. This research project will operate in external environments at designated DLA Distribution Centers in the United States.

Objective 2: Indoor AGV. Develop a robust AGV that operates inside warehouses and within warehouse tunnels and navigates the tunnel inclines found at the DLA Distribution Center, Hill Air Force Base, and UT (DDHU). The Indoor AGV design allows for the ascent and descent of tunnel inclines with up to 12 in a 100 grade (+/- 12%), the smooth transition between warehouse floors and tunnels, the navigation of sharp turns (180 degrees or more) requiring a minimum turning radius of 1.9 meters, and possess a threshold capability to tow two standard warehouse carts with a total combined weight of 12,000 pounds and a maximum tow capability of up to three standard warehouse carts with a total combined weight of up to 18,000 pounds (i.e., the weight of three loaded carts) given all conditions and requirements described

above. The Indoor AGV's state-of-the-art indoor navigation system will continuously operate within DLA Distribution Warehouses, will be integrated into warehouse automation systems, and communicates with WES Research and Development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has not been fully established. Further, proposed efforts must be judged to be at a Technology Readiness Level (TRL) 6 or less, but greater than TRL 3 to receive funding consideration.

TRL 3. (Analytical and Experimental Critical Function and/or Characteristic Proof of Concept)

TRL 6. (System/Subsystem Model or Prototype Demonstration in a Relevant Environment)

DESCRIPTION: Defense Logistics Agency (DLA) Distribution Modernization Program (DMP) topics of interest are research focused on a Continental United States-based AGV navigation solution in support of the routine navigation of vehicles operating both outdoors between DLA distribution warehouses, indoors within the DLA warehouses, and when traversing warehouse tunnels. This research project shall involve the use of Commercial/Industry AGVs that can withstand the demands of both outdoor and indoor operations, ascend/descend warehouse tunnels, and be integrated with outdoor and indoor-based navigation systems utilizing various sensors such as GPS, LS, Wi-Fi, and LiDAR that:

1. Support a joint effort between DLA Research and Development (R&D) and DLA J4 Distribution Headquarters to conduct research and testing of navigation systems integrated into a variety of AGVs during outdoor operations between warehouses and when towing loaded carts operating indoors within tunnels with 12 in a 100 grade (+/- 12%) grades.
2. Significantly addresses the navigational capabilities of AGVs in the outdoor environment, while enhancing resiliency to the varying conditions of an outdoor environment (e.g., less than desirable road conditions, road debris, and inclement weather conditions present when operating outdoors – snow, rain, fog, or sunshine).
3. The AGV can be used in the outdoor environment to transport goods between multiple warehouses at a DLA distribution site safely and operate at a higher materiel handling throughput, even under challenging road and weather conditions.
4. Feature navigation systems able to implement high precision measurement data for regular use in outdoor/indoor navigation.
5. Can operate indoors using a state-of-the-art indoor navigation system (e.g., LiDAR) that allows AGVs to continuously work within DLA's Distribution Warehouses and seamlessly transition between the outdoor and indoor warehouse environments.
6. Can integrate into warehouse communications systems such as a Warehouse Execution System (WES) to receive tasking and report status.
7. Allows AGVs to operate on inclines and ascend and descend warehouse tunnels with up to 12 in a 100 grade (+/- 12%) when safely transporting goods inside warehouses and between multiple warehouses at DLA distribution sites, and implement high precision measurement data for regular use, even under challenging road and weather conditions.
8. Able to transition smoothly between level and elevated warehouse surfaces, can navigate sharp turns within the warehouse environment, and can tow up to three loaded standard warehouse carts weighing up to 18,000 pounds.
9. Demonstrates an enhanced operational capability over existing commercial AGVs when both outdoors and indoors through the application of external navigation and internal navigation systems for AGVs, and facilitates a safe and robust navigational network technology used in a working environment shared with warehouse workers.
10. Navigation and mapping:

- a. Equipped with a dependable and robust navigation technology solution that allows AGVs to perform tasks outdoors and indoors without having to significantly lower operating speeds per existing trends in the industry.
 - b. Demonstrates compatibility with a Government data cloud environment for storage, retrieval, and use of high-resolution geospatial data without relying on a separate commercial data cloud environment to navigate successfully.
11. Conclusively demonstrates the use of new navigation technology and the use of more capable AGV designs for ascending and descending inclines when applied to AGVs in the distribution and delivery of material and goods during representative distribution warehouse operations in an innovative way.
12. Integrates a Universal Ball Hitch connection for trailers with automatic coupling by the autonomous vehicle.
13. Operates with a typical design load and all-terrain capabilities in outdoor temperatures of 10F through 100F, and adequately quantifies lost battery performance in temperatures below 40F, and implements measures to insulate batteries to address lost performance.
14. Executes a minimum 7.5-hr duty cycle at the full performance before re-charge. 30-minute quick charge from 0% to 50% charge.

PROJECT DURATION and COST:

- Phase I: NTE 12 Months \$150K- Base NTE \$100K base 6 Months, - Option 1 NTE \$50K base 6 Months
- PHASE II: Phase II – NTE 24 Months \$1.6M - Base 12-18 months, \$1M Option 6 Months NTE \$.6M

PHASE I: The research and development goals of Phase I provide Small Business eligible Research and Development firms the opportunity to successfully demonstrate how their proposed Outdoor and Indoor AGV navigation concept of operations (CONOPS) improves the distribution and goods and materials within the DLA distribution enterprise and effectively lessen the time to provide needed supplies to the Warfighter. The selected vendor will conduct a feasibility study to:

1. Address the requirements described above in the Description Section above for Outdoor AGVs operating between warehouses and Indoor AGVs traversing warehouse tunnel elevations.
2. Identify capability gap(s) and the requirement for DLA to use AGVs in the DLA Distribution Operations environment.
3. Develop the vendor's Concept of Operations (CONOPS) for the utilization of the AGVs and describe clearly how the requirements develop from it.

Note: During Phase I of the SBIR, testing is not required.

The vendor is required to create a CONOPS for Outdoor/Indoor AGVs in support of both routine and wartime distribution warehouse operations. The concept of operations will cover the utilization of rugged Outdoor AGVs to navigate between distribution warehouses during all weather and road conditions, and then seamlessly (with little or no operator effort) be able to operate as an Indoor AGV in the indoor warehouse environment, describing precisely all operational requirements as part of this process. This AGV navigation requirement intends to successfully operate and navigate between distribution warehouses dependent on weather conditions.

The deliverables for this project include a final report, including a cost breakdown of courses of action.

PHASE II: Based on the research and the concept of operations developed during Phase I, the research and development goals of Phase II emphasizes the execution of the seamless Indoor-Outdoor AGV navigation system following the typical DLA Distribution Warehouse concept of operations for materiel handling. During Phase II, the vendor will:

1. Address the specific user requirements, functional requirements, and system requirements as defined and provided by DLA.
2. Develop a prototype AGV for Developmental Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E).
3. Implement government cybersecurity controls in the prototype design and secure all necessary cybersecurity certifications for the operation of the equipment in the DLA warehouse environment with DOD cloud connections.
4. Design the prototype that is equal to the technology maturity of Technology Readiness Level (TRL) 9 after Phase II.
5. Deliver a final AGV prototype to DLA that is capable of demonstrating successful execution of the CONOPS established in Phase I.

The AGVs will operate across the United States at various DLA Distribution Center sites mutually agreed upon between DLA R&D and DLA Distribution HQ. The deliverables for this project include a final report, including a cost breakdown of courses of action (COAs).

PHASE III DUAL USE APPLICATIONS: At this point, there is no specific funding associated with Phase III. During Phase I and Phase II, the progress made should result in a vendor's qualification as an approved source for an Indoor-Outdoor AGV or as a source for both an Indoor AGV and Outdoor AGV support enabling participation in future procurements.

COMMERCIALIZATION: The manufacturer will pursue the commercialization of the various ruggedized Outdoor AGV navigation technologies, the Indoor AGV operating technology, and designs developed for ascending/descending tunnel inclines, and the processes developed in prior phases as well as potential commercial sales of manufactured mechanical parts or other items. The first path for commercial use will be at DLA's twenty-six Distribution Centers and twenty Disposition Centers. When fielded, DLA estimates the deployment of 20 - 26 units, but the number of units could be more.

REFERENCES:

1. Department of Defense, Defense Science Board, Task Force Report: The Role of Autonomy in DOD Systems in DOD Systems, July 2012. <https://fas.org/irp/agency/dod/dsb/autonomy.pdf>
2. R. Bostelman and E. Messina, "Towards Development of an Automated Guided Vehicle Intelligence Level Performance Standard," in *Autonomous Industrial Vehicles: From the Laboratory to the Factory Floor*, ed. R. Bostelman and E. Messina (West Conshohocken, PA: ASTM International, 2016), 1-22. <https://doi.org/10.1520/STP159420150054>
3. A. Dong, W. Hong, "VPH: a new laser radar-based obstacle avoidance method for intelligent mobile robots," WCICA 2004. Fifth World Congress on Intelligent Control and Automation, vol. 5, pp. 4681-4685, 2004.
4. A. K. Kar, N. K. Dhar, S. S. F. Nawaz, R. Chandola and N. K. Verma, "Automated guided vehicle navigation with obstacle avoidance in normal and guided environments," 2016 11th International Conference on Industrial and Information Systems (ICIIS), Roorkee, 2016, pp. 77-82

KEYWORDS: Autonomous Guided Vehicle, AGV, GPS, Laser Scanning, Wireless Fiber, Wi-Fi, Warehouse, Distribution.

RT&L FOCUS AREA(S): Warfighting Requirements (GWR)
TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: DLA seeks to provide responsive, best value supplies; in a manner, that consistently meets the customer's needs. DLA continually investigates diverse technologies for manufacturing improvements leading to the highest level of performance, and cost efficiency in battery products supporting fielded weapon systems with a future impact on both commercial technology and government applications. DLA seeks manufacturing improvements of advanced electrode material deposition processes to demonstrate the combination of improved battery manufacturing and operation, as well as improved business methods for affordability. Modeling and simulation are encouraged, but not required, to guide the development of improvements in the battery electrode manufacturing processes.

Proposed efforts funded under this topic must encompass specific advanced battery electrode manufacturing technology resulting in a unit cost reduction and improvement of battery product availability. It is preferred that technologies do not alter the form fit and function of the battery. Research and development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has yet to demonstrate a fully established maturity. Further, proposed efforts must align between Technology Readiness Level (TRL) 3 and 6 to receive funding consideration. The definition of TRL 3 is -- analytical and experimental critical function and/or characteristic proof of concept, and TRL 6 is -- system/subsystem model or prototype demonstration in a relevant environment.

DESCRIPTION: DLA seeks to develop advanced battery electrode deposition and manufacturing solutions that improve the industrial capability to deliver high power batteries to the Warfighter in a ready to use state with better shelf life, increased safety, lower cost, and decreased production lead-time. These solutions must apply innovations to improve the production of batteries and reduce costs associated with the battery manufacturing process.

These solutions must result in an improvement in the affordability of specific battery products to DLA and its customers. The proposals must include an economic analysis of the expected market impact of the technology proposed. This topic seeks a substantial reduction of unit cost metrics and battery product availability. Incremental advancements will receive very little consideration. DLA seeks only projects the private sector considers too risky for ordinary capital investment.

PROJECT DURATION and COST:

- Phase I: NTE 12 Months \$150K- Base NTE \$100K base 6 Months, - Option 1 NTE \$50K base 6 Months
- PHASE II: Phase II – NTE 24 Months \$1.6M - Base 12-18 months, \$1M Option 6 Months NTE \$.6M

PHASE I: Combine innovative approaches for modification and or functionalization of current and future battery electrode deposition and manufacturing. Incorporate material within the project to evaluate concept for proof-of-principle, and demonstration of the proof of principle in a controlled manufacturing environment. Demonstration will successfully detect and presumptively identify a manufacturing cost savings, a reduced production lead-time, and an increase of the item's availability.

PHASE II: Develop applicable and feasible demonstrations of the electrode manufacturing improvements for the approach described, and demonstrate a degree of commercial viability. Validate the feasibility of the innovative battery electrode manufacturing process by demonstrating implementation in the production, testing, and integration of items for DLA. Validation would include, but not be limited to, prototype fabrication or low-rate initial production and demonstration of item operation in a representative system. A partnership with a current or potential supplier to DLA is highly desirable. Identify any commercial benefit or application opportunities of the innovation. The development of innovative processes should proceed with the intent to readily transition to production in support of DLA and its supply chains.

PHASE III DUAL USE APPLICATIONS: Technology transition via successful demonstration of a new process technology. This demonstration must show near-term application to one or more Department of Defense systems, subsystems, or components. This demonstration must also verify the potential for enhancement of quality, reliability, performance and/or reduction of unit cost or total ownership cost of the proposed subject. Proposed efforts, if directly related to manufacturing process innovation, must be judged to be at a Manufacturing Private Sector Commercial Potential: Battery electrode deposition and manufacturing technologies have a direct applicability to all defense system technologies. Battery electrode manufacturing processes and related technology and support systems have wide applicability to the defense industry including air, ground, sea, and weapons technologies. There is relevance to the private sector industries as well as civilian sector. Many of the technologies under this topic would be directly applicable to other DoD agencies, NASA, and any commercial manufacturing venue. Advanced manufacturing technologies for battery electrodes would directly improve production in the commercial sector resulting in reduced cost and improved productivity.

REFERENCES:

KEYWORDS: Electrode deposition, electrode manufacturing, battery manufacturing, battery, technology insertion, automation, lithium, manufacturing cost, manufacturing efficiency, manufacturing quality, sustainable manufacturing, battery performance

RT&L FOCUS AREA(S): Warfighting Requirements (GWR)
TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: DLA seeks to provide responsive, best value supplies; in a manner, that consistently meets the customer's needs. DLA continually investigates diverse technologies for manufacturing improvements leading to the highest level of performance, and cost efficiency in battery products supporting fielded weapon systems with a future impact on both commercial technology and government applications. DLA seeks rapid, direct, production synthesis methods of battery-grade electrode materials to demonstrate the combination of improved battery manufacturing and operation, as well as improved business methods for affordability.

Proposed efforts funded under this topic must encompass specific synthesis methods for direct production of battery cathode/anode/electrolyte materials resulting in a cost reduction and improvement of battery product availability. It is preferred that technologies do not alter the form fit and function of the battery. Research and development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has yet to demonstrate a fully established maturity. Further, proposed efforts must align between Technology Readiness Level (TRL) 3 and 6 to receive funding consideration. The definition of TRL 3 is -- analytical and experimental critical function and/or characteristic proof of concept, and TRL 6 is -- system/subsystem model or prototype demonstration in a relevant environment.

DESCRIPTION: DLA seeks to develop rapid material synthesis processes that are significantly lower cost and displace standard sintering and synthesis processes for battery electrode materials. The process must improve the industrial capability to deliver high power batteries to the Warfighter in a ready to use state with better shelf life, increased safety, lower cost, and decreased production lead-time. These solutions must apply innovations to improve the production and availability of batteries and reduce costs associated with the battery manufacturing process. Solutions that involve materials that benefit military requirements of high energy, high safety, and broad temperature range are preferred. Potential materials to be considered for rapid, scaled synthesis are:

- Cathode
 - LCO
 - NMC
 - NCA
 - LMO
 - Lithium Cobalt or Iron Phosphates
- Anode
 - LTO
- Solid-State Electrolyte

- LLZO (Li₇La₃Zr₂O₁₂) ceramic

These solutions must result in an improvement in the affordability and availability of specific battery products to DLA and its customers. The proposals must include an economic analysis of the expected market impact of the technology proposed. This topic seeks a substantial reduction of cost metrics and battery material availability. Incremental advancements will receive very little consideration. DLA seeks only projects the private sector considers too risky for ordinary capital investment.

PROJECT DURATION and COST:

- Phase I: NTE 12 Months \$150K- Base NTE \$100K base 6 Months, - Option 1 NTE \$50K base 6 Months
- PHASE II: Phase II – NTE 24 Months \$1.6M - Base 12-18 months, \$1M Option 6 Months NTE \$.6M

PHASE I: Combine innovative approaches for modification and or functionalization of current and future battery electrode material synthesis. Incorporate material within the project to evaluate concept for proof-of-principle, and demonstration of the proof of principle in a controlled manufacturing environment. Demonstration will successfully detect and presumptively identify cost savings, reduced production lead-time, and an increase of availability.

PHASE II: Develop applicable and feasible demonstrations of the electrode synthesis for the approach described, and demonstrate a degree of commercial viability. Validate the feasibility of the innovative material production process by demonstrating implementation in the production, testing, and integration of items for DLA. Validation would include, but not be limited to, prototype fabrication or low-rate initial production and demonstration of operation in a representative system. A partnership with a current or potential supplier to DLA is highly desirable. Identify any commercial benefit or application opportunities of the innovation. The development of innovative processes should proceed with the intent to readily transition to production in support of DLA and its supply chains

PHASE III DUAL USE APPLICATIONS: Technology transition via successful demonstration of a new process technology. This demonstration must show near-term application to one or more Department of Defense systems, subsystems, or components. This demonstration must also verify the potential for enhancement of quality, reliability, performance and/or reduction of unit cost or total ownership cost of the proposed subject.

Private Sector Commercial Potential: Battery electrode material production methods have a direct applicability to all defense system technologies. Electrode material synthesis and related manufacturing technology and support systems have wide applicability to the defense industry including air, ground, sea, and weapons technologies. There is relevance to the private sector industries as well as civilian sector. Many of the technologies under this topic would be directly applicable to other DoD agencies, NASA, and any commercial manufacturing venue. Rapid, advanced, direct production synthesis methods for battery electrode materials would directly improve production in the commercial sector resulting in reduced cost and improved productivity.

REFERENCES:

KEYWORDS: Battery electrode material synthesis, cathode/anode/electrolyte material, direct production, rapid production, rapid synthesis, battery, technology insertion, automation, lithium, agile manufacturing, manufacturing cost, manufacturing efficiency, manufacturing quality, sustainable manufacturing

RT&L FOCUS AREA(S): Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The Defense Logistics Agency (DLA), seeks to develop the capability to recover boron carbon (B4C) from the hard armor ballistic plates used throughout the Department of Defense (DoD). The DoD develops and fields innovative Soldier protection equipment, functional uniforms and individual equipment that enhance mission effectiveness. As part of this, advanced technology demonstrations for enhancing affordability and development of advanced industrial practices the combination of improved discrete-parts recycling, manufacturing and improved business methods are of interest. All these areas of recycling and manufacturing technologies provide potential avenues toward achieving breakthrough advances. Proposed efforts funded under this topic may encompass any specific discrete-parts or materials recycling, manufacturing, or processing technology at any level resulting in a unit cost reduction.

Research and Development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has not been fully established. Further, proposed efforts must be judged to be at a Technology Readiness Level (TRL) 6 or less, but greater than TRL 3 to receive funding consideration.

TRL 3. (Analytical and Experimental Critical Function and/or Characteristic Proof of Concept)

TRL 6. (System/Subsystem Model or Prototype Demonstration in a Relevant Environment)

DESCRIPTION: DLA R&D is looking for a domestic capability that demonstrates the capability to recover boron carbon (B4C) from the hard armor ballistic plates used throughout the Department of Defense (DoD). Currently the DoD sends defective and unserviceable hard armor ballistic plates to the Defense Logistics Agency Disposition Services for demilitarization (DEMIL), and thus renders those plates to an unusable state. Recovery of raw materials from these DEMIL plates could reduce the amount of boron carbon mined and refined; there is limited domestic production of these materials and therefore a risk of foreign reliance. The goal is to recover B4C, at a suitable purity level, suitable to be placed into strategic stockpiles to be held, and in a form that it could reintroduced into manufacturing at a later point in time. Developing an economically viable, environmentally friendly process for recycling of hard armor ballistic plates from the existing scrap armor feedstock could facilitate the establishment of a viable, competitive domestic supply chain. If this produces a viable reclamation methodology and sustainable process it may lead to follow-on efforts at the discretion of the US Government.

R&D tasks include identifying potential additional feedstock sources in the existing supply chain and developing processes for hard armor plates recycling. The process should be amenable to the scale of operation required in hard armor manufacturing, and will improve the economics of hard armor plates from recovered material for reuse, rather than depend on foreign reliance.

Determine, insofar as possible, the scientific, technical, and commercial feasibility of the concept. Include a plan to demonstrate the innovative recycling process and address implementation approaches for near term insertion into the manufacture of Department of Defense (DoD) systems, subsystems, components, or parts.

PROJECT DURATION and COST:

- Phase I: NTE 12 Months \$150K- Base NTE \$100K base 6 Months, - Option 1 NTE \$50K base 6 Months
- PHASE II: Phase II – NTE 24 Months \$1.6M - Base 12-18 months, \$1M Option 6 Months NTE \$.6M

PHASE I: Develop applicable and feasible process demonstration for the approach described, and demonstrate a degree of commercial viability.

PHASE II: Validate the feasibility of the innovative process by demonstrating its use in the production, testing, and integration of items for PM SSV. Validation would include, but not be limited to, prototype quantities, data analysis, laboratory tests, system simulations, operation in test-beds, or operation in a demonstration system. A partnership with a current or potential supplier to PM SSV, DLA, OEM, or other suitable partner is highly desirable. Identify commercial benefit or application opportunities of the innovation. Innovative processes should be developed with the intent to readily transition to production in support of PM SSV and its supply chains.

PHASE III DUAL USE APPLICATIONS: : Technology transition via successful demonstration of a new process technology. This demonstration should show near-term application to one or more Department of Defense systems, subsystems, or components. This demonstration should also verify the potential for enhancement of quality, reliability, performance and/or reduction of unit cost or total ownership cost of the proposed subject. Private Sector Commercial Potential: Material manufacturing improvements, including development of domestic manufacturing capabilities, have a direct applicability to all defense system technologies. Material manufacturing technologies, processes, and systems have wide applicability to the defense industry including air, ground, sea, and weapons technologies. Competitive material manufacturing improvements should have leverage into private sector industries as well as civilian sector relevance. Many of the technologies under this topic would be directly applicable to other DoD agencies, NASA, and any commercial manufacturing venue. Advanced technologies for material manufacturing would directly improve production in the commercial sector resulting in reduced cost and improved productivity.

REFERENCES:

1. <https://www.sciencedirect.com/science/article/pii/S1738573315301078>
2. <https://www.sciencedirect.com/science/article/abs/pii/S0955221919301876>
3. <http://www.sapub.org/global/showpaperpdf.aspx?doi=10.5923/j.nn.20120203.01>

KEYWORDS: Hard Armor Ballistic Plate Boron Carbon (B4C) Recovery and Reclamation

DEFENSE LOGISTICS AGENCY
20.3 Small Business Innovation Research (SBIR) Program Direct to Phase II Proposal
Submission Instructions

The Defense Logistics Agency (DLA) Small Business Innovation Program (SBIP) seeks small businesses with strong research and development capabilities to pursue and commercialize specific technologies to meet DLA objectives.

The intent of the 20.3 DLA SBIR Direct to Phase II proposal submission instructions is to clarify the Department of Defense (DoD) instructions as they apply to DLA requirements. This Announcement is for Direct to Phase II proposals only. All Phase II proposals must be prepared and submitted through the DoD SBIR/STTR electronic submission site: <https://www.dodsbirsttr.mil/submissions/login>. The offeror is responsible for ensuring that their proposal complies with the requirements in the most current version of instructions. Prior to submitting your proposal, please review the latest version of these instructions as they are subject to change before the submission deadline.

Submit specific questions pertaining to the DLA SBIP Program to the DLA SBIP Program Management Office (PMO) at E-mail DLASBIR2@dla.mil

1. DIRECT TO PHASE II

15 U.S.C. §638 (cc), as amended by NDAA FY2012, Sec. 5106, and further amended by NDAA FY2019, Sec. 854, PILOT TO ALLOW PHASE FLEXIBILITY.

This allows the Department of Defense to make an award to a Small Business Concern (SBC) under Phase II of the SBIR Program with respect to a project, without regard to whether the small business concern received an award under Phase I of an SBIR Program with respect to such project.

DLA is conducting a "Direct to Phase II" implementation of this authority for this SBIR Announcement. This pilot does not guarantee DLA will offer any future Direct to Phase II opportunities.

PROJECT DURATION and COST:

Direct to PHASE II: Phase II – NTE 24 Months \$1.6M - Base 12-18 months, \$1M Option 6-12 Months NTE \$.6M

PERIOD OF PERFORMANCE: The Direct to Phase II period of performance is not to exceed 24 months total. Options are not Automatic. Approval is at the discretion of the DLA SBIP Program Manager. The decision is based on Project Performance, Priorities of the Agency, and/or the availability of funding.

INTRODUCTION

Direct to Phase II proposals must follow the steps outlined in the following statements.

1. Offerors must provide documentation that satisfies the Phase I feasibility requirement*.
 - This documentation will comprise the first twenty pages of Volume 2 (Technical Volume) of the Direct to Phase II proposal
2. Offerors must submit a complete Phase II proposal using the DLA Phase II proposal instructions below.

* NOTE: Offerors are required to provide information demonstrating that the scientific and technical merit and feasibility. DLA will not evaluate any Phase II proposal if it determines that the offeror has failed to demonstrate the establishment of technical merit and feasibility.

2. PROPOSAL SUBMISSION

Submit the complete proposal electronically at <https://www.dodsbirsttr.mil/submissions/login>

Complete proposals must include all of the following:

- a. Volume 1: DoD Proposal Cover Sheet, Produced in the DSIP System by your company profile.
- b. Volume 2: Technical proposal

Part 1: Phase I Justification (20 Pages Maximum)

Part 2: Phase II Technical Proposal (40 Pages Maximum)

- c. Volume 3: Cost Volume (Excel spreadsheet upload)
- d. Volume 4: Company Commercialization Report (Not Required for this BAA)
- e. Volume 5: Additional Documents (Optional)
- f. Volume 6 FWA Training Certificate is required for proposal submission

Phase II proposals require a comprehensive, detailed submission of the proposed effort. DLA SBIR Direct to Phase II periods of performance are 24 months. Commercial and military potential of the technology under development is extremely important. Successful proposals will emphasize applicability to specific DOD programs of record as well as dual-use applications and commercial exploitation of resulting technologies,

3. Direct to Phase II PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

PROPOSAL FORMAT (60 pages maximum)

A. **Cover Sheet.** This is completed using the DSIP Portal on the Submission Site. This is a compilation of company data as well as specific information regarding the proposed project. Include a brief description of the problem or opportunity, objectives, effort, and anticipated results. Summarize the expected benefits, as well as any government or private sector applications of the proposed research. OSD and SBA will post the Project Summary of selected proposals with unlimited distribution. Therefore, the summary should not contain any classified or proprietary information.

B. Technical Volume

- Phase I Justification (20 Pages Maximum). Offerors are required to provide information demonstrating the establishment of the scientific and technical merit and feasibility.
- Phase II Technical Objectives and Approach (40 Pages Maximum). List the specific technical objectives of the Phase II research and describe the planned technical approaches used to meet these objectives.
- Phase II Work Plan. Provide an explicit, detailed description of the Phase II approach. The plan should indicate how and where the firm will conduct the work, a schedule of major events, and the final product to be developed. The Phase II effort should attempt to accomplish the technical feasibility demonstrated in the justification, including potential commercialization results. Phase II is the principal research and development effort and is expected to produce a well-defined deliverable product or process.
- Related Work. Describe significant activities directly related to the proposed effort, including those conducted by the Principal Investigator, the proposing firm, consultants, or others. Report how the activities interface with the proposed project and discuss any planned coordination with outside sources. The proposers must demonstrate an awareness of the state-of-the-art in the technology and associated science.
- Relationship with Future Research or Research and Development. State the anticipated results of the proposed approach if the project is successful. Discuss the significance of the Phase II effort in providing a foundation for a Phase III research or research and development effort.
- Technology Transition and Commercialization Strategy. Describe your company's strategy for converting the proposed SBIR research, resulting from your proposed Phase II contract, into a product or non-R&D service with widespread commercial use -- including private sector and/or military markets. Note that the commercialization strategy is separate from the Commercialization Report described in Section 4.L below.

The strategy addresses how you propose to commercialize this research, while the Company Commercialization Report covers what you have done to commercialize the results of past Phase II awards. Historically, a well- conceived commercialization strategy is an excellent indicator of ultimate Phase III success. The commercialization strategy must address the following questions:

- What DoD Program and/or private sector requirement does the technology propose to support?
- What customer base will the technology support, and what is the estimated market size?
- What is the estimated cost and timeline to bring the technology to market to include projected funding amount and associated sources?
- What marketing strategy, activities, timeline, and resources will be used to enhance commercialization efforts??
- Who are your competitors, and describe the value proposition and competitive advantage over the competition?
- Key Personnel. Identify key personnel, including the Principal Investigator, who will be involved in the Phase II effort. List directly related education and experience and relevant publications (if any) of key personnel. Include a concise resume of the Principal Investigator(s).
- Facilities/Equipment. Describe available instrumentation and physical facilities necessary to carry out the Phase II effort. Justify the purchase of any items or equipment (as detailed in the cost proposal) including Government Furnished Equipment (GFE). All requirements for government furnished equipment or other assets, as well as associated costs, must be determined and agreed to during Phase II contract negotiations. State whether or not the proposed work facilities will be performed meet environmental laws and regulations of federal, state (name) and local governments. This includes, but is not limited to, the following groupings: airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal, and handling and storage of toxic and hazardous materials.
- Consultants. Involvement of university, academic institution, or other consultants in the project may be appropriate. If the firm intends to involve these type of consultants, describe these costs in detail in the Cost Volume.

C. Cost Volume. Download, complete, and upload the Spreadsheet. Some items in the cost volume template may not apply to the proposed project. Provide enough information to allow the DLA evaluators to assess the proposer's plans to use the requested funds if DLA were to award the contract.

- List all key personnel by name as well as number of hours dedicated to the project as direct labor.
- Special Tooling, Test Equipment, and Materials Costs:
- Special tooling, test equipment, and materials costs may be included under Phase II. The inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed; and
- The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the Government and relate it directly to the specific effort.
- Cost for travel funds must be justified and related to the needs of the project.

D. Commercialization Report. (Not required for the BAA) All Phase II proposals must include a Company Commercialization Report (CCR). This required proposal information does not count against the 60-page limit. The submission system will generate CCR is generated by the submission website based on information provided by the firm through the CCR tool. This report will list the name of the awarding agency, date of award, contract number, topic or subtopic, title, and award amount for each SBIR Phase II project performed by the company. The CCR, separate from the commercialization strategy described in Section 4.G, covers what you have done with past Phase II awards. Complete and accurate reporting of Phase III performance data by all participating companies is critical to the future success of the SBIR Program.

4. METHOD OF SELECTION AND EVALUATION CRITERIA

A. **Evaluation Criteria.** DLA will review all proposals for overall merit based on the evaluation criteria published in the DoD SBIR Program BAA: CONTRACTUAL CONSIDERATIONS

- A. Awards. The number of Direct to Phase II awards will depend upon the quality the Phase II proposals and the availability of funds. Each Phase II proposal selected for award under a negotiated contract requires a signature by both parties before work begins. DLA awards Phase II contracts to Small Businesses based on results of the agency priorities, scientific, technical, and commercial merit of the Phase II proposal.
- B. Reports. For incrementally funded Phase II projects an interim, midterm written report maybe required (at the discretion of the awarding agency).
- C. Payment Schedule. DLA Phase II Awards are Firm Fixed Price / Level of Effort contracts. Base monthly invoices on the labor hours recorded **PLUS** the monthly costs associated with the project.
- D. Markings of Proprietary Information. In accordance with DoD SBIR Program BAA, section 5.3. DLA does not accept classified proposals. All Final Reports are marked with Distribution Statement B, and the Initial Project Summary as well as the Final Project Summary should reference compliance with Distribution Statement A.
- E. Copyrights, Patents and Technical Data Rights. DLA handles all Copyrights, Patents, and Technical Data Rights in accordance with the guidelines in the DoD SBIR Program BAA.

5. TECHNICAL AND BUSINESS ASSISTANCE (TAB A)

The DLA SBIR Program does not participate in the Technical and Business Assistance (formally the Discretionary Technical Assistance Program). Contractors should not submit proposals that include Technical and Business Assistance.

6. REPORTING OF PHASE III OR ANY OTHER COMMERCIALIZATION EFFORTS

A. Each small business receiving a Phase II award is required to report all Phase III activities on their Company Commercialization Report <https://www.dodsbirsttr.mil/submissions/login>. In addition please send any corresponding Phase III documents in PDF format to: DLASBIR2@dla.mil

Reportable activities include:

- Sales revenue from new products and non-R&D services resulting from the Phase II project
- Additional investment from sources other than the Federal SBIR program in activities that further the development and/or the commercialization of the Phase II technology;
- The portion of additional investment representing clear and verifiable investment in the future commercialization of the technology (i.e. "hard investment");
- Whether the Phase II technology has been used in a fielded DoD system or acquisition program and, if so, which system or program;
- The number of patents resulting from the contractor's participation in the SBIR/STTR program;
- Growth in number of firm employees, and; Whether the firm completed an initial public offering (IPO) of stock resulting in part from the Phase II project

DLA SBIR Direct to Phase II Topic Index

DLA203-D06 Verifying the Domestic Manufacturing Process of Isostatically Molded (Isomolded) Synthetic Graphite Can Meet Military Requirements

DLA203-D06 TITLE: Verifying the Domestic Manufacturing Process of Isostatically Molded (Isomolded) Synthetic Graphite Can Meet Military Requirements

RT&L FOCUS AREA(S): Warfighting Requirements (GWR)
TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The Defense Logistics Agency (DLA) seeks to provide responsive, best value supplies consistently to our customers. DLA continually investigates diverse technologies for manufacturing which would lead to the highest level of innovation in the discrete-parts support of fielded weapon systems (many of which were designed in the 1960's, 1970's and 1980's) with a future impact on both commercial technology and government applications. As such, advanced technology demonstrations for affordability and advanced industrial practices to demonstrate the combination of improved discrete-parts manufacturing and improved business methods are of interest. All these areas of manufacturing technologies provide potential avenues toward achieving breakthrough advances. Proposed efforts funded under this topic may encompass any specific discrete-parts or materials manufacturing or processing technology at any level resulting in a unit cost reduction.

Research and Development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has not been fully established. Further, proposed efforts must be judged to be at a Technology Readiness Level (TRL) 6 or less, but greater than TRL 3 to receive funding consideration.

TRL 3. (Analytical and Experimental Critical Function and/or Characteristic Proof of Concept)
TRL 6. (System/Subsystem Model or Prototype Demonstration in a Relevant Environment)

DESCRIPTION: DLA R&D is looking for a domestic capability to address the lacking viable domestic source of isomolded graphite production. The military uses isomolded graphite in numerous applications, including tactical munitions, strategic rockets and missiles, and large, advance-launch systems. The United States has been dependent on foreign sources for isomolded graphite. Verifying a domestic manufacturing production process for isomolded graphite meets military requirements would eliminate the costly foreign alliance for this material.

R&D tasks include qualifying domestic pre-cursor materials for the a domestic isomolded manufacturing process, verify the domestically manufactured isomolded graphite material meets military requirements, and qualify the material on military applications.

PROJECT DURATION and COST:

- Phase I: N/A
- PHASE II: Phase II – NTE 24 Months \$1.6M - Base 12-18 months, \$1M Option 6 Months NTE \$.6M

PHASE I: Not Required for Direct to Phase II. Demonstrate your proof of concept in the first 20 pages of Volume 2.

PHASE II: Validate that domestically sourced pre-cursor materials for the isomolded graphite material can be utilized for the established domestic production process. Validation would include, but not be limited to, prototype quantities, data analysis, and laboratory tests. Validate the production process can manufacture isomolded graphite which can meet property specifications of previously used isomolded graphite for military applications. Validation would include, but not be limited to, prototype quantities, data analysis, and laboratory tests. Qualify the validated isomolded material on military applications that are utilizing obsolete or foreign sourced isomolded graphite.

PHASE III DUAL USE APPLICATIONS: Provide a Domestic Source for the isomolded graphite material can be utilized for the established domestic production process.

REFERENCES:

KEYWORDS: Isostatically Molded (Isomolded) Synthetic Graphite

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY
20.3 Small Business Innovation Research (SBIR)
Proposal Submission Instructions

GENERAL INFORMATION

The National Geospatial-Intelligence Agency has a responsibility to provide the products and services that decision makers, warfighters, and first responders need, when they need it most. As a member of the Intelligence Community and the Department of Defense, NGA supports a unique mission set. We are committed to acquiring, developing and maintaining the proper technology, people and processes that will enable overall mission success.

Geospatial intelligence, or GEOINT, is the exploitation and analysis of imagery and geospatial information to describe, assess and visually depict physical features and geographically referenced activities on the Earth. GEOINT consists of imagery, imagery intelligence and geospatial information.

With our unique mission set, NGA pursues research that will help guarantee the information edge over potential adversaries. Additional information pertaining to the National Geospatial-Intelligence Agency's mission can be obtained by viewing the website at <https://www.nga.mil>.

Inquiries of a general nature or questions concerning the administration of the SBIR Program should be addressed to:

National Geospatial-Intelligence Agency
Attn: SBIR Program Manager, RA, MS: S75-RA
7500 GEOINT Dr., Springfield, VA 22150-7500
Email: SBIR@nga.mil

For technical questions and communications with Topic Authors, see DoD Instructions, Section. 4.15. For general inquiries or problems with electronic submission, contact DoD SBIR Help Desk at DoDSBIRSupport@reisystems.com or 1-703-214-1333 between 9:00 am and 5:00 pm ET (Monday – Friday).

PHASE I PROPOSAL INFORMATION

Follow the instructions in the DoD SBIR Program BAA for program requirements and proposal submission instructions at <https://rt.cto.mil/rtl-small-business-resources/sbir-sttr/>.

NGA has developed topics to which small businesses may respond to in this fiscal year 2020 SBIR Phase I iteration. These topics are described on the following pages. **The maximum amount of SBIR funding for a Phase I award is \$100,000, and the maximum period of performance for a Phase I award is nine months.** While NGA participates in the majority of SBIR program options, NGA does not participate in either the Commercialization Readiness Program (CRP), Technical and Business Assistance (TABAs) or Phase II Enhancement programs.

The entire SBIR proposal submission (consisting of a Proposal Cover Sheet, the Technical Volume, Cost Volume, and Company Commercialization Report) must be submitted electronically through the DoD SBIR/STTR Proposal Submission system located at <https://www.dodsbirsttr.mil/submissions/> for it to be evaluated.

- **Proposal Cover Sheet (Volume 1):** The Cover Sheet must include a brief technical abstract of no more than 200 words that describes the proposed R&D project with a discussion of anticipated benefits and potential commercial applications. Do not include proprietary or classified information in the Proposal Cover Sheet. If your proposal is selected for award, the technical abstract and discussion of anticipated benefits may be publicly released.
- **Format of Technical Volume (Volume 2):** The Technical Volume must be a single Portable Document Format (PDF) file, including graphics. Perform a virus check before uploading the Technical Volume file. If a virus is detected, it may cause rejection of the proposal. Do not lock or encrypt the uploaded file. Do not include or embed active graphics such as videos, moving pictures, or other similar media in the document. The length of each part of the technical volume is limited to 20 pages. The Government will not consider pages in excess of the page count limitations. Number all pages of your proposal consecutively. Font size should not be smaller than 12 point Times New Roman font, with at least a one-inch margin on top, bottom, and sides, on 8½" by 11" paper. The header on each page of the Technical Volume should contain your company name, topic number, and proposal number assigned by DSIP when the Cover Sheet was created. The header may be included in the one-inch margin.
 - (1) Significance of the Problem. Define the specific technical problem or opportunity addressed and its importance.
 - (2) Phase I Technical Objectives. Enumerate the specific objectives of the Phase I work, and describe the technical approach and methods to be used in meeting these objectives.
 - (3) Phase I Statement of Work. The statement of work should provide an explicit, detailed description of the Phase I approach, indicate what is planned, how and where the work will be carried out, a schedule of major events and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail. This section should be a substantial portion of the total proposal. Include how and where the work will be carried out, a schedule of major events and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail.
 - (4) Related Work. Describe significant activities directly related to the proposed effort, including any conducted by the PI, the proposer, consultants or others. Describe how these activities interface with the proposed project and discuss any planned coordination with outside sources. The proposal must persuade reviewers of the proposer's awareness of the state of the art in the specific topic. Describe previous work not directly related to the proposed effort but similar. Provide the following: (1) short description, (2) client for which work was performed (including individual to be contacted and phone number) and (3) date of completion.
 - (5) Relationship with Future Research or Research and Development. State the anticipated results of the proposed approach if the project is successful.
 - (6) Key Personnel. Identify key personnel who will be involved in the Phase II effort including information on directly related education and experience. A concise resume of the PI, including a list of relevant publications (if any), must be included. All resumes count toward the page limitation.
 - (7) Foreign Citizens. Identify any foreign nationals you expect to be involved on this project.
 - (8) Facilities/Equipment. Describe available instrumentation and physical facilities necessary to carry out the Phase I effort. Items of equipment to be purchased (as detailed in the cost proposal) shall be justified under this section. If proposing to perform classified activities during the period of performance you need to provide the following: 1) Will the information include controlled unclassified information (CUI) and; 2) What unclassified IT systems will be required.

- (9) Subcontractors/Consultants. Involvement of a university or other subcontractors or consultants in the project may be appropriate. If such involvement is intended, it should be identified and described according to the Cost Breakdown Guidance. Please refer to section 4.2 of this BAA for detailed eligibility requirements as it pertains to the use of subcontractors/consultants.
- 10) Prior, Current or Pending Support of Similar Proposals or Awards. If a proposal submitted in response to this is substantially the same as another proposal that was funded, is now being funded, or is pending with another Federal Agency, or another or the same DoD Component, you must reveal this on the Proposal Cover Sheet and provide the following information: a) Name and address of the Federal Agency(s) or DoD Component to which a proposal was submitted, will be submitted, or from which an award is expected or has been received. b) Date of proposal submission or date of award. c) Title of proposal. d) Name and title of the PI for each proposal submitted or award received. e) Title, number, and date of BAA(s) or solicitation(s) under which the proposal was submitted, will be submitted, or under which award is expected or has been received. f) If award was received, state contract number. g) Specify the applicable topics for each proposal submitted or award received. Note: If this does not apply, state in the proposal "No prior, current, or pending support for proposed work."
- (11) Commercialization Strategy. NGA is equally interested in dual use commercialization of SBIR/STTR projects that result in products sold to the U.S. military, the private sector market, or both. NGA expects explicit discussion of key activities to achieve this result in the commercialization strategy part of the proposal. The Technical Volume of each Direct to Phase I proposal must include a commercialization strategy section. The Phase I commercialization strategy shall not exceed 5 pages. The commercialization strategy should include the following elements:
 - a) Problem or Need Statement. Briefly describe what you know of the problem, need, or requirement, and its significance relevant to a Department of Defense application and/or a private sector application that the SBIR/STTR project results would address.
 - b) Description of Product(s) and/or System Application(s). Identify the commercial product(s) and/or DoD system(s), or system(s) under development, or potential new system(s). Identify the potential DoD endusers, Federal customers, and/or private sector customers who would likely use the technology.
 - c) Business Model(s)/Procurement Mechanism(s). Discuss your current business model hypothesis for bringing the technology to market. Describe plans to license, partner, or self-produce your product. How do you plan to generate revenue? Understanding NGA's goal of creating and sustaining a U.S. military advantage, describe how you intend to develop your product and supply chains to enable this differentiation.
 - d) Target Market. Describe the market and customer sets you propose to target, their size, their growth rate, and their key reasons they would consider procuring the technology. Describe competing technologies existent today on the market as well as those being developed in the lab.
 - e) Funding Requirements. Describe your company's funding history. How much external financing have you raised? Describe your plans for future funding sources (internal, loan, angel, venture capital, etc.).
 - f) Commercialization Risks. Describe the major technology, market and team risks associated with achieving successful transition of the NGA funded technology. NGA is not afraid to take risks but we want to ensure that our awardees clearly understand the risks in front of them.

- g) Expertise/Qualifications of Team/Company Readiness. Describe the expertise and qualifications of your management, marketing/business development and technical team that will support the transition of the technology from the prototype to the commercial market and into government operational environments. Has this team previously taken similar products/services to market? If the present team does not have this needed expertise, how do you intend to obtain it? What is the financial history and health of your company (e.g., availability of cash, profitability, revenue growth, etc.)?
- **Format of Cost Volume (Volume 3):** The Cost Volume (and supporting documentation) DOES NOT count toward the page limit of the Technical Volume. Some items in the Cost Breakdown Guidance below may not apply to the proposed project. If such is the case, there is no need to provide information on each and every item. ALL proposed costs should be accompanied by documentation to substantiate how the cost was derived. For example, if you proposed travel cost to attend a project-related meeting or conference, and used a travel website to compare flight costs, include a screen shot of the comparison. Similarly, if you proposed to purchase materials or equipment, and used the internet to search for the best source, include your market research for those items. You do not necessarily have to propose the cheapest item or supplier, but you should explain your decision to choose one item or supplier over another. It's important to provide enough information to allow contracting personnel to understand how the proposer plans to use the requested funds. If selected for award, failure to include the documentation with your proposal will delay contract negotiation, and the proposer will be asked to submit the necessary documentation to the Contracting Officer to substantiate costs (e.g., cost estimates for equipment, materials, and consultants or subcontractors). It is important to respond as quickly as possible to the Contracting Officer's request for documentation. Cost Breakdown Guidance:
 - List all key personnel by name as well as by number of hours dedicated to the project as direct labor.
 - Special tooling and test equipment and material cost may be included. The inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the Government and should be related directly to the specific topic. These may include such items as innovative instrumentation and/or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with NGA; unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by NGA.
 - Cost for travel funds must be justified and related to the needs of the project.
 - Cost sharing is permitted for proposals under this announcement; however, cost sharing is not required nor will it be an evaluation factor in the consideration of a proposal.
 - All subcontractor costs and consultant costs must be detailed at the same level as prime contractor costs in regard to labor, travel, equipment, etc. Provide detailed substantiation of subcontractor costs in your cost proposal. The Supporting Documents Volume (Volume 5) may be used if additional space is needed. For more information about cost proposals and accounting standards, see the DCAA publication titled "Audit Process Overview – Information for Contractors" available at: <http://www.dcaa.mil>.
- **Company Commercialization Report (Volume 4):** Not available for 20.3
- **Supporting Documents (Volume 5):** The vendor may submit supporting documents (Volume 5) but that material WILL NOT be rated by the evaluation team as part of the proposal evaluation. Items that may go into, not all inclusive, are additional cost proposal information, Completed Form SF328, advocacy letters, etc.

- **Fraud, Waste and Abuse Training (Volume 6):** Will be addressed at time of contract award.

Selection of Phase I proposals will be in accordance with the evaluation procedures and criteria discussed in this BAA (refer to Section 6.0 of the BAA).

Proposals not conforming to the terms of this BAA, and unsolicited proposals, will not be considered. Awards are subject to the availability of funding and successful completion of contract negotiations.

The NGA SBIR Program reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality in the judgment of the technical evaluation team will be funded. The offeror must be responsive to the topic requirements, as solicited.

An unsuccessful offeror has 3 days after notification that its proposal was not selected to submit a written request for a debriefing to the Contracting Officer (CO). Those offerors who get their written request in within the allotted timeframe above will be provided a debriefing.

Federally Funded Research and Development Contractors (FFRDC) and other government contractors, whom have signed Non-Disclosures Agreements, may be used in the evaluation of your proposal. NGA typically provides a firm fixed price contract for Phase I awards. The type of contract is at the discretion of the Contracting Officer.

Phase I contracts will include a requirement to produce monthly status reports, a more detailed interim report not later than 7 months after award, a final report no later than 9 months after award and any software/algorithms/documentation from items developed in Phase I. These reports shall include the following sections:

- A summary of the results of the Phase I research to date
- A summary of the Phase I tasks not yet completed, with an estimated completion date for each task
- A statement of potential applications and benefits of the research.
- A summary of any risks or issues

The interim report (draft final report) and final report shall be prepared single spaced in 12 point Times New Roman font, with at least a one-inch margin on top, bottom, and sides, on 8½” by 11” paper. The pages shall be numbered.

PHASE II GUIDELINES

Phase II is the demonstration of the technology found feasible in Phase I. All NGA SBIR Phase I awardees from this BAA will be allowed to submit an UNCLASSIFIED Phase II proposal for evaluation without an invitation and for possible selection. To minimize the gap between the Phase I and Phase II, it is suggested that the vendor submit their proposal 60 days prior to the end date of the Phase I award.

Small businesses submitting a Phase II Proposal must use the DoD SBIR electronic proposal submission system (<https://www.dodsbirsttr.mil/submissions/>). This site contains step-by-step instructions for the preparation and submission of the Proposal Cover Sheets, the Company Commercialization Report, the Cost Volume, and how to upload the Technical Volume. For general inquiries or problems with proposal

electronic submission, contact the DoD SBIR/STTR Help Desk at DoDSBIRSupport@reisystems.com or 1-703-214-1333 (9:00 am to 5:00 pm ET Monday - Friday).

NGA SBIR Phase II Proposals have four UNCLASSIFIED Volumes: Proposal Cover Sheets, Technical Volume, Cost Volume and Company Commercialization Report. The Technical Volume has a 40-page limit including: table of contents, pages intentionally left blank, references, letters of support, appendices, technical portions of subcontract documents (e.g., statements of work and resumes) and any attachments. Do not include blank pages, duplicate the electronically generated Cover Sheets or put information normally associated with the Technical Volume in other sections of the proposal as these will count toward the 40-page limit.

Technical Volumes that exceed the 40-page limit will be reviewed only to the last word on the 40th page. Information beyond the 40th page will not be reviewed or considered in evaluating the offeror's proposal. To the extent that mandatory technical content is not contained in the first 40 pages of the proposal, the evaluator may deem the proposal as non-responsive and score it accordingly.

Selection of Phase II proposals will be in accordance with the evaluation procedures and criteria discussed in this BAA (refer to Section 6.0 of the BAA). As part of factor c in the evaluation criteria, the vendor will be evaluated on how it addresses the following five questions on the overall commercialization strategy:

- (1) What is the first product that this technology will go into?
- (2) Who will be the customers, and what is the estimated market size?
- (3) How much money will be needed to bring the technology to market, and how will that money be raised?
- (4) Does the company contain marketing expertise and, if not, how will that expertise be brought into the company?
- (5) Who are the proposing firm's competitors, and what is the price and/or quality advantage over those competitors?

Due to limited funding, the NGA SBIR Program reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

NGA typically provides a firm fixed price contract as a Phase II award. The type of contract is at the discretion of the Contracting Officer.

Initial Phase II proposals shall be limited to \$1,000,000 over a two-year period with a Period of Performance not exceeding 24 months. A work breakdown structure that shows the number of hours and labor category broken out by task and subtask, as well as the start and end dates for each task and subtask, shall be included.

Phase II contracts shall include a requirement to produce a monthly status and financial reports, an interim report not later than 12 months after contract award, a prototype demonstration not later than 23 months after contract award and a final report not later than 24 months after contract award. These reports shall include the following sections:

- A summary of the results of the Phase II research to date
- A summary of the Phase II tasks not yet completed with an estimate of the completion date for each task
- A statement of potential applications and benefits of the research.
- A summary of any risks or issues

The interim and final report shall be prepared single spaced in 12 point Times New Roman font, with at least a one-inch margin on top, bottom, and sides, on 8½" by 11" paper. The pages shall be numbered.

USE OF FOREIGN NATIONALS

Due to the nature of the NGA mission and operations, foreign nationals are restricted from participating or working under certain NGA contracts. The participation of foreign nationals on NGA SBIR contracts is limited to only those that are scoped, proposed and awarded as exclusively Fundamental Research. For contracts that are scoped, proposed and awarded with either a portion of fundamental research, or no fundamental research, the Principle Investigator must be a US citizen, and participation of foreign nationals prohibited. Additionally, foreign nationals are prohibited from exposure to Controlled Unclassified Information.

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

Controlled Unclassified Information (CUI) is information that requires safeguarding or dissemination controls pursuant to and consistent with applicable law, regulations, and government-wide policies but is not classified under Executive Order 13526 or the Atomic Energy Act, as amended.

Executive Order 13556 "Controlled Unclassified Information" (the Order), establishes a program for managing CUI across the Executive branch and designates the National Archives and Records Administration (NARA) as Executive Agent to implement the Order and oversee agency actions to ensure compliance. The Archivist of the United States delegated these responsibilities to the Information Security Oversight Office (ISOO).

32 CFR Part 2002 "Controlled Unclassified Information" was issued by ISOO to establish policy for agencies on designating, safeguarding, disseminating, marking, decontrolling, and disposing of CUI, self-inspection and oversight requirements, and other facets of the Program. The rule affects Federal executive branch agencies that handle CUI and all organizations (sources) that handle, possess, use, share, or receive CUI—or which operate, use, or have access to Federal information and information systems on behalf of an agency.

During performance of this contract, if the government provides the vendor a dataset that is not publically released, the vendor must be CUI Compliant to receive it. For more information on this compliance please see DFARS Clause 252.204-7012, NIST Special Publication SP 800-171 and the National Archives and Records Administration (NARA) website (<https://www.archives.gov/cui/about>).

CERTIFICATE PERTAINING TO FOREIGN INTERESTS

Offers must submit a SF-328 in Volume 5 in order to be considered for award. If after review of the form, the offeror may be found ineligible for award if the offerors foreign interest are found to be unacceptable. The form can be found at <https://www.gsa.gov/forms-library/certificate-pertaining-foreign-interests>.

252.207-7000 DISCLOSURE OF INFORMATION

(a) The Contractor shall not release to anyone outside the Contractor's organization any unclassified information, regardless of medium (e.g., film, tape, document), pertaining to any part of this contract or any program related to this contract, unless-

- (1) The Contracting Officer has given prior written approval;
- (2) The information is otherwise in the public domain before the date of release; or

(3) The information results from or arises during the performance of a project that involves no covered defense information (as defined in the clause at DFARS 252.204-7012, Safeguarding Covered Defense Information and Cyber Incident Reporting) and **has been scoped and negotiated by the contracting activity with the contractor and research performer and determined in writing by the contracting officer to be fundamental research* (which by definition cannot involve any covered defense information)**, in accordance with National Security Decision Directive 189, National Policy on the Transfer of Scientific, Technical and Engineering Information, in effect on the date of contract award and the Under Secretary of Defense (Acquisition, Technology, and Logistics) memoranda on Fundamental Research, dated May 24, 2010, and on Contracted Fundamental Research, dated June 26, 2008 (available at DFARS PGI 204.4).

(b) Requests for approval under paragraph (a)(1) shall identify the specific information to be released, the medium to be used, and the purpose for the release. The Contractor shall submit its request to the Contracting Officer at least 10 business days before the proposed date for release.

(c) The Contractor agrees to include a similar requirement, including this paragraph (c), in each subcontract under this contract. Subcontractors shall submit requests for authorization to release through the prime contractor to the Contracting Officer.

***Note: This has to be negotiated prior to award of the contract. A request for determination after award will not be entertained.**

5X252.204-7000-90 PUBLIC RELEASE OF INFORMATION

(a) Except as provided in paragraph (b) of this clause, information pertaining to this contract shall not be released to the public unless authorized by the Contracting Officer in accordance with DFARS 252.204-7000, Disclosure of Information. Requests for approval to release information pertaining to this contract shall be submitted to the Contracting Officer by means of NGA Form 5230-1, National Geospatial-Intelligence Agency Request for Clearance for Public Release.

(b) The contractor may provide past performance information regarding this contract, without Contracting Officer approval, to the Office of the Director of National Intelligence (ODNI), the Central Intelligence Agency (CIA), the National Reconnaissance Office (NRO), the National Security Agency (NSA), the Defense Intelligence Agency (DIA), and NGA to support source selections at those agencies. The contractor is responsible for the proper classification and handling of such information and shall provide a copy of the information provided to the Contracting Officer.

5X52.227-9000 UNAUTHORIZED USE OF NGA NAME, SEAL AND INITIALS

(a) As provided in 10 U.S.C. Section 425, no person may, except with the written permission of the Director, National Geospatial-Intelligence Agency, knowingly use the words "National Geospatial-Intelligence Agency", "National Imagery and Mapping Agency" or "Defense Mapping Agency", the initials "NGA", "NIMA" or "DMA", the seal of the National Geospatial-Intelligence Agency, National Imagery and Mapping Agency or the Defense Mapping Agency, or any colorable imitation of such words, initials, or seal in connection with any merchandise, retail product, impersonation, solicitation, or commercial activity in a manner reasonably calculated to convey the impression that such is approved, endorsed, or authorized by the Director, NGA.

(b) Whenever it appears to the U.S. Attorney General that any person is engaged or about to engage in an act or practice which constitutes or will constitute conduct prohibited by paragraph (a), the Attorney General may initiate a civil proceeding in a district court of the United States to enjoin such act or

practice. Such court shall proceed as soon as practicable to hearing and determination of such action and may, at any time before such final determination, enter such restraining orders or prohibition, or take such other action as is warranted, to prevent injury to the United States, or to any person or class of persons whose protection the action is brought.

NGA SBIR 20.3 Phase I Topic Index

NGA203-001	Enhancing Motion with Foundation
NGA203-002	Enhanced Modeling and Simulations of Hypersonics
NGA203-005	Novel Mathematical Foundation for Automated Annotation of Massive Image Data Sets

NGA203-001 TITLE: Enhancing Motion with Foundation

RT&L FOCUS AREA(S): Autonomy

TECHNOLOGY AREA(S): Information Systems; Sensors; Electronics

OBJECTIVE: Develop and demonstrate a capability to generate narrative descriptions and structured summaries of events, activities and anomalies associated with locations from mover intelligence (MOVINT), Geographic Information Systems (GIS) and contextual foundation data.

DESCRIPTION: Existing sources of MOVINT are generating massive amounts of persistent data of fixed locations, and more platforms are being planned. Detecting and tracking movers in full motion video (FMV), wide area motion imagery (WAMI), moving target indication (MTI) data, and other MOVINT sources have developed mature capabilities deployed for various platforms. However, converting tracks into meaningful intelligence has received relatively little attention beyond manual analysis and summary visualization techniques such as heatmaps of traffic density. Automated track analytics, such as complex threat and anomaly detection, have been hampered by short track durations, particularly in urban areas; intermittent coverage, leading to significant temporal gaps at arbitrary times; and the difficulty of incorporating higher-level, semantic understanding of the scene and cultural behaviors.

This topic will develop methods to automatically detect significant activities, anomalies and relationships from MOVINT and use them to produce human-level, semantic summaries of the most salient information associated with a location, facility or other fixed entity. GIS information from foundation feature databases should be incorporated to provide prior knowledge of the scene in the form of known buildings, facilities and structures. The interactions and relationships of movers to those features should be explicitly incorporated into algorithms to provide context sensitivity and semantic understanding that would be useful to an analyst responsible for monitoring the scene. For a designated area and temporal interval, the methods should produce an activity summary that includes structured information such as the most significant, unusual or salient events, and a narrative, textual description of that information in natural language text. Ideally, an analyst would be able to delve into any part of the summary to examine the intermediate layers of information, such as individual events, locations, and underlying raw data used to discover them.

The methods should scale to city-size areas with hours of coverage per day, enabling an analyst to rapidly obtain an automated summary of any specified region of the scene such as a single building, a parking area, a compound or a city block. Summaries should highlight activities that are unusual or significant within the local cultural context, such as high amounts of activity at a religious facility when it is not the normal time for ceremonies there, or no activity when there should be a ceremony there. The system should not rely on data-driven methods to learn patterns of life, but instead should infer expected behaviors and other information from prior cultural knowledge encoded in a suitable representation.

PHASE I: Using WAMI data, show the feasibility to generate summaries of salient events at a designated location, emphasizing the improvement in salient activity detection and summarization from leveraging GIS and cultural information. Phase I will provide an initial proof of concept using constrained spatial and temporal information to create structured representation summaries.

PHASE II: Develop a mature algorithmic capability implemented within a prototype to generate salient summaries, both structured and narrative, of arbitrary regions across multiple scales, multiple MOVINT data types and multiple cultures. GIS and cultural information should be encoded in structured representations and leveraged for inference about important activities vice benign or insignificant ones. The prototype should provide a user interface for analyst evaluation of the system on operationally relevant data.

PHASE III DUAL USE APPLICATIONS: Fully develop and transition the technology and methodology based on the research and development results developed during Phase II for DOD applications in the areas of MOVINT analytics, and other anomaly surveillance and reconnaissance applications. For example, civil authorities might use MOVINT for disaster relief, or transportation monitoring

REFERENCES:

None

KEYWORDS: full motion video (FMV); wide area motion imagery (WAMI); moving target indication (MTI) data

NGA203-002 TITLE: Enhanced Modeling and Simulations of Hypersonics

RT&L FOCUS AREA(S): Hypersonics
TECHNOLOGY AREA(S): Weapons

OBJECTIVE: Develop advanced multi-physics tools to improve estimation of hypersonic flowfields and phenomenologies

DESCRIPTION: Hypersonic flight has been studied for decades, yet it still presents challenges in hypersonic vehicle design and analysis [1]. Computational fluid dynamics (CFD) techniques are routinely employed to yield high accuracy numerical estimates of hypersonic flowfields given specific geometry and boundary conditions. Benchmarking CFD modeling tools with experimental data, such as from wind tunnels, is important to verify and validate accuracy of simulations. Additionally, CFD predictions can assist in improving system design and performance, as well as with interpretation and analysis of measurements from tests [2]. Analysis of complex hypersonic flowfields typically require large computational grids, and long simulation run times even when parallel processing on supercomputers. Accurate modeling of hypersonic flow under realistic flight conditions is complicated by the nonlinear and thermochemical nonequilibrium conditions experienced in the atmosphere [3]. Variations in atmospheric conditions, chemical reactions, vibrational excitation, ablation products, and gas-surface interactions further complicate accurate modeling of flowfields. The air can also become ionized under high enough Mach numbers which in turn affects the overall flowfield[4].

NGA seeks innovative modeling and simulation concepts for estimating hypersonic flowfields and phenomenologies. Enhanced modeling and simulation tools are needed to accurately and efficiently solve these complex fluid, thermal, kinetic, and structural problems using coupled multi-physics codes to assist with interpretation of observations [5]. Areas of interest include: coupling of CFD to ionized plasma, RF, and optical predictions; flowfield estimation from sparse measurements; CFD solutions for non-axisymmetric bodies; coupled flow-thermal-structural-vibrational analysis; advanced numerical techniques; improvements in chemical kinetics and turbulence models; and/or improvements in high performance CFD efficiency [6-11].

PHASE I: Phase I proposal should focus on demonstrating feasibility of one or more novel concepts for enhanced modeling and simulation of hypersonic flowfields and phenomenologies. The proposal should identify current methods and develop quantifiable metrics to demonstrate improvement over state-of-the-art. The proposal should demonstrate feasibility of the concept by verifying with publically available data.

PHASE II: The performer should expand the Phase I research to include feasibility of multiple concepts and perform verification and validation of those concepts. Additional quantifiable metrics should be developed to further demonstrate improvement over state-of-the-art. The Phase II proposal should focus on coupling solutions to a variety of the multi-physics problems described above.

PHASE III DUAL USE APPLICATIONS: The performer shall work with industry to make their novel methods and codes available as part of a wider multi-physics effort in hypersonics. Hypersonic flight vehicles, atmospheric flow thermochemistry, multi-physics codes

REFERENCES:

1. Mark J. Lewis, "Hypersonic Flight: A Status Report", Science & Technology Policy Institute, July 2019.;
2. Graham V. Candler et al., "Development of the US3D Code for Advanced Compressible and Reacting Flow Simulations", 53rd AIAA Aerospace Sciences Meeting, AIAA, 2015.;

3. Graham V. Candler and Robert MacCormack, "The computation of hypersonic ionized flows in chemical and thermal nonequilibrium", 26th Aerospace Sciences Meeting, AIAA, 1988.;
4. Graham V. Candler and Robert MacCormack, "Computation of weakly ionized hypersonic flows in thermochemical nonequilibrium", Journal of Thermophysics and Heat Transfer, Volume 5, Number 3, July 1991.;
5. Timothy R. Deschenes et al., "Recent Development and Application of Advanced Software Tools for Hypersonic Flowfields and Signatures", HTSC 2019 Presentation, June 2019.;
6. Ross S. Chaudhry et al., "Implementation of a Chemical Kinetics Model for Hypersonic Flows in Air for High-Performance CFD", AIAA Scitech 2020 Forum, AIAA, January 2020.;
7. Sook-Ying Ho and Allan Paull, "Coupled thermal, structural and vibrational analysis of a hypersonic engine for flight test", Aerospace Science and Technology, Volume 10, Issue 5, July 2006.;
8. Adam J. Culler et al., "Studies on Fluid-Structural Coupling for Aerothermoelasticity in Hypersonic Flow", Aeronautics and Astronautics, Volume 48, Number 8, August 2010.;
9. Anubhav Dwivedi et al., "Transient growth analysis of oblique shock-wave/boundary-layer interactions at Mach 5.92", ArXiv, 2019.;
10. Florent Duchaine et al., "Computational-Fluid-Dynamics-Based Kriging Optimization Tool for Aeronautical Combustion Chambers", Aeronautics and Astronautics, Volume 47, Number 3, March 2009.;
11. Periklis Papadopoulos et al., "Current grid-generation strategies and future requirements in hypersonic vehicle design, analysis and testing", Applied Mathematical Modelling, Volume 23, Issue 9, September 1999.

KEYWORDS: Hypersonic; Computational fluid dynamics (CFD)

NGA203-005 TITLE: Novel Mathematical Foundation for Automated Annotation of Massive Image Data Sets

RT&L FOCUS AREA(S): Autonomy; Artificial Intelligence/Machine Learning

TECHNOLOGY AREA(S): Information Systems; Sensors; Electronics

OBJECTIVE: This announcement seeks proposals that offer dramatic improvements in automated object detection and annotation of massive image data sets. Imaging data is being created at an extraordinary rate from many sources, both from government assets as well as private ones. Automated methods for accurate and efficient object identification and annotation are needed to fully exploit this resource. This topic is focused on new artificial intelligence (AI) methods to effectively and efficiently solve this problem.

DESCRIPTION: Current choke points blocking optimal exploitation of the full stream of available image data include confronting widely different views (perspective, resolution, etc.) of the same or similar objects and the overwhelming amounts of human effort required for effective processing. Current manual processes requires human eyes on every image to perform detection, identification, and annotation. Current state of the art AI requires intensive human support to generate giant training sets. Further, resulting methods frequently generate rule sets that are overly fragile in that training on one object is not transferrable to the detection of another object, even though the object might strike a human as essentially the same, and thus the need for increased human review of the algorithm decisions.

NGA seeks new types of AI tools optimized for the task of object identification and annotation across diverse families of image data that are reliable, robust, not dependent on extensive training demands, are applicable to objects of interest to both government and commercial concerns, and simultaneously be parsimonious with user resources in general. In particular, we seek solutions that make AI outputs both more explainable and more “lightweight” to human users.

The focus of a successful phase 1 effort should be on explaining the mathematical foundation that will enable the significantly improved AI tools described herein. Of specific interest are novel AI constructs that are more principled and universal and less ad hoc than current technology and can be used to construct a tool that performs relevant tasks. For the purposes of this announcement “relevant tasks” are limited to object identification across view types, drawing an object bounding box, and correctly labelling the object in a text annotation. A successful Phase 1 proposal should explain how the mathematical foundation needed to build the required tools will be developed in Phase 1 and implemented in a software toolkit in Phase 2. Examples should be developed during Phase 1 and should illustrate either improved reliability or robustness over the current state of the art, as well as reducing training demands and user resources. Proposals describing AI approaches that are demonstrably at or near the current state of the art in commercial AI performance, such as on ImageNet data sets, are specifically not of interest under this topic. The foundational element of a successful proposal under this topic is exploitation of novel mathematics that will enable new and better AI approaches.

Both Phase I and Direct to Phase 2 proposals are being accepted under this topic. A straight to phase 2 proposal should describe pre-existing mathematical foundations and illustrative examples described in the paragraph above. Phase 2 proposals should also propose a set of milestones and demonstrations that will establish the novel AI tools as a viable commercial offering.

PHASE I: A successful Phase 1 proposal should explain how the mathematical foundation needed to build the required tools described herein will be developed in Phase 1. Examples should be developed during Phase 1 and should illustrate either improved reliability or robustness over the current state of the art, as well as reducing training demands and user resources.

PHASE II: The performer shall implement a software toolkit based on the foundations developed in Phase I.

PHASE III DUAL USE APPLICATIONS: Follow-on activities are expected to be aggressively pursued by the offeror, namely in seeking opportunities to build more capable AI algorithms based upon the new mathematical foundation. This will deliver commercial benefits in the forms of improved algorithm performance.

REFERENCES:

None

KEYWORDS: artificial intelligence (AI); automated object detection; annotation of massive image data sets

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY
20.3 Small Business Innovation Research (SBIR)
Direct to Phase II
Proposal Submission Instructions

GENERAL INFORMATION

The National Geospatial-Intelligence Agency has a responsibility to provide the products and services that decision makers, warfighters, and first responders need, when they need it most. As a member of the Intelligence Community and the Department of Defense, NGA supports a unique mission set. We are committed to acquiring, developing and maintaining the proper technology, people and processes that will enable overall mission success.

Geospatial intelligence, or GEOINT, is the exploitation and analysis of imagery and geospatial information to describe, assess and visually depict physical features and geographically referenced activities on the Earth. GEOINT consists of imagery, imagery intelligence and geospatial information.

With our unique mission set, NGA pursues research that will help guarantee the information edge over potential adversaries. Additional information pertaining to the National Geospatial-Intelligence Agency's mission can be obtained by viewing the website at

<https://www.nga.mil/Partners/ResearchandGrants/SmallBusinessInnovationResearch/Pages/default.aspx/>.

Inquiries of a general nature or questions concerning the administration of the SBIR Program should be addressed to:

National Geospatial-Intelligence Agency
Attn: SBIR Program Manager, RA, MS: S75-RA
7500 GEOINT Dr., Springfield, VA 22150-7500
Email: SBIR@nga.mil

For technical questions and communications with Topic Authors, see DoD Instructions, Section. 4.15. For general inquiries or problems with electronic submission, contact DoD SBIR Help Desk at DoDSBIRSupport@reisystems.com or 1-703-214-1333 between 9:00 am and 5:00 pm ET (Monday – Friday).

DIRECT TO PHASE II PROPOSAL INFORMATION

Follow the instructions in the DoD SBIR Program BAA for program requirements and proposal submission instructions at <https://rt.cto.mil/rtl-small-business-resources/sbir-sttr/>.

15 U.S.C. §638 (cc), as amended by NDAA FY2012, Sec. 5106, and further amended by NDAA FY2019, Sec. 854, PILOT TO ALLOW PHASE FLEXIBILITY, allows the Department of Defense to make an award to a small business concern under Phase II of the SBIR program with respect to a project, without regard to whether the small business concern was provided an award under Phase I of an SBIR program with respect to such project. NGA is conducting a "Direct to Phase II" implementation of this authority for this 20.3 SBIR Announcement and does not guarantee Direct to Phase II opportunities will be offered in future Announcements. Each eligible topic requires documentation to determine that Phase I feasibility described in the Phase I section of the topic has been met.

NGA has developed topics to which small businesses may respond to in this fiscal year 2020 SBIR Direct to Phase II iteration. These topics are described on the following pages. **The maximum amount for a Direct to Phase II award is \$1,000,000, and the maximum period of performance for a Direct to Phase II is 24 months.** While NGA participates in the majority of SBIR program options, NGA does not participate in either the Commercialization Readiness Program (CRP), Technical and Business Assistance (TABA) or Phase II Enhancement programs.

The entire SBIR proposal submission (consisting of a Proposal Cover Sheet, the Technical Volume, Cost Volume, and Company Commercialization Report) must be submitted electronically through the DoD SBIR/STTR Proposal Submission system located at <https://www.dodsbirsttr.mil/ehb-app/home> for it to be evaluated.

- **Proposal Cover Sheet (Volume 1):** The Cover Sheet must include a brief technical abstract of no more than 200 words that describes the proposed R&D project with a discussion of anticipated benefits and potential commercial applications. Do not include proprietary or classified information in the Proposal Cover Sheet. If your proposal is selected for award, the technical abstract and discussion of anticipated benefits may be publicly released.
- **Format of Technical Volume (Volume 2):** The Technical Volume must include two parts, PART ONE: Feasibility Documentation and PART TWO: Technical Proposal. The Technical Volume must be a single Portable Document Format (PDF) file, including graphics. Perform a virus check before uploading the Technical Volume file. If a virus is detected, it may cause rejection of the proposal. Do not lock or encrypt the uploaded file. Do not include or embed active graphics such as videos, moving pictures, or other similar media in the document. The length of each part of the technical volume are as follows: Feasibility Documentation is limited to 20 pages and Technical Proposal is limited to 40 pages. The Government will not consider pages in excess of the page count limitations. Number all pages of your proposal consecutively. Font size should not be smaller than 12 pitch Times New Roman font, with at least a one-inch margin on top, bottom, and sides, on 8½" by 11" paper. The header on each page of the Technical Volume should contain your company name, topic number, and proposal number assigned by DSIP when the Cover Sheet was created. The header may be included in the one-inch margin.
 - **Content of the Technical Volume (Volume 2) PART ONE: Feasibility Documentation:** Provide documentation to substantiate that the scientific and technical merit and feasibility described in the Phase I section of the topic has been met and describes the potential commercial applications. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results. Maximum page length for feasibility documentation is 20 pages. If you have references, include a reference list or works cited list as the last page of the feasibility documentation. This will count towards the page limit. Work submitted within the feasibility documentation must have been substantially performed by the proposer and/or the PI. If technology in the feasibility documentation is subject to Intellectual Property (IP), the proposer must either own the IP, or must have obtained license rights to such technology prior to proposal submission, to enable it and its subcontractors to legally carry out the proposed work. Documentation of IP ownership or license rights shall be included in the Technical Volume of the proposal. Include a one page summary on Commercialization Potential addressing the following: i. Does the company contain marketing expertise and, if not, how will that expertise be brought into the company? ii. Describe the potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization. **DO NOT INCLUDE marketing material. Marketing material will NOT be evaluated.**
 - **PART TWO: Technical Proposal:**

- (1) Significance of the Problem. Define the specific technical problem or opportunity addressed and its importance.
- (2) Phase II Technical Objectives. Enumerate the specific objectives of the Phase II work, and describe the technical approach and methods to be used in meeting these objectives.
- (3) Phase II Statement of Work. The statement of work should provide an explicit, detailed description of the Phase II approach, indicate what is planned, how and where the work will be carried out, a schedule of major events and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail. This section should be a substantial portion of the total proposal. Include how and where the work will be carried out, a schedule of major events and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail.
- (4) Related Work. Describe significant activities directly related to the proposed effort, including any conducted by the PI, the proposer, consultants or others. Describe how these activities interface with the proposed project and discuss any planned coordination with outside sources. The proposal must persuade reviewers of the proposer's awareness of the state of the art in the specific topic. Describe previous work not directly related to the proposed effort but similar. Provide the following: (1) short description, (2) client for which work was performed (including individual to be contacted and phone number) and (3) date of completion.
- (5) Relationship with Future Research or Research and Development. State the anticipated results of the proposed approach if the project is successful. ii. Discuss the significance of the Phase II effort in providing a foundation for Phase III research and development or commercialization effort.
- (6) Key Personnel. Identify key personnel who will be involved in the Phase II effort including information on directly related education and experience. A concise resume of the PI, including a list of relevant publications (if any), must be included. All resumes count toward the page limitation.
- (7) Foreign Citizens. Identify any foreign nationals you expect to be involved on this project.
- (8) Facilities/Equipment. Describe available instrumentation and physical facilities necessary to carry out the Phase II effort. Items of equipment to be purchased (as detailed in the cost proposal) shall be justified under this section. If proposing to perform classified activities during the period of performance you need to provide the following: 1) Highest Level of Classification of the Research; 2) Where the classified work will be performed; 3) Will the information include controlled unclassified information (CUI); 4) What classified/unclassified IT systems will be required and ; 5) CAGE Code for Facility Clearance (FCL) Validation
- (9) Subcontractors/Consultants. Involvement of a university or other subcontractors or consultants in the project may be appropriate. If such involvement is intended, it should be identified and described according to the Cost Breakdown Guidance. Please refer to section 4.2 of this BAA for detailed eligibility requirements as it pertains to the use of subcontractors/consultants.
- 10) Prior, Current or Pending Support of Similar Proposals or Awards. If a proposal submitted in response to this is substantially the same as another proposal that was funded, is now being funded, or is pending with another Federal Agency, or another or the same DoD Component, you must reveal this

on the Proposal Cover Sheet and provide the following information: a) Name and address of the Federal Agency(s) or DoD Component to which a proposal was submitted, will be submitted, or from which an award is expected or has been received. b) Date of proposal submission or date of award. c) Title of proposal. d) Name and title of the PI for each proposal submitted or award received. e) Title, number, and date of BAA(s) or solicitation(s) under which the proposal was submitted, will be submitted, or under which award is expected or has been received. f) If award was received, state contract number. g) Specify the applicable topics for each proposal submitted or award received. Note: If this does not apply, state in the proposal "No prior, current, or pending support for proposed work."

- (11) Commercialization Strategy. NGA is equally interested in dual use commercialization of SBIR/STTR projects that result in products sold to the U.S. military, the private sector market, or both. NGA expects explicit discussion of key activities to achieve this result in the commercialization strategy part of the proposal. The Technical Volume of each Direct to Phase II proposal must include a commercialization strategy section. The Phase II commercialization strategy shall not exceed 5 pages. The commercialization strategy should include the following elements:
 - a) A summary of transition and commercialization activities conducted during Phase I, and the Technology Readiness Level (TRL) achieved. Discuss how the preliminary transition and commercialization path or paths may evolve during the Phase II project. Describe key proposed technical milestones during Phase II that will advance the technology towards product such as: prototype development, laboratory and systems testing, integration, testing in operational environment, and demonstrations.
 - b) Problem or Need Statement. Briefly describe what you know of the problem, need, or requirement, and its significance relevant to a Department of Defense application and/or a private sector application that the SBIR/STTR project results would address.
 - c) Description of Product(s) and/or System Application(s). Identify the commercial product(s) and/or DoD system(s), or system(s) under development, or potential new system(s). Identify the potential DoD endusers, Federal customers, and/or private sector customers who would likely use the technology.
 - d) Business Model(s)/Procurement Mechanism(s). Discuss your current business model hypothesis for bringing the technology to market. Describe plans to license, partner, or self-produce your product. How do you plan to generate revenue? Understanding NGA's goal of creating and sustaining a U.S. military advantage, describe how you intend to develop your product and supply chains to enable this differentiation.
 - e) Target Market. Describe the market and customer sets you propose to target, their size, their growth rate, and their key reasons they would consider procuring the technology. Describe competing technologies existent today on the market as well as those being developed in the lab.
 - f) Funding Requirements. Describe your company's funding history. How much external financing have you raised? Describe your plans for future funding sources (internal, loan, angel, venture capital, etc.).

- g) Commercialization Risks. Describe the major technology, market and team risks associated with achieving successful transition of the NGA funded technology. NGA is not afraid to take risks but we want to ensure that our awardees clearly understand the risks in front of them.
 - h) Expertise/Qualifications of Team/Company Readiness. Describe the expertise and qualifications of your management, marketing/business development and technical team that will support the transition of the technology from the prototype to the commercial market and into government operational environments. Has this team previously taken similar products/services to market? If the present team does not have this needed expertise, how do you intend to obtain it? What is the financial history and health of your company (e.g., availability of cash, profitability, revenue growth, etc.)?
 - i) Anticipated Commercialization Results. Include a schedule showing the anticipated quantitative commercialization results from the Phase II project at one year after the start of Phase II, at the completion of Phase II, and after the completion of Phase II (i.e., amount of additional investment, sales revenue, etc.).
- **Format of Cost Volume (Volume 3):** The Cost Volume (and supporting documentation) DOES NOT count toward the page limit of the Technical Volume. Some items in the Cost Breakdown Guidance below may not apply to the proposed project. If such is the case, there is no need to provide information on each and every item. ALL proposed costs should be accompanied by documentation to substantiate how the cost was derived. For example, if you proposed travel cost to attend a project-related meeting or conference, and used a travel website to compare flight costs, include a screen shot of the comparison. Similarly, if you proposed to purchase materials or equipment, and used the internet to search for the best source, include your market research for those items. You do not necessarily have to propose the cheapest item or supplier, but you should explain your decision to choose one item or supplier over another. It's important to provide enough information to allow contracting personnel to understand how the proposer plans to use the requested funds. If selected for award, failure to include the documentation with your proposal will delay contract negotiation, and the proposer will be asked to submit the necessary documentation to the Contracting Officer to substantiate costs (e.g., cost estimates for equipment, materials, and consultants or subcontractors). It is important to respond as quickly as possible to the Contracting Officer's request for documentation. Cost Breakdown Guidance:
 - List all key personnel by name as well as by number of hours dedicated to the project as direct labor.
 - Special tooling and test equipment and material cost may be included. The inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the Government and should be related directly to the specific topic. These may include such items as innovative instrumentation and/or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with NGA; unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by NGA.
 - Cost for travel funds must be justified and related to the needs of the project.
 - Cost sharing is permitted for proposals under this announcement; however, cost sharing is not required nor will it be an evaluation factor in the consideration of a proposal.
 - All subcontractor costs and consultant costs must be detailed at the same level as prime contractor costs in regard to labor, travel, equipment, etc. Provide detailed substantiation

of subcontractor costs in your cost proposal. The Supporting Documents Volume (Volume 5) may be used if additional space is needed. For more information about cost proposals and accounting standards, see the DCAA publication titled "Audit Process Overview – Information for Contractors" available at: <http://www.dcaa.mil>.

- **Company Commercialization Report (Volume 4):** Not available for 20.3
- **Supporting Documents (Volume 5):** The vendor may submit supporting documents (Volume 5) but that material WILL NOT be rated by the evaluation team as part of the proposal evaluation. Items that may go into, not all inclusive, are additional cost proposal information, Completed Form SF328, advocacy letters, etc.
- **Fraud, Waste and Abuse Training (Volume 6):** Will be addressed at time of contract award.

Selection of Direct to Phase II proposals will be in accordance with the evaluation procedures and criteria discussed in this BAA (refer to Section 6.0 and 7.0 of the BAA). As part of subfactor c in the evaluation criteria, the vendor will be evaluated on how it addresses the following five questions on the overall commercialization strategy:

- (1) What is the first product that this technology will go into?
- (2) Who will be the customers, and what is the estimated market size?
- (3) How much money will be needed to bring the technology to market, and how will that money be raised?
- (4) Does the company contain marketing expertise and, if not, how will that expertise be brought into the company?
- (5) Who are the proposing firm's competitors, and what is the price and/or quality advantage over those competitors?

NGA will not continue evaluating the Offeror's related Phase II proposal if it determines that the Offeror failed to demonstrate that feasibility has been established or the Offeror failed to demonstrate work submitted in the feasibility documentation was substantially performed by the Offeror and/or the Principal Investigator.

The NGA SBIR Program reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality in the judgment of the technical evaluation team will be funded. The offeror must be responsive to the topic requirements, as solicited.

An unsuccessful offeror has 3 days after notification that its proposal was not selected to submit a written request for a debriefing to the Contracting Officer (CO). Those offerors who get their written request in within the allotted timeframe above will be provided a debriefing.

Federally Funded Research and Development Contractors (FFRDC) and other government contractors, whom have signed Non-Disclosures Agreements, may be used in the evaluation of your proposal. NGA typically provides a firm fixed price contract for Direct to Phase II awards. The type of contract is at the discretion of the Contracting Officer.

Direct to Phase II contracts will include the following deliverables:

- **Monthly Reporting**
 - A monthly summary of the results of the Phase II research to date
 - A monthly summary of the Phase II tasks not yet completed, with an estimated completion date for each task
 - A statement of potential applications and benefits of the research.

- An interim report no later than 12 months after award describing finding to date and continued way forward, not to be all-inclusive.
- A final report no later than 24 months after award
- A demonstration of the prototype no later than 23 months after award
- Final delivery of the prototype and associated documentation no later than 24 months after award.

The interim report and final report shall be prepared single spaced in 12 pitch Times New Roman font, with at least a one-inch margin on top, bottom, and sides, on 8½" by 11" paper. The pages shall be numbered.

USE OF FOREIGN NATIONALS

Due to the nature of the NGA mission and operations, foreign nationals are restricted from participating or working under certain NGA contracts. The participation of foreign nationals on NGA SBIR contracts is limited to only those that are scoped, proposed and awarded as exclusively Fundamental Research. For contracts that are scoped, proposed and awarded with either a portion of fundamental research, or no fundamental research, the Principle Investigator must be a US citizen, and participation of foreign nationals prohibited. Additionally, foreign nationals are prohibited from exposure to Controlled Unclassified Information.

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

Controlled Unclassified Information (CUI) is information that requires safeguarding or dissemination controls pursuant to and consistent with applicable law, regulations, and government-wide policies but is not classified under Executive Order 13526 or the Atomic Energy Act, as amended.

Executive Order 13556 "Controlled Unclassified Information" (the Order), establishes a program for managing CUI across the Executive branch and designates the National Archives and Records Administration (NARA) as Executive Agent to implement the Order and oversee agency actions to ensure compliance. The Archivist of the United States delegated these responsibilities to the Information Security Oversight Office (ISOO).

32 CFR Part 2002 "Controlled Unclassified Information" was issued by ISOO to establish policy for agencies on designating, safeguarding, disseminating, marking, decontrolling, and disposing of CUI, self-inspection and oversight requirements, and other facets of the Program. The rule affects Federal executive branch agencies that handle CUI and all organizations (sources) that handle, possess, use, share, or receive CUI—or which operate, use, or have access to Federal information and information systems on behalf of an agency.

During performance of this contract, if the government provides the vendor a dataset that is not publically released, the vendor must be CUI Compliant to receive it. For more information on this compliance please see DFARS Clause 252.204-7012, NIST Special Publication SP 800-171 and the National Archives and Records Administration (NARA) website (<https://www.archives.gov/cui/about>).

CERTIFICATE PERTAINING TO FOREIGN INTERESTS

Offers must submit a SF-328 in Volume 5 in order to be considered for award. If after review of the form, the offeror may be found ineligible for award if the offerors foreign interest are found to be unacceptable. The form can be found at <https://www.gsa.gov/forms-library/certificate-pertaining-foreign-interests>.

252.207-7000 DISCLOSURE OF INFORMATION

(a) The Contractor shall not release to anyone outside the Contractor's organization any unclassified information, regardless of medium (e.g., film, tape, document), pertaining to any part of this contract or any program related to this contract, unless-

(1) The Contracting Officer has given prior written approval;
(2) The information is otherwise in the public domain before the date of release; or
(3) The information results from or arises during the performance of a project that involves no covered defense information (as defined in the clause at DFARS 252.204-7012, Safeguarding Covered Defense Information and Cyber Incident Reporting) and **has been scoped and negotiated by the contracting activity with the contractor and research performer and determined in writing by the contracting officer to be fundamental research* (which by definition cannot involve any covered defense information)**, in accordance with National Security Decision Directive 189, National Policy on the Transfer of Scientific, Technical and Engineering Information, in effect on the date of contract award and the Under Secretary of Defense (Acquisition, Technology, and Logistics) memoranda on Fundamental Research, dated May 24, 2010, and on Contracted Fundamental Research, dated June 26, 2008 (available at DFARS PGI 204.4).

(b) Requests for approval under paragraph (a)(1) shall identify the specific information to be released, the medium to be used, and the purpose for the release. The Contractor shall submit its request to the Contracting Officer at least 10 business days before the proposed date for release.

(c) The Contractor agrees to include a similar requirement, including this paragraph (c), in each subcontract under this contract. Subcontractors shall submit requests for authorization to release through the prime contractor to the Contracting Officer.

***Note: This has to be negotiated prior to award of the contract. A request for determination after award will not be entertained.**

5X252.204-7000-90 PUBLIC RELEASE OF INFORMATION

(a) Except as provided in paragraph (b) of this clause, information pertaining to this contract shall not be released to the public unless authorized by the Contracting Officer in accordance with DFARS 252.204-7000, Disclosure of Information. Requests for approval to release information pertaining to this contract shall be submitted to the Contracting Officer by means of NGA Form 5230-1, National Geospatial-Intelligence Agency Request for Clearance for Public Release.

(b) The contractor may provide past performance information regarding this contract, without Contracting Officer approval, to the Office of the Director of National Intelligence (ODNI), the Central Intelligence Agency (CIA), the National Reconnaissance Office (NRO), the National Security Agency (NSA), the Defense Intelligence Agency (DIA), and NGA to support source selections at those agencies. The contractor is responsible for the proper classification and handling of such information and shall provide a copy of the information provided to the Contracting Officer.

5X52.227-9000 UNAUTHORIZED USE OF NGA NAME, SEAL AND INITIALS

(a) As provided in 10 U.S.C. Section 425, no person may, except with the written permission of the Director, National Geospatial-Intelligence Agency, knowingly use the words "National Geospatial-Intelligence Agency", "National Imagery and Mapping Agency" or "Defense Mapping Agency", the initials "NGA", "NIMA" or "DMA", the seal of the National Geospatial-Intelligence Agency, National Imagery and Mapping Agency or the Defense Mapping Agency, or any colorable imitation of such words, initials, or seal in connection with any merchandise, retail product, impersonation, solicitation, or

commercial activity in a manner reasonably calculated to convey the impression that such is approved, endorsed, or authorized by the Director, NGA.

(b) Whenever it appears to the U.S. Attorney General that any person is engaged or about to engage in an act or practice which constitutes or will constitute conduct prohibited by paragraph (a), the Attorney General may initiate a civil proceeding in a district court of the United States to enjoin such act or practice. Such court shall proceed as soon as practicable to hearing and determination of such action and may, at any time before such final determination, enter such restraining orders or prohibition, or take such other action as is warranted, to prevent injury to the United States, or to any person or class of persons whose protection the action is brought.

NGA SBIR Direct to Phase II Topic Index

NGA203-003	Novel Mathematical Foundation for Automated Annotation of Massive Image Data Sets
NGA203-004	High Dimensional Nearest Neighbor Search

NGA203-003 TITLE: Novel Mathematical Foundation for Automated Annotation of Massive Image Data Sets

RT&L FOCUS AREA(S): Autonomy; Artificial Intelligence/Machine Learning
TECHNOLOGY AREA(S): Information Systems; Sensors; Electronics

OBJECTIVE: This announcement seeks proposals that offer dramatic improvements in automated object detection and annotation of massive image data sets. Imaging data is being created at an extraordinary rate from many sources, both from government assets as well as private ones. Automated methods for accurate and efficient object identification and annotation are needed to fully exploit this resource. This topic is focused on new artificial intelligence (AI) methods to effectively and efficiently solve this problem.

DESCRIPTION: Current choke points blocking optimal exploitation of the full stream of available image data include confronting widely different views (perspective, resolution, etc.) of the same or similar objects and the overwhelming amounts of human effort required for effective processing. Current manual processes requires human eyes on every image to perform detection, identification, and annotation. Current state of the art AI requires intensive human support to generate giant training sets. Further, resulting methods frequently generate rule sets that are overly fragile in that training on one object is not transferrable to the detection of another object, even though the object might strike a human as essentially the same, and thus the need for increased human review of the algorithm decisions.

NGA seeks new types of AI tools optimized for the task of object identification and annotation across diverse families of image data that are reliable, robust, not dependent on extensive training demands, are applicable to objects of interest to both government and commercial concerns, and simultaneously be parsimonious with user resources in general. In particular, we seek solutions that make AI outputs both more explainable and more “lightweight” to human users.

The focus of a successful phase 1 effort should be on explaining the mathematical foundation that will enable the significantly improved AI tools described herein. Of specific interest are novel AI constructs that are more principled and universal and less ad hoc than current technology and can be used to construct a tool that performs relevant tasks. For the purposes of this announcement “relevant tasks” are limited to object identification across view types, drawing an object bounding box, and correctly labelling the object in a text annotation. A successful Phase 1 proposal should explain how the mathematical foundation needed to build the required tools will be developed in Phase 1 and implemented in a software toolkit in Phase 2. Examples should be developed during Phase 1 and should illustrate either improved reliability or robustness over the current state of the art, as well as reducing training demands and user resources. Proposals describing AI approaches that are demonstrably at or near the current state of the art in commercial AI performance, such as on ImageNet data sets, are specifically not of interest under this topic. The foundational element of a successful proposal under this topic is exploitation of novel mathematics that will enable new and better AI approaches.

Direct to Phase 2 proposals are being accepted under this topic. A straight to phase 2 proposal should describe pre-existing mathematical foundations and illustrative examples described in the paragraph above. Phase 2 proposals should also propose a set of milestones and demonstrations that will establish the novel AI tools as a viable commercial offering.

PHASE I: A successful Phase 1 proposal should explain how the mathematical foundation needed to build the required tools described herein will be developed in Phase 1. Examples should be developed during Phase 1 and should illustrate either improved reliability or robustness over the current state of the art, as well as reducing training demands and user resources.

PHASE II: The performer shall implement a software toolkit based on the foundations developed in Phase I.

PHASE III DUAL USE APPLICATIONS: Follow-on activities are expected to be aggressively pursued by the offeror, namely in seeking opportunities to build more capable AI algorithms based upon the new mathematical foundation. This will deliver commercial benefits in the forms of improved algorithm performance.

REFERENCES:

None

KEYWORDS: artificial intelligence (AI); automated object detection; annotation of massive image data sets

NGA203-004 TITLE: High Dimensional Nearest Neighbor Search

RT&L FOCUS AREA(S): Autonomy

TECHNOLOGY AREA(S): Information Systems; Sensors; Electronics

OBJECTIVE: This topic seeks research in geolocation of imagery and video media taken at near-ground level [1]. The research will explore hashing/indexing techniques (such as [2]) that match information derived from media to a global reference data. The reference data is composed of digital surface models (DSMs) of known geographical regions and features that can be derived from that surface data, together with limited “foundation data” of the same regions consisting of map data such as might be present in Open Street Maps and landcover data (specifying regions that are fields, vegetation, urban, suburban, etc.). Query data consists of images or short video clips that represent scenes covered by the digital surface model in the reference data, but may or may not have geo-tagged still images in the reference data from the same location.

Selected performers will be provided with sample reference data, consisting of DSM data and a collection of foundation data, and will be provided with sample query data. This sample data is described below. However, proposers might suggest other reference and query data that they will use to either supplement or replace government-furnished sample data. This topic seeks novel ideas for the representation of features in the query data and the reference data that can be used to perform retrieval of geo-located reference data under the assumption that the query data lacks geolocation information. The topic particularly seeks algorithmically efficient approaches such as hashing techniques for retrieval based on the novel features extracted from query imagery and reference data that can be used to perform matching using nearest neighbor approaches in feature space.

DESCRIPTION: The reference data includes files consisting of a vectorized two-dimensional representation of a Digital Surface Model (DSM) [4], relative depth information, and selected foundation feature data. The foundation features will include feature categories such as the locations of roads, rivers, and man-made objects.

The desired output of a query is a location within meters of the ground truth location of the camera that acquired the imagery. In practice, only some of the queries will permit accurate geolocation based on the reference data, and in some cases, the output will be a candidate list of locations, such that the true location is within the top few candidates. It is reasonable to assume that there exists a reference database calculated from a global DSM with a minimum spatial resolution of 30 meters that may, in some locations, provide sub-meter spatial resolution. The foundation feature is at least as rich as that present in Open Street Maps, and can include extensive landcover data with multiple feature types. For the purpose of this topic, the reference data will not include images. Sample reference and query data representative of these assumptions, but of limited geographical areas, will be provided to successful proposers.

The topic seeks approaches that are more accurate than a class of algorithms that attempt to provide geolocation to a general region, such as a particular biome or continent. These algorithms are often based on a pure neural network approach, such as described in [3], and is unlikely to produce sufficient precise camera location information that is accurate to within meters.

The objective system, in full production, should be sufficiently efficient as to scale to millions of square kilometers of reference data, and should be able to process queries at a rate of thousands of square kilometers per minute. While a phase 2 system might provide a prototype at a fraction of these capabilities, a detailed complexity analysis is expected to support the scalability of the system.

The proposed approach may apply to only a subset of query imagery types. For example, the proposed approach may be accurate only for urban data, or only for rural scenes. The proposer should carefully explain the likely limitations of the proposed approach and suggest methods whereby query imagery could be filtered so that only appropriate imagery is processed by the proposed system.

Proposers who can demonstrate prior completion of all of the described Phase I activities may propose a “straight to Phase II” effort. In this case the novelty of the proposed feature and retrieval approach will be a consideration in determining an award.

PHASE I: Based on the proposed approach for feature extraction, representation, and retrieval, develop a detailed prototype implementation plan, with pseudocode that establishes feasibility against a limited reference data set.

PHASE II: Build and test the module designed in Phase 1. Conduct an operational prototype and/or capability demonstration.

PHASE III DUAL USE APPLICATIONS: This capability should allow users to restore location metadata to some percentage of media data that has been stripped of its metadata. This capability might assist in identifying archived imagery to perform legacy analysis, or assist in categorizing and organizing albums of media. This capability is of interest to commercial and government concerns alike.

REFERENCES:

1. G. Baatz, O. Saurer, K. Koser and M. Pollefeys, "Large Scale Visual Geo-Location of Images in Mountainous Terrain," Proceedings of the 12th European Conference on Computer Vision (ECCV), vol. 7573, pp. 517-530, 2012.;
2. A. Andoni and P. Indyk, "Near-Optimal Hashing Algorithms for Approximate Nearest Neighbor in High Dimensions," Comm. ACM, vol. 51, pp. 117-122, 2008.;
3. T. Weyand, I. Kostrikov and J. Philbin, "PlaNet - Photo Geolocation with Convolutional Neural Networks," European Conference on Computer Vision (ECCV), pp. 6-7, 2016.;
4. J. Zhu, N. Vander Valk, M. Bansal and H. Cheng, "Adaptive Rendering for Large-Scale Skyline Characterization and Matching," Computer Vision - ECCV 2012 - Workshops and Demonstrations, pp. 163-174, 2012.;
5. F. Cong and C. Deng, "EFANNA: An Extremely Fast Approximate Nearest Neighbor Search Algorithm Based on kNN Graph," ArXiv, p. 1609.07228, 2016.

KEYWORDS: digital surface models (DSMs); hashing/indexing; geolocation

Defense Human Resources Activity (DHRA)
Office of the Secretary of Defense (OSD)
20.3 Small Business Innovation Research (SBIR) Program
Proposal Submission Instructions

The Defense Human Resources Activity (DHRA) SBIR Program seeks small businesses with strong research and development capabilities to pursue and commercialize technologies.

Broad Agency Announcement (BAA), topic, and general questions regarding the SBIR Program should be addressed according to the DoD SBIR Program BAA. For technical questions about a topic during the pre-release period, contact the Topic Author(s) listed for each topic in the BAA. To obtain answers to technical questions during the formal BAA period, visit <https://www.dodsbirsttr.mil/submissions>.

PHASE I PROPOSAL SUBMISSION

Follow the instructions in the DoD SBIR Program BAA for program requirements and online proposal submission instructions.

DHRA SBIR Phase I Proposals have four Volumes: Proposal Cover Sheets, Technical Volume, Cost Volume and Company Commercialization Report. **Please note that the DHRA SBIR will not be accepting a Volume Five (Supporting Documents) as noted at the DoD SBIR website.** The Technical Volume has a 10-page limit including: table of contents, pages intentionally left blank, references, letters of support, appendices, technical portions of subcontract documents (e.g., statements of work and resumes) and any other attachments. Do not duplicate the electronically generated Cover Sheet or put information normally associated with the Technical Volume in other sections of the proposal as these will count toward the 10-page limit.

Only the electronically generated Cover Sheet and Cost Volume are excluded from the 10-page limit. Technical Volumes that exceed the 10-page limit will be reviewed only to the last word on the 10th page. Information beyond the 10th page will not be reviewed or considered in evaluating the offeror's proposal. To the extent that mandatory technical content is not contained in the first 10 pages of the proposal, the evaluator may deem the proposal as non-responsive and score it accordingly.

Note: The Company Commercialization Report (CCR) will NOT be available during the 20.3 BAA cycle. No Commercialization Achievement Index (CAI) will be generated. The CCR will be available for future DoD BAA cycles. If the CCR is available at the time of the Phase II submission for any awarded Phase I efforts resulting from this BAA, the proposing firm is required to submit the CCR for its Phase II proposal.

Companies submitting a Phase I proposal under this BAA must complete the Cost Volume using the on-line form, within a total cost not to exceed \$256,000.00 over a period of up to six months.

Proposals not conforming to the terms of this BAA, and unsolicited proposals, will not be considered. Awards are subject to the availability of funding and successful completion of contract negotiations.

EVALUATION CRITERIA

Proposals will be evaluated based on the criteria outlined below. Selections will be based on best value to the Government considering the following factors which are listed in descending order of importance:

- a. The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.
- b. The qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.
- c. The potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization.

Cost reasonableness and realism shall also be considered to the extent appropriate.

Technical reviewers will base their conclusions only on information contained in the proposal. It cannot be assumed that reviewers are acquainted with the firm or key individuals or any referenced experiments. Relevant supporting data such as journal articles, literature, including Government publications, etc., should be contained or referenced in the proposal and will count toward the page limit.

TECHNICAL INQUIRIES

During the Pre-release Period of the DoD 20.3 SBIR Broad Agency Announcement (BAA), any questions should be limited to specific information that improves the understanding of a particular topic's requirements. All questions must be submitted in writing either by email to the TPOC listed or posted in the online SBIR/STTR Topic Q&A portal (formerly SITIS) – all questions and answers will be released to the general public. All inquiries must include the topic number in the subject line of the e-mail.

During the Open Period, all questions must be posted in the online Topic Q&A portal (formerly SITIS). Please follow the instructions in section 4.13.d of the DoD 20.3 SBIR BAA Instructions.

PROPOSAL SUBMISSION

In order to participate in the DHRA SBIR Program, all potential proposers should register on the DoD SBIR/STTR Web site at <https://www.dodsbirsttr.mil/submissions> as soon as possible. This site contains step-by-step instructions for the preparation and submission of the complete proposal. It is required that all proposers submit their proposal electronically through the DoD SBIR/STTR Proposal Submission Web site at <https://www.dodsbirsttr.mil/submissions>. For general inquiries or questions about the proposal electronic submission process, contact the DoD SBIR Help Desk at DoDSBIRSupport@reisystems.com (9:00 a.m. to 5:00 p.m. ET Monday - Friday).

Proposals shall be submitted in response to the specific DHRA topic identified in the topic description section following these instructions.

DHRA does not provide Direct Technical and Business Assistance (TABAs).

DHRA SBIR Program Point of Contact:

General inquiries concerning the DHRA SBIR Program should be addressed to:

Ms. Tammy Proffitt, SBIR Program Manager
Tammy.j.proffitt2.civ@mail.mil

OSD DHRA SBIR 20.3 Topic Index

OSD203-004	Domain-Specific Text Analysis
OSD203-005	Modernization of Biometric Capture

OSD203-004 TITLE: Domain-Specific Text Analysis

RT&L FOCUS AREA(S): Artificial Intelligence/Machine Learning

TECHNOLOGY AREA(S): Information Systems; Human Systems

OBJECTIVE: Develop text analysis software that leverages current Natural Language Processing (NLP) algorithms and techniques, (e.g., Bayesian algorithms, word embeddings, recurrent neural networks) for accurately conducting content and sentiment analysis, as well as dictionary development.

DESCRIPTION: The United States Department of Defense (DoD) collects large amounts of text data from their personnel using a variety of different formats including opinion/climate surveys, memoranda, incident reports, standard forms, and transcripts of focus group/sensing sessions. Much of these data are used operationally; however, recent interest in the leveraging of text data to glean insight into personnel trends/behaviors/intentions has prompted a greater degree of research in NLP. Additionally, Topic Modeling and Sentiment Analysis have been explored by various research arms of the DoD; however, two foundational hurdles exist that need to be addressed before they can realistically be applied to the DoD:

First, the varied use of jargon, nomenclature, and acronyms across the DoD and Service Branches must be more comprehensively understood. Additionally, development of a “DoD Dictionary” should enable the fluid use of extant and newly-created jargon, phrases, and sayings used over time.

Second, the emergent nature and rapid innovation of NLP techniques has made bridging the technical gap between DoD analysts and tools difficult. Additionally, the understanding and interpreting of NLP techniques by non-technical leadership is particularly difficult. There currently exists no standard format or package that can be used to analyze and develop visualizations for text data in such a way that accommodates the needs of operational leadership to make decisions regarding personnel policies or actions.

PHASE I: Expectations for this Phase I feasibility study include, but are not limited to, a white paper detailing software designed to assist the user in:

- Summarizing key content across a range of sources or in a single document
- Capturing document-germane sentiment, assessing the tone, intent, and social content
- Determining the reasons for themed statements
- Identifying relationships among themes
- Effectively parsing and combining findings, such as aggregate results by service, occupation, or other demographics, where possible
- Accommodating the plethora of DoD, Service, and DoD civilian nomenclature, jargon, and acronyms

Design of the user interface may be primarily icon-driven, and should be intuitive and easy to maneuver for those with limited technological experience. At the same time, the program should include accessible syntax using, or derived from, one or more open source programming languages for transparency and customization for more technically-adept users. Efforts should also address how the software could provide hints to users regarding candidate issues/topics to include, along with candidate contexts to consider including in the detailed analysis, based on a preliminary analysis of the text.

PHASE II: The Phase II effort shall take the white paper solution to development and software pilot and address the following key requirements in implementation:

- 1) Accommodating domain-specific terms (words, phrases, sayings) into a comprehensive and flexible dictionary that can be regularly/continuously updated with information regarding the sentiment associated with DoD-specific terms, as well as any incipient or ubiquitous meanings/sentiment associated with otherwise universal words or terms
- 2) Maintainable and updatable software solution for conducting NLP text analysis and briefing the results using domain-specific sentiment/understanding, i.e. a GUI or other easily workable “dashboard” for non-technical users to leverage in such a way that they can identify, track, and communicate potential trends and (where possible) forecast areas of concern (i.e., user-identified “hot button” topics) with regard to personnel opinions, attitudes, or contemplated or disclosed behaviors that may require attention by non-technical leadership.

PHASE III DUAL USE APPLICATIONS: Examples of Phase III military applications include: A persistently running text-analysis platform capable of automatically identifying emerging patterns or areas of concern in any of the DoD’s free-text data collection efforts. These may include, but are not limited to, personnel satisfaction surveys, standard forms, incident reports, and the like. Examples of commercial applications include: A flexible software platform enabling corporate-level analysis of text-data to potentially include opinion/climate surveys, HR forms, or complaint reports to identify emerging trends in personnel attitudes/behaviors.

REFERENCES:

1. <https://patents.google.com/patent/US7197449B2/en>
2. <https://www.aclweb.org/anthology/W14-6002.pdf>

KEYWORDS: Artificial Intelligence Software, Natural Language Processing Software, Automated Text Summarization, Text Analytics, Predictive Modeling, Corpus, Word Recognition, Topic Modeling, Concept Drift

OSD203-005 TITLE: Modernization of Biometric Capture

RT&L FOCUS AREA(S): Cybersecurity

TECHNOLOGY AREA(S): Information Systems

OBJECTIVE: Develop a concept for capturing iris scans. Conceptualize and design an innovative biometric repository for capturing facial scans.

DESCRIPTION: DMDC can collect 10-fingerprint collections, iris scans, and facial scans from various sources. The primary population for biometric collection by DMDC consists of “Blue Force” personnel, such as Service Members, DoD Contractors, and DoD Civilians and Family Members. Upon capture of these biometrics, DMDC must ensure there are robust storage capabilities that are adequately protected and capable of processing stored biometrics for identity resolution and authentication efficiently.

4

Biometric data gathering and storage technology exists today. However, the integration of stored biometric data for the use of identity verification and authentication is limited and not widely used. The purpose of this research is to provide analytical and laboratory studies applying research to perform advanced technology development to integrate stored biometric data technology with verification and authentication technologies.

PHASE I:

- Design a concept for capturing, storing, and using biometrics for person verification and authentication
- Design/develop an innovative concept along with the limited testing of materials for the above
- Provide a plan for practical deployment of the proposed concept.

PHASE II: Phase II will involve the following: COA 1) Leverage the findings from Phase 1, develop and demonstrate a prototype; COA 2) Develop concept for capturing iris scans; COA 3) Conceptualize and design an innovative biometric repository for capturing facial scans. The TRLs for this phase are:

- Non-Hardware and Software - TRL #7
- Hardware and Software – TRL #6

PHASE III DUAL USE APPLICATIONS: This research has the potential to strengthen proofing and authentication controls to DoD networks and physical buildings. The results will be applicable to other federal agencies and the commercial world to enhance security for online banking, ecommerce, and protecting data. It would provide methods for government agencies and corporate entities to capture and validate biometrics as a form of identity proofing, verification, and authentication instead of in person proofing or less secure forms of authentication. Many agencies and corporations need this capability to securely provide self-service online services.

REFERENCES:

1. Technology Insight for Biometric Authentication, Gartner, 2018;
2. Department of Defense Instruction 1000.13 Identification (ID) Cards for Members of the Uniformed Services, Their Dependents, and Other Eligible Individuals, Department of Defense, 2017
3. Federal Information Processing Standards 201-2 Personal Identity Verification (PIV) of Federal Employees and Contractors, National Institute of Standards and Technology, 2013
4. Department of Defense Directive 8521.01E DoD Biometrics, Department of Defense, 2016
5. Special Publication 800-79-2 Guidelines for the Authorization of PIV Card Issuers and Derived PIV Credential Issuers, National Institute of Standards and Technology, 2015

6. Special Publication 800-63A Digital Identity Guidelines: Enrollment and Identity Proofing, National Institute of Standards and Technology, 2017
7. Regulation 680-3 Personnel Information Systems Entrance Processing and Reporting System Management, United States Military Entrance Processing Command, 2018

KEYWORDS: Identity Management, Biometrics, Facial Recognition, Authentication, and Identity Verification.

Joint Service Small Arms Program (JSSAP)
Office of the Secretary of Defense (OSD)
20.3 Small Business Innovation Research (SBIR)
Direct to Phase II
Proposal Submission Instructions

IMPORTANT

Deadline for Receipt: Proposals must be **completely** submitted and certified no later than **12:00 p.m.** ET, **November 05, 2020**. Proposals submitted after 12:00 p.m. will not be evaluated.

Proposers must follow all instructions as provided in the DoD SBIR 2020.3 BAA Instructions at <https://www.dodsbirsttr.mil/submissions>, EXCEPT for the specific deviations listed below.

Help Desk: If you have questions about the Defense Department's SBIR or STTR Programs, please call the DoD SBIR/STTR Help Desk email DoDSBIRSupport@reisystems.com (Monday through Friday, 9:00 a.m. to 5:00 p.m. ET).

INTRODUCTION

The Joint Service Small Arms Program (JSSAP) is participating under the OSD SBIR Program on this SBIR 20.3 Broad Agency Announcement (BAA).

Proposers responding to the JSSAP topic listed in this Announcement must follow all instructions provided in the DoD SBIR 20.3 Broad Agency Announcement (BAA) posted on the DoD SBIR/STTR website at: <https://www.dodsbirsttr.mil/submissions>.

Firms with strong research and development capabilities in science or engineering in any of the topic areas described in this section, and with the ability to commercialize the results, are encouraged to participate. The OSD SBIR Program will support high quality research and development proposals of innovative concepts to solve the listed defense-related scientific or engineering problems, especially those concepts that also have high potential for commercialization in the private sector.

Objectives of the OSD SBIR Program include stimulating technological innovation, strengthening the role of small business in meeting DOD research and development needs, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DOD-supported research and development results. The guidelines presented in the announcement incorporate and exploit the flexibility of the SBA Policy Directive to encourage proposals based on scientific and technical approaches most likely to yield results important to DoD and the private sector.

CHART 1: Consolidated SBIR Topic Information

Applicable Topics	Direct to Phase II			
	Technical Volume (Vol 2)	Additional Info (Vol 5)	Award Amount	Technical Duration
OSD203-D003	Not to exceed 30 pages	N/A	Base Period: \$1,000,000 Option Period: \$500,000 Not to exceed total award amount: \$1,500,000	Base Period: 12 months Option Period: 6 months Total Duration: 18 months

DIRECT TO PHASE II

15 U.S.C. §638 (cc), as amended by NDAA FY2012, Sec. 5106, and further amended by NDAA FY2019, Sec. 854, PILOT TO ALLOW PHASE FLEXIBILITY, allows the Department of Defense to make an award to a small business concern under Phase II of the SBIR program with respect to a project, without regard to whether the small business concern was provided an award under Phase I of an SBIR program with respect to such project. OSD is conducting a Direct to Phase II (DP2) implementation of this authority for this 20.3 SBIR Announcement and does not guarantee DP2 opportunities will be offered in future Announcements.

Proposers interested in submitting a DP2 proposal in response to an eligible topic must provide documentation to substantiate that the scientific and technical merit and feasibility described in the Phase I section of the topic has been met and describes the potential commercial applications. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results. Work submitted within the feasibility documentation must have been substantially performed by the proposer and/or the PI.

OSD will not evaluate the proposer's related Phase II proposal if it determines that the proposer has failed to demonstrate that technical merit and feasibility has been established or the proposer has failed to demonstrate that work submitted in the feasibility documentation was substantially performed by the proposer and/or the PI.

Feasibility documentation cannot be based upon any prior or ongoing federally funded SBIR or STTR work and DP2 proposals MUST NOT logically extend from any prior or ongoing federally funded SBIR or STTR work.

The OSD SBIR Program reserves the right to not make any awards under this DP2 announcement. The Government is not responsible for expenditures by the offeror prior to award of a contract. All awards are subject to availability of funds and successful negotiations.

PROPOSAL SUBMISSION

Proposers are REQUIRED to submit UNCLASSIFIED proposals via the Defense SBIR/STTR Innovation Portal (DSIP) at <https://www.dodsbirsttr.mil/submissions/>. Firms submitting through this site for the first time will be asked to register. It is recommended that firms register as soon as possible upon identification of a proposal opportunity to avoid delays in the proposal submission process. Submission deadlines are strictly enforced. Proposals submitted by any other means will be disregarded.

Full proposal packages must be submitted by 12:00 PM EST on **November 5, 2020**.

DIRECT TO PHASE II PROPOSAL PREPARATION INSTRUCTIONS AND PROPOSAL REQUIREMENTS

The Technical Volume is limited to 30 pages, which includes 10 pages for the feasibility documentation and 20 pages for the Phase II Technical Proposal. The Cover Sheet, Cost Volume and Commercialization Report do not count toward the 30-page limitation. The Government will not consider pages in excess of the page count limitations.

Phase II proposals require a comprehensive, detailed submission of the proposed effort. OSD Direct to Phase II efforts are awarded up to a maximum value of the dollar amounts and duration listed in Chart 1.

A. Proposal Cover Sheet (Volume 1): Complete as specified in DoD SBIR BAA section 5.

B. Format of Technical Volume (Volume 2):

- (1) The Technical Volume must include two parts, PART ONE: Feasibility Documentation and PART TWO: Technical Proposal.
- (2) Type of file: The Technical Volume must be a single Portable Document Format (PDF) file, including graphics. Perform a virus check before uploading the Technical Volume file. If a virus is detected, it may cause rejection of the proposal. Do not lock or encrypt the uploaded file. Do not include or embed active graphics such as videos, moving pictures, or other similar media in the document.
- (3) Layout: Number all pages of your proposal consecutively. Font size should not be smaller than 10-point on standard 8-1/2" x 11" paper with one-inch margins. The header on each page of the Technical Volume should contain your company name, topic number, and proposal number assigned by DSIP when the Cover Sheet was created. The header may be included in the one-inch margin.

C. Content of the Technical Volume (Volume 2)

PART ONE: Feasibility Documentation

- Provide documentation to substantiate that the scientific and technical merit and feasibility described in the Phase I section of the topic has been met and describes the potential commercial applications. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results.
- Maximum page length for feasibility documentation is 10 pages. If you have references, include a reference list or works cited list as the last page of the feasibility documentation. This will count towards the page limit.
- Work submitted within the feasibility documentation must have been substantially performed by the proposer and/or the PI.
- If technology in the feasibility documentation is subject to Intellectual Property (IP), the proposer must either own the IP, or must have obtained license rights to such technology prior to proposal submission, to enable it and its subcontractors to legally carry out the proposed work. Documentation of IP ownership or license rights shall be included in the Technical Volume of the proposal
- DO NOT INCLUDE marketing material. Marketing material will NOT be evaluated.

PART TWO: Technical Proposal

Maximum page length for the technical proposal is 20 pages. If you have references, include a reference list or works cited list as the last page of the technical proposal. This will count towards the page limit.

- (1) Significance of the Problem. Define the specific technical problem or opportunity addressed and its importance.
- (2) Phase II Technical Objectives. Enumerate the specific objectives of the Phase II work, and describe the technical approach and methods to be used in meeting these objectives.
- (3) Phase II Statement of Work. The statement of work should provide an explicit, detailed description of the Phase II approach, indicate what is planned, how and where the work will be carried out, a schedule of major events and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail. This section should be a substantial portion of the total proposal.
 - a) Phase II Option Statement of Work The statement of work should provide an explicit, detailed description of the activities planned during the Phase II Option, if exercised. Include how and where the work will be carried out, a schedule of major events and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail.
- (4) Related Work. Describe significant activities directly related to the proposed effort, including any conducted by the PI, the proposer, consultants or others. Describe how these activities interface with the proposed project and discuss any planned coordination with outside sources. The proposal must persuade reviewers of the proposer's awareness of the state of the art in the specific topic. Describe previous work not directly related to the proposed effort but similar.

Provide the following: (1) short description, (2) client for which work was performed (including individual to be contacted and phone number) and (3) date of completion.

- (5) Relationship with Future Research or Research and Development.
- a) State the anticipated results of the proposed approach if the project is successful.
 - b) Discuss the significance of the Phase II effort in providing a foundation for Phase III research and development or commercialization effort.
- (6) Key Personnel. Identify key personnel who will be involved in the Phase II effort including information on directly related education and experience. A concise resume of the PI, including a list of relevant publications (if any), must be included. All resumes count toward the page limitation. Identify any foreign nationals you expect to be involved on this project.
- (7) Foreign Citizens. Identify any foreign citizens or individuals holding dual citizenship expected to be involved on this project as a direct employee, subcontractor, or consultant. For these individuals, please specify their country of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project. Supplemental information provided in response to this paragraph will be protected in accordance with the Privacy Act (5 U.S.C. 552a), if applicable, and the Freedom of Information Act (5 U.S.C. 552(b)(6)).
- (8) Facilities/Equipment. Describe available instrumentation and physical facilities necessary to carry out the Phase II effort. Items of equipment to be purchased (as detailed in the cost proposal) shall be justified under this section. Also state whether or not the facilities where the proposed work will be performed meet environmental laws and regulations of federal, state (name) and local Governments for, but not limited to, the following groupings: airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal practices and handling and storage of toxic and hazardous materials.
- (9) Subcontractors/Consultants. Involvement of a university or other subcontractors or consultants in the project may be appropriate. If such involvement is intended, it should be identified and described according to the Cost Breakdown Guidance. Please refer to section 4 of the DoD BAA for detailed eligibility requirements as it pertains to the use of subcontractors/consultants.
- (10) Prior, Current or Pending Support of Similar Proposals or Awards. If a proposal submitted in response to this topic is substantially the same as another proposal that was funded, is now being funded, or is pending with another Federal Agency, or another or the same DoD Component, you must reveal this on the Proposal Cover Sheet and provide the following information:
- a) Name and address of the Federal Agency(s) or DoD Component to which a proposal was submitted, will be submitted, or from which an award is expected or has been received.
 - b) Date of proposal submission or date of award.
 - c) Title of proposal.
 - d) Name and title of the PI for each proposal submitted or award received.

- e) Title, number, and date of BAA(s) or announcement(s) under which the proposal was submitted, will be submitted, or under which award is expected or has been received.
- f) If award was received, state contract number.
- g) Specify the applicable topics for each proposal submitted or award received.

Note: If this does not apply, state in the proposal "No prior, current, or pending support for proposed work."

- (11) Commercialization Strategy. Discuss key activities to achieve commercialization of the funded research into a product or non-R&D service with widespread commercial use – including private sector and/or military markets. Note that the commercialization strategy is separate from the Commercialization Report required in Volume 4. The strategy addresses how you propose to commercialize this research, while the Company Commercialization Report covers what you have done to commercialize the results of past Phase II awards.

The commercialization strategy must address the following questions:

- a) What DoD Program and/or private sector requirement does the technology propose to support?
- b) What customer base will the technology support, and what is the estimated market size?
- c) What is the estimated cost and timeline to bring the technology to market to include projected funding amount and associated sources?
- d) What marketing strategy, activities, timeline, and resources will be used to enhance commercialization efforts?
- e) Who are your competitors, and describe the value proposition and competitive advantage over the competition?

D. Content of the Cost Volume (Volume 3)

Complete the Cost Volume by using the on-line cost volume form on the Defense SBIR/STTR Innovation Portal (DSIP). Some items in the Cost Breakdown Guidance may not apply to the proposed project. If that is the case, there is no need to provide information on each and every item. What matters is that enough information be provided to allow us to understand how you plan to use the requested funds if a contract is awarded.

- (1) List all key personnel by name as well as by number of hours dedicated to the project as direct labor.
- (2) While special tooling and test equipment and material cost may be included, the inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Component Contracting Officer, be advantageous to the Government and should be related directly to the specific topic. These may include such items as innovative instrumentation or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with the DoD Component, unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by the DoD Component.
- (3) Cost for travel funds must be justified and related to the needs of the project.
- (4) Cost sharing is permitted for proposals under this BAA; however, cost sharing is not required nor

will it be an evaluation factor.

(5) A Phase II Option should be fully costed separately from the Base approach.

(6) All subcontractor costs and consultant costs must be detailed at the same level as prime contractor costs in regard to labor, travel, equipment, etc. Provide detailed substantiation of subcontractor costs in your cost proposal. Enter this information in the Explanatory Material section of the on-line cost proposal form.

If the proposal is selected for a potential award, you must be prepared to submit further documentation to the Component Contracting Officer to substantiate costs (e.g., an explanation of cost estimates for equipment, materials, and consultants or subcontractors). For more information about cost proposals and accounting standards, see <http://www.dcaa.mil>. Click on “Guidance” and then click on “Audit Process Overview Information for Contractors.”

E. Company Commercialization Report (Volume 4) The Company Commercialization Report (CCR) will NOT be available during the 20.3 BAA cycle. No Commercialization Achievement Index (CAI) will be generated. The CCR will be available for future DoD BAA cycles.

METHOD OF SELECTION AND EVALUATION CRITERIA

Phase II proposals will be evaluated based on the criteria outlined in section 8 of the DoD 20.3 SBIR BAA Instructions.

OSD JSSAP SBIR 20.3 Topic Index

OSD203-D003 High Temperature, Corrosion, Erosion, and Wear Resistant Coatings for Small Arms
Barrels and Suppressors

OSD203- D003 TITLE: High Temperature, Corrosion, Erosion, and Wear Resistant Coatings for Small Arms Barrels and Suppressors

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Materials/Processes, Weapons

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop and demonstrate a high temperature, corrosion, and wear resistant coating / plating for use on small caliber weapon system barrels and signature suppressors.

DESCRIPTION: Small caliber weapon system barrels and signature suppressors operate in a high temperature, chemically corrosive, and high mechanical wear environment. This environment leads to rapid deterioration of substrate materials and ultimately, failure of the barrel or signature suppressor to meet performance requirements. In extreme cases, the combination of extreme environments can cause catastrophic failure of the weapon system component, resulting in injury to the operator. Future weapon systems are anticipated to further push the extremes with a combination of hotter flame temperature and more chemically corrosive propellants, higher pressures, and harder projectiles. Traditionally, the bore of small caliber barrels are plated with hard chrome, however the chrome application process results in environmentally hazardous byproducts. Additionally, hard chrome does not sufficiently perform under the required conditions, and is not applicable to all materials.

There is a need for the development of coatings / plating for barrel bores and signature suppressor internal surfaces which can perform / remain adhered under extreme temperatures, and which prevent chemical and mechanical corrosion associated with small arms firing. Proposed coatings / plating shall be compatible chemically, thermally, and mechanically with a variety of materials, both traditional and novel, that may be used for barrels and signature suppressors. Proposed coating / plating materials and application processes shall be compatible with small caliber barrel bores as small as 5.56mm in diameter, and signature suppressors with numerous deep hidden features. Additionally, proposed coatings / plating shall prevent buildup / fouling of carbon as well as gilding metals that are commonly found in gas systems, and suppressors after extended firing. Further, application processes shall take into account the requirements of the coated / plated components in the small arms system – the application processes shall not adversely affect the substrate material in ways that may affect performance, including dimensional changes or effects on material properties, such as strength or fatigue life. Non-line of sight application is required in order to apply the coating or plating to the internal surfaces of the bore and signature suppressor.

PHASE I: Given the direct to Phase II nature of this effort, a determination of Phase I equivalency will be made which will require proof that the proposed coating / plating is sufficiently mature to be funded at a Phase II level. Documentation showing prior work coating / plating of small arms systems and/or components or a related field is required. A report detailing the Phase I equivalent efforts should be included. Phase I equivalent effort documentation shall include some or all of the following:

- Baseline or existing coating / plating properties to be used as starting point for this application, including:

- Coating thickness
- Coating hardness
- Coefficient(s) of friction
- Corrosion resistance
- Color ranges
- Operating temperatures and thermal stability
- Adhesion to substrate
- Chemical compatibility
- Application limitations, including internal diameter limitations, Line of sight or Non-Line of sight, substrate compatibility, etc.
- Baseline or existing coating / plating application parameters, including:
 - Application temperature
 - Application time
 - Other relevant application parameters
- Baseline or existing coating / plating performance, including
 - Description of the system and operating environment that the existing coating is applied to
 - Performance metrics and data in that application
- Cost of the baseline or existing coating / plating
- Estimated or predicted properties of the proposed coating / plating, including:
 - Coating thickness
 - Coating hardness
 - Coefficient(s) of friction
 - Corrosion resistance
 - Color ranges
 - Operating temperatures and thermal stability
 - Adhesion to substrate
 - Chemical compatibility
 - Application limitations, including internal diameter limitations, Line of sight or Non-Line of sight, substrate compatibility, etc.
- Predicted application parameters of the proposed coating / plating, including:
 - Application temperature
 - Application time
 - Other relevant application parameters
- Results of all analyses performed to show that the proposed development process will result in coating / plating that will meet the Government's needs, including
 - Results of modeling and simulation
 - Results of all analyses, including chemical, thermal, and structural analyses
 - Ability of the coating / plating to be applied to the internal bore of the barrel and internal features of a signature suppressor
 - Overall predicted performance in use as a small caliber bore coating or an internal signature suppressor coating
- Estimated cost of proposed coating / plating

The Offeror is encouraged to provide any other relevant information to substantiate that the proposed coating / plating is at an acceptable stage to be funded at the DP2 level.

PHASE II: The primary deliverables for Phase II shall be:

- Development of one or more coating(s) / plating(s) formulations and associated application processes that meet the Government's requirements. This deliverable includes all necessary documentation to define the formulation as well as the application process.

- A comprehensive report that documents the entirety of the effort. The report shall highlight the development process, results of all analyses performed throughout the development process, results of destructive testing (i.e. coating thickness in sectioned barrels and suppressors), and contractor's test results in lab (coupon testing) as well as simulated operational environment (live fire testing of coated barrels and/or signature suppressors). The report shall highlight and address any shortcomings in performance, propose potential fixes to these shortcomings, and shall address any anticipated challenges with scaling to full rate production. The report shall also provide estimates of the cost to implement the proposed coating / plating in a production setting.
- Quantity of ten (10) coated / plated coupons sized to be used in the Government-owned small caliber Vented Erosion Simulator (VES).
- One or both of the following:
 - Quantity of five (5) small caliber barrels with coated / plated bores (weapon system / caliber to be determined – barrels may be provided as GFM).
 - Quantity of five (5) signature suppressors with internal features coated / plated (specific suppressor to be determined – suppressor may be provided as GFM).

Upon successful completion of the primary deliverables, an Option Period may be exercised. The primary deliverables for the Option Period will be one or more of the following:

- Additional Science and Technology development of coatings to improve performance in extreme operating regimes
- Application of coating / plating to additional quantities of barrels and/or suppressors that represent either challenging performance requirements or challenging application requirements.

PHASE III DUAL USE APPLICATIONS: Virtually all small caliber weapon systems, commercial and military, would benefit from improved barrel systems. There is a large commercial market for small arms, and much money is spent by individuals upgrading barrels and adding suppressors to their personal firearms. An Offeror would likely need to partner with an OEM barrel or suppressor manufacturer and have this technology offered as part of the item itself, since it is unlikely that existing barrels or suppressors would be able to be coated or plated at a reasonable cost to the consumer.

REFERENCES:

1. Xiaolong Li, Yong Zang, Lei Mu, Yong Lian, Qin Qin, 2020, Erosion analysis of machine gun barrel and lifespan prediction under typical shooting conditions, *Wear*, Volumes 444–445, 203177, ISSN 0043-1648, <https://doi.org/10.1016/j.wear.2019.203177>

KEYWORDS: Barrel, suppressor, advanced coating, high temperature, bore erosion, small caliber, small arms

**Manufacturing Technology Program (ManTech)
Office of the Secretary of Defense (OSD)
20.3 Small Business Innovation Research (SBIR) Program
Proposal Submission Instructions**

The DoD Manufacturing Technology Program (ManTech) SBIR Program seeks small businesses with strong research and development capabilities to pursue and commercialize technologies.

Broad Agency Announcement (BAA), topic, and general questions regarding the SBIR Program should be addressed according to the DoD SBIR Program BAA. For technical questions about a topic during the pre-release period, contact the Topic Author(s) listed for each topic in the BAA. To obtain answers to technical questions during the formal BAA period, visit <https://www.dodsbirsttr.mil/submissions>.

PHASE I PROPOSAL SUBMISSION

Follow the instructions in the DoD SBIR Program BAA for program requirements and online proposal submission instructions.

ManTech SBIR Phase I Proposals have four Volumes: Proposal Cover Sheets, Technical Volume, Cost Volume and Company Commercialization Report. **Please note that the ManTech SBIR will not be accepting a Volume Five (Supporting Documents) as noted at the DOD SBIR website.** The Technical Volume has a 10-page limit including: table of contents, pages intentionally left blank, references, letters of support, appendices, technical portions of subcontract documents (e.g., statements of work and resumes) and any other attachments. Do not duplicate the electronically generated Cover Sheets or put information normally associated with the Technical Volume in other sections of the proposal as these will count toward the 10-page limit.

Only the electronically generated Cover Sheet and Cost Volume are excluded from the 10-page limit. Technical Volumes that exceed the 10-page limit will be reviewed only to the last word on the 10th page. Information beyond the 10th page will not be reviewed or considered in evaluating the offeror's proposal. To the extent that mandatory technical content is not contained in the first 10 pages of the proposal, the evaluator may deem the proposal as non-responsive and score it accordingly.

Note: The Company Commercialization Report (CCR) will NOT be available during the 20.3 BAA cycle. No Commercialization Achievement Index (CAI) will be generated. The CCR will be available for future DoD BAA cycles. If the CCR is available at the time of the Phase II submission for any awarded Phase I efforts resulting from this BAA, the proposing firm is required to submit the CCR for its Phase II proposal.

Companies submitting a Phase I proposal under this BAA must complete the Cost Volume using the on-line form, within a total cost not to exceed \$167,000.00 over a period of up to twelve months.

Proposals not conforming to the terms of this BAA, and unsolicited proposals, will not be considered. Awards are subject to the availability of funding and successful completion of contract negotiations.

EVALUATION CRITERIA

Proposals will be evaluated based on the criteria outlined below. Selections will be based on best value to the Government considering the following factors which are listed in descending order of importance:

- d. The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.
- e. The qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.
- f. The potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization.
- g. Potential of utilization and/or collaboration with a Department of Defense sponsored Manufacturing Innovation Institute and/or their component members

Cost reasonableness and realism shall also be considered to the extent appropriate.

Technical reviewers will base their conclusions only on information contained in the proposal. It cannot be assumed that reviewers are acquainted with the firm or key individuals or any referenced experiments. Relevant supporting data such as journal articles, literature, including Government publications, etc., should be contained or referenced in the proposal and will count toward the page limit.

TECHNICAL INQUIRIES

During the Pre-release Period of the DoD 20.3 SBIR Broad Agency Announcement (BAA), any questions should be limited to specific information that improves the understanding of a particular topic's requirements. All questions must be submitted in writing either by email to the TPOC listed or posted in the online SBIR/STTR Topic Q&A portal (formerly SITIS) – all questions and answers will be released to the general public. All inquiries must include the topic number in the subject line of the e-mail.

During the Open Period, all questions must be posted in the online Topic Q&A portal. Please follow the instructions in section 4.13.d of the DoD 20.3 SBIR BAA Instructions.

PROPOSAL SUBMISSION

In order to participate in the ManTech SBIR Program, all potential proposers should register on the DoD SBIR/STTR Web site at <https://www.dodsbirsttr.mil/submissions> as soon as possible. This site contains step-by-step instructions for the preparation and submission of the complete proposal. It is required that all proposers submit their proposal electronically through the DoD SBIR/STTR Proposal Submission Web site at <https://www.dodsbirsttr.mil/submissions>. For general inquiries or questions about the proposal electronic submission process, contact the DoD SBIR Help Desk at DoDSBIRSupport@reisystems.com (9:00 a.m. to 5:00 p.m. ET Monday - Friday).

Proposals shall be submitted in response to the specific ManTech topic identified in the topic description section following these instructions.

ManTech does not provide Direct Technical and Business Assistance (TABAs).

ManTech SBIR Program Point of Contact:

General inquiries concerning the DoD ManTech SBIR Program should be addressed to:

Ms. Tracy Frost, OSD ManTech SBIR Program Manager
Tracy.g.frost.civ@mail.mil

OSD ManTech SBIR 20.3 Topic Index

OSD 203-001	Improved Ablative Technology for the Reduction of Gun Bore Erosion
OSD 203-002	High precision liner manufacturing using exotic metals for enhanced shaped charge jet performance.

OSD203-001 TITLE: Fabric-based power generation and storage

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Weapons

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop improved ablative technology that minimizes gun bore erosion for high-energy gun propulsion systems and gun propellants.

DESCRIPTION: The Gun Weapon System (GWS) requirements for increased muzzle velocity, extended range and enhanced lethality have led to the use of high-energy gun propellants that exhibit high flame temperatures. High flame temperatures typically cause excessive gun barrel bore erosion that limits the life cycle of a gun barrel. In addition, the mechanical wear caused by the frictional effects of the projectile rotating band on the bore surface can be significant, especially at very high velocity. Various methods have been employed to reduce the rate of gun barrel wear and erosion, including chromium plating of the bore surface, the use of ablative wear liners within the propelling charge, the development of gun propellants with nitrogen-rich components as well as the development of low mechanical wear rotating bands made of plastic or soft metals. The focus of this SBIR will be on thermochemical erosion of the gun bore caused by propellant combustion products and will not directly address mechanical wear due to projectile/bore surface frictional effects.

Chromium surface plating of the bore surface has been applied extensively to US DoD gun barrels and it has been shown to reduce the rate of bore surface erosion due to its refractory nature. However, after the first few shots are fired in a new gun barrel, cracks, initially present in the chromium coating from the manufacturing process, are exacerbated and create direct pathways for hot propellant combustion products to access and react with the gun steel. New, more rugged refractory bore surface coatings and coating processes are under constantly under development, however, these may not be available in the short or even mid-term.

Ablative wear liners usually consist of a thin sheet of a titanium dioxide (TiO₂)/binder (wax or silicone-based materials) mixture placed along the inner wall of a charge or cartridge. During gun fire, the TiO₂/binder mixture ablates and forms an insulating layer adjacent to the bore surface to reduce the gun wear rate. Wear liner technology has been extensively used within propelling charges and cartridges, however, with the advent of new more energetic gun propellants more effective ablative wear liners are required for use with in-service as well as new design gun propulsion systems and gun barrels. Improved ablative technology (in the form of liners or other novel means of application) would lengthen the useful life of existing gun barrels so that the barrels can remain in use for a greater number of rounds fired and reduce the expense of frequent barrel replacement. Developing ablatives that take advantage of the 'dynamic nitriding effect' theorized to occur for nitrogen-rich gun propellants could also be a viable area for research. For example, nitrogen-rich inert compounds could be combined with the TiO₂/binder mixture to combine the insulating effect with a dynamic nitriding effect to enhance erosion reduction. Alternatively, other metals, metal oxides or combinations thereof might exhibit a greater insulating effect

as compared to TiO₂. Improvements to the ablative binder might also be possible. Wear liners appear to be the most effective means to deliver the ablative material to the bore surface, however, other more effective methods of ablative delivery may be possible.

Improved ablative technology would be relatively easy to implement and could serve as a stop gap measure until new bore surface coating technology becomes mature. It is cautioned, however, that the introduction of an excessive amount of inorganic material into a propelling charge could result in the undesirable effect of bore fouling in which excessive ash or other deposits form on the bore surface that could eventually constrict the bore to where it affects gun performance. In addition, inert ablative wear liners typically reduce the overall energy available from the charge for projectile propulsion because energy is consumed during gun fire, for example, in raising the temperature of the ablative and transporting ablative materials down-bore. As a result, the design of new ablative wear and erosion reduction technologies must take a careful approach to balance improvements in erosion reduction with limiting impacts to interior ballistic performance.

PHASE I: The objective of Phase I shall be to develop gun propulsion system prototype ablative wear liners or ablatives in more effective configurations consisting of new and improved materials and other technologies and to evaluate the viability of the proposed technologies in a laboratory environment. Phase I will initiate with an extensive literature search to define the state of the art with respect to ablative wear reduction technology as well as the identification of new materials that could be applied to improve the efficacy of ablative wear reduction technologies. Laboratory test apparatus shall be configured to emulate the gun bore environment and be assessed for erosion and heat transfer effects with and without the proposed technologies. A final report will document testing results and present the top level plan to continue development in Phase II.

PHASE II: The objective of Phase II shall be to scale-up and demonstrate those technologies developed under Phase I that show the greatest promise to reduce barrel wear and erosion in representative medium and/or large caliber GWS(s). The gun barrels shall be evaluated for barrel wear and erosion on a systematic basis with and without the prototype ablative materials/systems. In addition, barrel heat transfer data will be collected to complement the barrel wear data. Testing may occur at either private and/or government gun test ranges. Several ablative system designs shall be tested to determine which design is most suitable for the selected GWS(s) and gun propulsion system(s). The result of Phase II will be a prototype design, including applicable technical data, which will be integrated into current and future gun propulsion system designs for extended range/enhanced lethality.

PHASE III DUAL USE APPLICATIONS: Upon success of Phase II the proposed technologies would be transitioned to in-service gun propulsion systems and/or those currently under development.

REFERENCES:

Stiefel, L., Editor, 'Gun Propulsion Technology', Progress in Astronautics and Aeronautics, Volume 109, American Institute of Aeronautics and Astronautics, Inc., Washington, D.C., 1988. (Chapters 10, 11 and 12).

KEYWORDS: gun barrel; gun tube; bore; bore surface; wear; erosion; ablative; wear liner; titanium dioxide; polydimethylsiloxane (PDMS); dynamic nitriding; high-nitrogen

OSD203-002

High precision liner manufacturing using exotic metals for enhanced shaped charge jet performance.

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Weapons

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: To develop high precision metal forming/liner manufacturing capabilities for liner manufacturing surge capacity and to enable more cost competitive government loading, fabrication, and testing of developmental shaped charge and explosively formed penetrator warheads using hard to machine, exotic materials.

DESCRIPTION: Manufacturing of metal liners for explosively formed penetrators and shaped charges can be a complicated and time-consuming process to do with the required precision. There are generally two phases of this process, manufacturing the preforms from raw material, billets, plate, or sheet, and machining the preforms to the desired shape. There are only about 4-5 companies that currently do this in the entire continental United States.

To manufacture liner preforms for large diameter liners, heavy forges are necessary to forge billets of raw material into near net shape preformed blanks. For smaller applications, deep drawing operations may be used and although somewhat less complicated than the heavy-duty forges required to manufacture larger liners, still require specialized skill and expertise to produce high tolerance, precision parts necessary to achieve high performance warheads.

Precision liner machining requires not only extremely high precision and tolerance, often around .0005 inch for a liner that may be 6 inches or greater in diameter, but unique expertise in machining all surfaces of somewhat conical shaped liners in addition to warhead loading techniques. Shaped charge liners are generally manufactured using vacuum fixtures that allow precise location and machining of each of the surfaces. Through wall thickness, liner profile, transverse wall thicknesses, and surface finish requirements all require extreme precision. Finally, specialized skill at machining exotic materials is often required. These types of materials may either have high densities, e.g. greater than 10 g/cc and may be as high as approximately 19 g/cc. Some of these exotic materials may also be pyrophoric in nature and may require machining under specialized fluids with particular feed and speed rates for safety purposes.

PHASE I: The objectives of phase I are for the liner manufacturer to evaluate 1) whether they currently have the capability to manufacture precision liners to government specified tolerances 2) if they do not currently possess this ability, to calculate the feasibility and cost of procuring all necessary hardware, including ancillary fixtures and devices, in order to stand this capability up. The final, and most important objective of this effort would be to provide an estimated unit production cost, based on machining delivered preforms for a typical quantity of liners, materials, and geometries so that the government could measure their cost against larger, more traditional liner manufacturers. Their findings will be documented in a final report and shall include plans, if warranted, for continuing into Phase II.

PHASE II: In phase II the contractor will either begin manufacturing the necessary ancillary hardware determined previously in phase I or they will procure the hardware if the government determines that it is warranted and cost effective. After this, they will then manufacture a limited number of liners, up to approximately 12 liners of 3 different designs for comparison to known metallurgy, geometric tolerance, and ultimately performance against baseline charges.

PHASE III DUAL USE APPLICATIONS: If an additional source of cost competitive, high quality liner manufacturing can be developed, there are a variety of systems to which this technology might be transferred. These include, but are not limited to, TOW2A/B, Hellfire, Javelin, DPICM, and shoulder fired systems among others.

REFERENCES:

1. Walters, W.P., Zukas, J. A., "Fundamentals of Shaped Charges" Wiley-Interscience, January 1989.
2. Buc, Steven M. "Shaped Charge Liner Materials: Resources, Processes, Properties, Costs, and Applications. February 1991.
3. Walters, William. "A Brief History of Shaped Charges" ARL-RP-232, December 2008.
4. Singh, M., Bola, M.S., Prakash, S., "Determination fo Dynamic Tensile Strength of Metals from Jet Break-Up Studies" 19th International Symposium on Ballistics, 7-11 May 2001, Switzerland.

KEYWORDS: shaped charge liner, liner materials, liner manufacturing, explosively formed penetrator liner, high precision machining, dense metal machining

OSD/STRATEGIC CAPABILITIES OFFICE (SCO)
20.3 Small Business Innovation Research (SBIR) Program
Direct to Phase II Proposal Submission Instructions

The Strategic Capabilities Office (SCO) seeks small businesses with strong research and development capabilities to pursue and commercialize specific technologies to meet SCO objectives.

The 2020.3 SCO SBIR Direct to Phase II proposal submission instructions are intended to clarify the Department of Defense (DoD) instructions as they apply to SCO requirements. This Announcement is for Direct to Phase II proposals only. All Phase II proposals must be prepared and submitted through the DoD SBIR/STTR electronic submission site: <https://www.dodsbirsttr.mil/>. The offeror is responsible for ensuring that their proposal complies with the requirements in the most current version of instructions. Prior to submitting your proposal, please review the latest version of these instructions as they are subject to change before the submission deadline.

Specific questions pertaining to the SCO SBIR Program should be submitted to the SCO SBIR Program office at:

E-mail – sbir@sco.mil

1. DIRECT TO PHASE II

15 U.S.C. §638 (cc), as amended by NDAA FY2012, Sec. 5106, and further amended by NDAA FY2019, Sec. 854, PILOT TO ALLOW PHASE FLEXIBILITY, allows the Department of Defense to make an award to a small business concern under Phase II of the SBIR Program with respect to a project, without regard to whether the small business concern was provided an award under Phase I of an SBIR Program with respect to such project. SCO is conducting a "Direct to Phase II" implementation of this authority for this 20.3 SBIR Announcement and does not guarantee Direct to Phase II opportunities will be offered in future Announcements.

SCO Direct to Phase II Proposals are different from traditional SCO SBIR Phase I proposals. The chart below explains some of these differences.

	STANDARD SCO SBIR PROCESS	SCO D2P2 PROCESS
PHASE 1 TYPICAL FUNDING LEVEL	\$250,000	None
PHASE 1 TECHNICAL *POP DURATION	6 months	None
PHASE 2 TYPICAL FUNDING LEVEL	\$1,500,000	\$1,500,000
PHASE 2 TECHNICAL *POP DURATION	24 months	24 months

*POP= Period of Performance

2. INTRODUCTION

Direct to Phase II proposals must follow the steps outlined below:

1. Offerors must create a Cover Sheet using the DoD Proposal submission system. Offerors must provide documentation that satisfies the Phase I feasibility requirement* that will be included in the Phase II proposal. Offerors must demonstrate that they have completed research and development through means other than the SBIR/STTR Program to establish the feasibility of the proposed Phase II effort based on the criteria outlined in the topic description.
2. Offerors must submit a Phase II proposal using the SCO Phase II proposal instructions below.

* NOTE: Offerors are required to provide information demonstrating that the scientific and technical merit and feasibility has been established. SCO will not evaluate the offeror's related Phase II proposal if it determines that the offeror has failed to demonstrate that technical merit and feasibility has been established or the offeror has failed to demonstrate that work submitted in the feasibility documentation was substantially performed by the offeror and/or the Principal Investigator (PI).

3. PROPOSAL SUBMISSION

The complete proposal, i.e., DoD Proposal Cover Sheet, technical volume, cost volume, and Company Commercialization Report, must be submitted electronically at <https://www.dodsbirsttr.mil/>. Ensure your complete technical volume and additional cost volume information is included in this sole submission.

Complete proposals must include all of the following:

- a. DoD Proposal Cover Sheet (Volume 1)
- b. Technical Volume (Volume 2):
 - Part 1: Phase I Justification (5 Pages Maximum)
 - Part 2: Phase II Technical Proposal (15 Pages Maximum)
- c. Cost Volume (Volume 3)

The SCO SBIR Program is accepting Volume 5 (Supporting Documents). This volume should not exceed 15 pages.

Phase II proposals require a comprehensive, detailed submission of the proposed effort. SCO SBIR Direct to Phase II periods of performance are 24 months. SCO may award SBIR Direct to Phase II efforts up to a maximum value of \$1,500,000 per contract award. Commercial and military potential of the technology under development is extremely important. Proposals emphasizing dual-use applications and commercial exploitation of resulting technologies are sought.

4. Direct to Phase II PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

PROPOSAL FORMAT

- A. **Cover Sheet.** As instructed on the DoD SBIR proposal submission website, prepare a Proposal Cover Sheet. Proposal Abstract and Expected benefits and Government or private sector applications of the proposed research should also be summarized in the space provided. The abstract/benefits of selected proposals will be submitted for publication with unlimited distribution. Therefore, the summary should not contain classified or proprietary information.

B. Volume II (20 pages)

1. **Phase I Justification (5 Pages Maximum)**. Offerors are required to provide information demonstrating the establishment of the scientific and technical merit and feasibility. **Feasibility documentation MUST NOT be solely based on work performed under prior or ongoing Federally funded SBIR or STTR work.**
2. **Phase II Technical Objectives and Approach (15 Pages Maximum)**. List the specific technical objectives of the Phase II research and provide a detailed technical approach in in order to meet these objectives.
 - **Phase II Work Plan.** Provide an explicit, detailed description of the Phase II approach. The plan should indicate what is planned, how and where the work will be carried out, a schedule of major events, and the final product to be developed. A Phase II effort should attempt to accomplish the technical feasibility demonstrated in Phase I, including potential commercialization of results. Phase II is the principal research and development effort and is expected to produce a well-defined deliverable product or process.
 - **Related Work.** Describe significant activities directly related to the proposed effort, including those conducted by the Principal Investigator, the proposing firm, consultants, or others. Report how the activities interface with the proposed project and discuss any planned coordination with outside sources. The proposers' awareness of the state-of-the-art in the technology and associated science must be demonstrated.
 - **Relationship with Future Research or Research and Development.** State the anticipated results of the proposed approach if the project is successful. Discuss the significance of the Phase II effort in providing a foundation for a Phase III research or research and development effort.
 - **Technology Transition and Commercialization Strategy (nte 5 pages within VOLII).** Describe your company's strategy for converting the proposed SBIR research, resulting from your proposed Phase II contract, into a product or non-R&D service with widespread commercial use -- including private sector and/or military markets. Note that the commercialization strategy is separate from the Commercialization Report described in Section 4.L below. The strategy addresses how you propose to commercialize this research, while the Company Commercialization Report covers what you have done to commercialize the results of past Phase II awards. Historically, a well-conceived commercialization strategy is an excellent indicator of ultimate Phase III success. The commercialization strategy must address the following questions:
 - What is the first product that this technology will go into?
 - Who will be your customers, and what is your estimate of the market size?
 - How much funding will you need to bring the technology to market, and how will you raise those funds?
 - Does your company contain marketing expertise and, if not, how do you intend to bring that expertise into the company?
 - Who are your competitors, and what is your price and/or quality advantage over your competitors?

- **Key Personnel.** Identify key personnel, including the Principal Investigator, who will be involved in the Phase II effort. List directly related education and experience and relevant publications (if any) of key personnel. Include a concise resume of the Principal Investigator(s).
- **Facilities/Equipment.** Describe available instrumentation and physical facilities necessary to carry out the Phase II effort. Justify items of equipment to be purchased (as detailed in the cost proposal) including Government Furnished Equipment (GFE). All requirements for government furnished equipment or other assets, as well as associated costs, must be determined and agreed to during Phase II contract negotiations. State whether or not the facilities where the proposed work will be performed meet environmental laws and regulations of federal, state (name) and local governments. This includes, but is not limited to, the following groupings: airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal practices, and handling and storage of toxic and hazardous materials.
- **Consultants.** Involvement of university, academic institution, or other consultants in the project may be appropriate. If such involvement is intended, it should be described in detail and identified in the Cost Volume.

C. Volume III- Cost (\$1,500,000 Maximum). A detailed, Phase II Cost Volume must be submitted online and in the proper format shown in the Cost Breakdown Guidance in Section 5.4 d of the DoD SBIR Broad Agency Announcement (BAA). Some items in the cost volume template may not apply to the proposed project. If such is the case, there is no need to provide information for each and every item. Provide enough information to allow the SCO evaluators to assess the proposer's plans to use the requested funds if the contract is awarded.

1. List all key personnel by name as well as number of hours dedicated to the project as direct labor.
2. Special Tooling, Test Equipment, and Materials Costs:
 - a. Special tooling, test equipment, and materials costs may be included under Phase II. The inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed; and
 - b. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the Government and should be related directly to the specific effort.
3. Cost for travel funds must be justified and related to the needs of the project.

5. METHOD OF SELECTION AND EVALUATION CRITERIA

A. Evaluation Criteria. All proposals will be reviewed for overall merit based on the evaluation criteria published in the DoD SBIR Program BAA:

1. The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.
2. The qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development, but also the ability to commercialize the results.
3. The potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization.

6. CONTRACTUAL CONSIDERATIONS

- A. **Awards.** The number of Direct to Phase II awards will depend upon the quality the Phase II proposals and the availability of funds. Each Phase II proposal selected for award under a negotiated contract requires a signature by both parties before work begins. SCO awards Phase II contracts to Small Businesses based on results of the agency priorities, scientific, technical, and commercial merit of the Phase II proposal.
- B. **Reports.** For incrementally funded Phase II projects an interim, midterm written report may be required (at the discretion of the awarding agency).
- C. **Payment Schedule.** SCO Phase II Awards Level of Effort Firm Fixed Price contracts. Monthly invoices are based on the labor hours recorded and the monthly costs associated with the project.
- D. **Markings of Proprietary Information.** Per DoD SBIR Program BAA, section 5.3.
- E. **Copyrights, Patents and Technical Data Rights.** Per DoD SBIR Program BAA.
- F. **Security Information.** SCO anticipates work produced in Phase II may become classified. Note: The prospective contractor(s) must be U.S. owned and operated with no foreign influence as defined by DoD 5220.32-M, National Industrial Security Program Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA). The selected company will be required to safeguard classified material IAW DoD 5220.32-M during the advanced phases of this contract.

Contractors wishing to submit classified proposals must send an unclassified email to sbir@sco.mil requesting classified submission instructions, and a DD Form 254 issued by SCO security. Contractors will ensure all industrial, personnel, and information systems processing security requirements are in place and at the appropriate level.

7. TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The SCO SBIR Program will not participate in the Technical and Business Assistance.

SCO SBIR Direct to Phase II 20.3 Topic Index

SCO203-001	Machine Learned Cyber Threat Behavior Detection
SCO203-002	Small Satellite Experiment

RT&L FOCUS AREA(S): Artificial Intelligence/ Machine Learning
TECHNOLOGY AREA(S): Information Systems

OBJECTIVE: Develop unsupervised machine learn algorithms to evaluate Zeek logs of common inbound and outbound perimeter network traffic protocols to provide high confident anomaly detection of suspicious and/or malicious network traffic.

The algorithms must be able to be run from a 1U commodity hardware on small to large networks. Report outputs from the algorithms should be retrievable as json or csv formatted files and contain sufficient information for ingestion and correlation against various databases or SIEM systems. At a minimum, the output reports should provide enough data to understand the suspicious threat anomalies identified, corresponding Zeek metadata associated with the detection for correlation and enrichment with other databases, date/time, confidence associated with the detection, and technical reasoning behind the confidence levels and detections made. The government must be equipped with the ability to specify how reporting is generated based confidence thresholds.

DESCRIPTION: Machine Learning of Cyber Behavior

PHASE I: SCO is accepting Direct to Phase II proposals ONLY. Proposers must demonstrate that the following achievements:

Provide a detailed summary of current research and development and/or commercialization of artificial intelligence methodologies used to identify cyber threats. The summary shall include:

- a) Specific models used in previous research and how they would be applicable for this SBIR. Explain the maturation of these models and previous successes and known limitations in meeting the SBIR goals.
- b) Detailed description of the training data available to the company. Identify whether the proposed training corpus will be accessible in-house, accessed via an open source corpus, or purchased from a commercial training corpus site. Provide the cost to access the proposed training corpus throughout the SBIR period of performance.
- c) Describe the previous work done with the training corpus, specifically the methodologies used and resulting findings.
- d) Finally, include an attachment detailing the schema to be assessed by the proposed algorithm and indicate if the schema was already tested in prior research efforts (NOTE: this schema list does not to count against the maximum number of pages. If this is considered Proprietary information, the company shall indicate this with additional handling instructions).

PHASE II: This SBIR is a direct to Phase II effort. Awardee(s) will be responsible for providing their own hardware and software, chargeable to the contract, but not to exceed the SBIRS' maximum funding limits. During the SBIR Phase II effort, neither SCO, nor its partners, will provide access to any training material, government furnished information, or equipment.

Proposals must describe in detail how the proposed solution will take data from decrypted bi-directional perimeter network traffic and provide a repeatable solution tested against multiple network sizes. Proposals will provide a detailed description of training criteria and schema of the perimeter traffic evaluated. It should also explain the selection criteria for assessed traffic, and any non-selected criteria with reason why it was not used to train the system. The awardee may compliment their machine learning-based anomaly detection work with other analytical methods to achieve the final product but the core of the overall detection approach must be the result of machine learning (i.e. data modeling, etc). If complimented with open source behavior

or signatures analysis, the proposal must include (as an attachment not counting toward the SBIR page count limit), all signatures and analysis tools being considered and the source for each.

Awardees are responsible for providing their own training corpuses, and must be able to fully describe said corpuses, what criteria will be used to teach the system, and maintain continued/regular access to said training corpus in the Phase II proposals. The training corpus may be any government, commercial, academic, proprietary, or open source data set, or a combination of any or all. Loss of access to the training corpus before or during the SBIR program will result in cessation of participation of the contract. At the close of the SBIR process, awardees will deliver to the government:

- 1) A successful software operational prototype with full government use rights
- 2) Associated artifacts of all documentation required to replicate the build and use of the ML algorithms. Artifacts include, but are not limited to, a fully developed reference guide and detailed schema packages, specific machine learning criteria and teaching corpus description, detailed hardware/software requirements, all algorithms and unique/proprietary software needed to run the analysis, and all internal test plans and results.
- 3) If applicable, any open source behavior or signatures analysis and analytical tools being used, and the source for each

Awardees may use any developed efforts for other governmental or commercial opportunities, including continued service support in any Phase III options. However, none of the artifacts shall be presented as proprietary or otherwise restricted data, and the government shall have unlimited use rights to the resulting hardware, software, algorithms or other deliverables from this SBIR.

PHASE III DUAL USE APPLICATIONS: Private sector commercial potential includes using the developed tools in a network security environment either as a service provider or as a supplier to network security service providers.

REFERENCES:

1. National Science & Technology Council. (2020). Artificial Intelligence and Cybersecurity: Opportunities and Challenges. Technical Workshop Summary Report. Networking & Information Technology Research and Development Subcommittee and the Machine Learning & Artificial Intelligence Subcommittee. Retrieved July 29, 2020 from
2. <https://www.nitrd.gov/pubs/AI-CS-Tech-Summary-2020.pdf>;
2. J. Spring, J. Fallon, A. Galyardt, A. Horneman, L. Metcalf, & E. Stoner. (2019). Machine Learning in Cybersecurity: A Guide (CMU/SEI-2019-TR-005). Retrieved July 29, 2020, from the Software Engineering Institute, Carnegie Mellon University website: <http://resources.sei.cmu.edu/library/asset-view.cfm?AssetID=633583>;
3. Y. Xin et al., "Machine Learning and Deep Learning Methods for Cybersecurity," in IEEE Access, vol. 6, pp. 35365-35381, 2018, doi: 10.1109/ACCESS.2018.2836950.

KEYWORDS: Machine Learning; Cyber Defense; Threat Behavior Analysis

RT&L FOCUS AREA(S): Space

TECHNOLOGY AREA(S): Space Platform

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This Direct to Phase II SBIR is to build and operate the second of two small satellites hosting a common RF communications payload in a string of pearls configuration. This project will assess the feasibility and affordability of multi-spacecraft cooperative payload operations to include simultaneous interaction with multiple, existing ground terminals. Additional benefits are payload redundancy, expanded opportunities to collect data, and expanded RF coverage for the overall constellation. The selected vendor will need to be able to incorporate their activities into the existing Program.

DESCRIPTION:

PHASE I: In order to be considered for a Direct to Phase II, proposals must show evidence of:

- A. Demonstrated understanding of 6U cubesat designs, manufacturing and system integration.
- B. Demonstrated capability to produce small satellites with RF payloads that have relevance to this mission area.
- C. Demonstrated understanding of opportunities, processes and constraints for ground communications links, satellite operations and low cost launch, primarily through ridesharing.

The second vehicle must supply a 6U CubeSat bus with enough size, weight and power (SWAP) to host a RF payload with simultaneous receive and transmit capability to a designated ground site while flying that payload in conjunction with a similar small sat for cooperative operations. The second CubeSat platform must be capable of quickly, demonstrating on-orbit efficacy/CONOPs, in LEO, for a high-gain antenna/communication system, while providing 1.9U of platform space to permit cost savings for other possible government payloads in need of a stable spacecraft bus platform.

PHASE II: This Direct to Phase II SBIR is to design and build a second, nearly identical vehicle built in a previous program to launch and operate in conjunction with the first in a 6 month on orbit demonstration. The vehicle must be capable of cooperative operation with the existing CubeSat and be compatible with the existing fixed and mobile ground control systems. This second vehicle will greatly expand the number of opportunities to contact the spacecraft and investigate the operational parameters and performance of the payload as well as enhance the initial investment by better enabling RF coverage for the data collection.

The current Program structure incorporates a six-month design period and one year for the manufacture, integration and test of the first bus and RF payload and a 6-month on-orbit demonstration. Awardee(s) will be responsible for providing their own hardware and software, chargeable to the contract, but not to exceed the SBIRS' maximum funding limits. During the SBIR Phase II effort, neither SCO, nor its partners, will provide access to any training material, government furnished information, or equipment.

Proposals must describe in detail how the proposed solution will demonstrate cooperative operation and on-orbit efficacy for the high-gain RF antenna/communication system, while providing additional platform space to permit cost savings for other government payloads in need of a stable and proven spacecraft bus platform. Proposals will provide a detailed description of how the solution will leverage an existing CubeSat bus design/architecture and be able to integrate into an existing ground control center, operations planning, and portable ground site to provide enhanced coverage for the demonstration.

The awardee will expose hardware to the expected operating environment to assure a high probability of successful performance in space, including verifying that designs meet performance requirements, identifying defects in material and workmanship, and discovering unexpected interactions between subassemblies. The testing shall include Thermal Vacuum, Random Vibration, pre- and post-environments functional as well as deployments of solar arrays and experiments commensurate with a class D mission risk.

Awardees are responsible for integrating operation of this system with the extant program system to achieve a successful cooperative outcome. Awardees shall perform the system engineering and mission design necessary to ensure that the satellite bus meets all of the requirements (including derived requirements) requisite to host and operate the RF and other government payloads as applicable. At the close of the SBIR process, awardees will deliver to the government:

- 4) A successful operational unit compatible with the StreamLINK mission control system and extant ground segment (FSK UHF uplink/BPSK S-Band downlink).
 - 5) 1.9U of remaining available payload space (beyond the 2U needed for the RF antenna payload) suitable to support the integration of an additional government payload (TBD) if required.
- Awardees may use any developed efforts for other governmental or commercial opportunities, including continued service support in any Phase III options.

PHASE III DUAL USE APPLICATIONS: Private sector commercial potential includes a marketable, reusable Cubesat bus configuration with a large, generic, payload volume capable of very rapid integration of multiple payloads; additional potential for a constellation of Cubesats with control from both fixed and mobile ground terminals.

REFERENCES:

1. SpaceNews August 2018, Small Satellites are at the Center of a Space Industry Transformation, SpaceNews <https://spacenews.com/small-satellites-are-at-the-center-of-a-space-industry-transformation/>

KEYWORDS: SmallSat; Satellite; RF comm payload

UNITED STATES SPECIAL OPERATIONS COMMAND
20.3 Small Business Innovation Research (SBIR)
Phase I Proposal Submission Instructions

Introduction:

The United States Special Operations Command (USSOCOM) seeks small businesses with strong research and development capabilities to pursue and commercialize technologies needed by Special Operations Forces through the Department of Defense (DoD) SBIR 20.3 Program Broad Agency Announcement (BAA). A thorough reading of the “Department of Defense Small Business Innovation Research (SBIR) Program, SBIR 20.3 Program Broad Agency Announcement (BAA)” prior to reading these USSOCOM instructions is highly recommended.

These USSOCOM instructions explain USSOCOM specific aspects that differ from the DoD Announcement and its instructions.

Table 1: Consolidated SBIR Topic Information

Topic	Technical Volume (Vol 2)	Additional Info. (Vol 5)	Period of Performance	Award Amount	Contract Type
<i>Phase I</i> SOCOM203-001	Not to exceed 5 pages	15 page PowerPoint	Not to exceed 6 months	NTE \$150,000.00	Firm-Fixed-Price
<i>Phase I</i> SOCOM203-002	Not to exceed 5 pages	15 page PowerPoint	Not to exceed 6 months	NTE \$150,000.00	Firm-Fixed-Price
<i>Phase I</i> SOCOM203-003	Not to exceed 5 pages	15 page PowerPoint	Not to exceed 6 months	NTE \$150,000.00	Firm-Fixed-Price
<i>Phase I</i> SOCOM203-004	Not to exceed 5 pages	15 page PowerPoint	Not to exceed 6 months	NTE \$150,000.00	Firm-Fixed-Price

Contract Awards:

SBIR awards for topic SOCOM203-004 will be made under the authority of National Defense Authorization Act for Fiscal Year 2020, Section 851, **PILOT PROGRAM FOR DEVELOPMENT OF TECHNOLOGY-ENHANCED CAPABILITIES WITH PARTNERSHIP INTERMEDIARIES**. USSOCOM may use a partnership intermediary to award SBIR contracts and agreements to small business concerns. SOCOM203-004 SBIR contract awards may be done through SOFWERX and result in a commercial contract between the firm and DEFENSEWERX. The Government will evaluate and select for award all SOCOM203-004 proposals. The Government will award all SBIR contracts for SOCOM203-001, SOCOM203-002, and SOCOM203-003.

Proposal Submission:

Firms must upload their proposals to the Defense SBIR/STTR Innovation Portal Proposal Submissions at <https://www.dodsbirsttr.mil/submissions/login> . Additional USSOCOM specific submission requirements for each volume are detailed below.

Technical Inquiries:

During the Pre-release Period of the DoD SBIR 20.3 Program BAA, all questions must be submitted in writing either by e-mail to sbir@socom.mil or through Topic Q&A (formerly SITIS). All questions and answers submitted to Topic Q&A will be released to the general public. USSOCOM does not allow inquirers to talk directly or communicate in any other manner to the topic authors (differs from Section 4.13.c. of the DoD SBIR 20.3 Program BAA instructions). **All inquiries must include the topic number in the subject line of the e-mail.**

During the Open Period, follow the instructions in section 4.13.d of the DoD SBIR 20.3 Program BAA Instructions.

Site visits will not be permitted during the Pre-release and Open Periods of the DoD SBIR 20.3 Program BAA.

Proposal Volumes:

Volume 1: Cover page required per DoD instructions.

Volume 2: Technical Volume

The Technical Volume page count will include all the required items under section 5.4.c of the DoD SBIR 20.3 instructions and shall not exceed 5 pages. Offerors shall also submit a slide deck not to exceed 15 PowerPoint slides in Volume 5 and there is no set format requirements for the two documents. It is recommended (but not required) that more detailed information is included in the technical volume and higher level information is included in the slide deck. The Cost Volume (Volume 3) for the Topics will cover the total effort.

The identification of foreign national involvement in a USSOCOM SBIR topic is needed to determine if a firm is ineligible for award on a USSOCOM topic that falls within the parameters of the United States Munitions List, Part 121 of the International Traffic in Arms Regulation (ITAR). A firm employing a foreign national(s) (as defined in paragraph 3.7 entitled “Foreign Nationals” of the DoD SBIR 20.3 Announcement) to work on a USSOCOM ITAR topic must possess an export license to receive a SBIR Phase I contract.

Volume 3: Cost Volume

Companies submitting a Phase I proposal under this BAA must complete the USSOCOM Phase I Cost excel spreadsheet, with a base not to exceed \$150,000.00 plus Technical and Business Assistance (TABAs) cost (if applicable) not to exceed \$6,500 over a period of up to six months.

USSOCOM may provide TABA funds in Phase I awards to firms to meet Cybersecurity Maturity Model Certification (CMMC) Level 1 certification requirements. Draft of the CMMC is located at <https://www.acq.osd.mil/cmmc/draft.html>.

The TABA information must be included in the firm’s cost proposal specifically identified as “Discretionary Technical and Business Assistance” and cannot be subject to any profit or fee by the requesting SBIR firm. In addition, the provider of the TABA may not be the requesting firm, an affiliate of the requesting firm, an investor of the requesting firm, or a subcontractor or consultant of the requesting firm otherwise required as part of the paid portion of the research effort (e.g., research partner, consultant, tester, or administrative service provider). Proposed TABA will be evaluated by the USSOCOM SBIR Program office. The proposed amount is in addition to the award amount for Phase I and cannot exceed \$6,500. The firm’s proposal must (1) clearly identify the need for assistance (purpose and objective of required assistance); (2) provide details on the provider of the assistance (name and point

of contact for performer and unique skills/specific experience to carry out the assistance proposed); and (3) the cost of the required assistance (costs and hours proposed or other details on arrangement that would justify the proposed expense).

A minimum of two-thirds of the research and/or analytical work in Phase I must be conducted by the proposing firm. The percentage of work is measured by both direct and indirect costs as a percentage of the total contract cost.

Volume 4: Company Commercialization Report – Not in use for 20.3 BAA

Not Required by DoD for 20.3 BAA and not evaluated by USSOCOM.

Volume 5: Supporting Documents

Potential Offerors shall submit a slide deck not to exceed 15 PowerPoint slides.

Volume 6: Fraud, Waste and Abuse Training

Not required by USSOCOM.

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Phase I proposals shall NOT include:

- 1) Any travel for Government meetings. All meetings with the Government will be conducted via electronic media.
- 2) Government furnished property or equipment.
- 3) Priced or Unpriced Options.
- 4) A Technical Volume exceeding five pages. USSOCOM will only evaluate the first five pages of the Technical Volume. Additional pages will not be considered or evaluated.
- 5) “Basic Research” (or “Fundamental Research”) defined as a “Systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and/or observable facts without specific applications toward processes or products in mind.”
- 6) Human or animal studies.

Phase I Evaluations:

USSOCOM evaluates Phase I proposals using the evaluation criteria specified in section 6.0 of the DoD 20.3 SBIR Announcement except for:

The Technical Volume and slide deck will be reviewed holistically. Proposals missing the slide deck will not be evaluated. The two-part evaluation process is explained below:

Part I: The evaluation of the Technical Volume will utilize the Evaluation Criteria provided in Section 6.0 of the DoD SBIR 20.3 BAA. Once the evaluations are complete, all Offerors will be notified as to whether they were selected to present the slide deck portion of their proposal.

Part II: Selected Offerors will receive an invitation to present their slide deck (30 minute presentation time / 30 minute question and answer), in a technical question and answer forum, to the USSOCOM evaluation team, in November 2020 via electronic media. Selected Offerors shall restrict their presentations to only the 15 page PowerPoint presentation that were submitted with their proposals. There will be no changes or updates to the presentations from what was proposed. This presentation will be evaluated by a panel against the criteria listed under Section 6.0 of the DoD SBIR 20.3 BAA. This will follow with a selection/non-selection notification in a timely manner.

Additionally, input on technical aspects of the proposals may be solicited by USSOCOM from non-Government consultants and advisors who are bound by appropriate non-disclosure requirements. Non-Government personnel will not establish final assessments of risk, rate, or rank Offeror's proposals. These advisors are expressly prohibited from competing for USSOCOM SBIR awards. All administrative support contractors, consultants, and advisors having access to any proprietary data will certify that they will not disclose any information pertaining to this announcement, including any submission, the identity of any submitters, or any other information relative to this announcement; and shall certify that they have no financial interest in any submission. Submissions and information received in response to this announcement constitutes the Offeror's permission to disclose that information to administrative support contractors and non-Government consultants and advisors.

Selection Notifications:

For topic SOCOM203-004 the Defensewerx (also known as SOFWERX) will notify each Offeror whether they have been selected for award. The e-mail notification will be sent to the Corporate Official (Business) identified by the Offeror.

For topics SOCOM203-001, SOCOM203-002, and SOCOM203-003, the Government Contracting Officer will notify each Offeror by e-mail whether they have been selected for award. The e-mail notification will be sent to the Corporate Official (Business) identified by the Offeror.

Informal Feedback:

A non-selected Offeror can make a written request to their respective Contracting Officer, within 30 calendar days of receipt of notification of non-selection, for informal feedback. The respective Contracting Officer will provide informal feedback in response to an Offeror's written request rather than a debriefing as specified in paragraph 4.10, entitled "Debriefing," of the DoD SBIR 20.3 Announcement.

USSOCOM SBIR Program Point of Contact:

Inquiries concerning the USSOCOM SBIR Program should be addressed to sbir@socom.mil.

USSOCOM SBIR 20.3 Topic Index

SOCOM203-001	Positioning, Navigation and Timing for Target Acquisition
SOCOM203-002	Handheld Celestial Navigation System
SOCOM203-003	High-Performance Multi-Platform / Sensor Computing Engine
SOCOM203-004	Geospatially Integrated Cyber Situational Awareness

SOCOM203-001

TITLE: Positioning, Navigation and Timing for Target Acquisition

RT&L FOCUS AREA(S): Network Command, Control and Communications

TECHNOLOGY AREA(S): Ground Sea; Information Systems; Sensors; Electronics; Battlespace

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic is to develop an innovative algorithm (injectable software) that is optically agnostic allowing any VAS systems to calculate a more accurate position with reference to height above ellipsoid (HAE). This will assist current global positioning systems (GPS) eliminate the associated error and/or assist with assured navigation while being jammed or spoofed.

DESCRIPTION: Participants are expected to account for astronomical formations that can be identified from earth's surface. Once the celestial mapping is complete, participants will determine a 'system' that allows for specific optical parameters, allowing for any capable VAS system to be used. As a part of this feasibility study, offerors shall address all viable overall system design options with respective specifications, determining what requirements will be necessary to determine 'capable VAS systems'. Please take note: determining the factors that will be needed to ensure software can be ingested into VAS systems will be step one. Evaluators must be able to discern what system requirements (processing power, optical pathways, etc.) will be needed before moving forward. Currently, several industry partners are moving toward a celestial solution for their specific VAS systems.

PHASE I: Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraph entitled "Description."

The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study ("Technology Readiness Level 3") to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II: Develop, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study on the Celestial Assured Navigation.

PHASE III DUAL USE APPLICATIONS: This system could be used in a broad range of military applications where navigation and targeting devices are used both for increased accuracy and for operation in jammed and spoofed environments.

REFERENCES:

1. "Celestial navigation": https://en.wikipedia.org/wiki/Celestial_navigation

2. "Celestial Navigation - Sextant Sight Reduction", by Dr. Harald Merkel:

<https://apps.apple.com/us/app/celestial-navigation/id1458513224>

3. Joint Effects Targeting System (JETS) Target Location Designation System (TLDS):

[https://asc.army.mil/web/portfolio-item/soldier-](https://asc.army.mil/web/portfolio-item/soldier-jets/#:~:text=The%20Joint%20Effects%20Targeting%20System%20%28JETS%29%20Target%20Location,improve%20the%20effectiveness%20of%20engagement%20with%20unguided%20munitions.)

[jets/#:~:text=The%20Joint%20Effects%20Targeting%20System%20%28JETS%29%20Target%20Location,improve%20the%20effectiveness%20of%20engagement%20with%20unguided%20munitions.](https://asc.army.mil/web/portfolio-item/soldier-jets/#:~:text=The%20Joint%20Effects%20Targeting%20System%20%28JETS%29%20Target%20Location,improve%20the%20effectiveness%20of%20engagement%20with%20unguided%20munitions.)

4. "Celestial navigation": https://en.wikipedia.org/wiki/Celestial_navigation

5. "Celestial Navigation - Sextant Sight Reduction", by Dr. Harald Merkel:

<https://apps.apple.com/us/app/celestial-navigation/id1458513224>

6. Joint Effects Targeting System (JETS) Target Location Designation System (TLDS):

[https://asc.army.mil/web/portfolio-item/soldier-](https://asc.army.mil/web/portfolio-item/soldier-jets/#:~:text=The%20Joint%20Effects%20Targeting%20System%20%28JETS%29%20Target%20Location,improve%20the%20effectiveness%20of%20engagement%20with%20unguided%20munitions.)

[jets/#:~:text=The%20Joint%20Effects%20Targeting%20System%20%28JETS%29%20Target%20Location,improve%20the%20effectiveness%20of%20engagement%20with%20unguided%20munitions.](https://asc.army.mil/web/portfolio-item/soldier-jets/#:~:text=The%20Joint%20Effects%20Targeting%20System%20%28JETS%29%20Target%20Location,improve%20the%20effectiveness%20of%20engagement%20with%20unguided%20munitions.)

KEYWORDS: Celestial Navigation, Precision Navigation Timing (PNT), Targeting

TECHNOLOGY AREAS: Electronics

ACQUISITION PROGRAM: Handheld Celestial Navigation System

Description of technology to respond to this topic and the technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 5.4.c.(8) of the solicitation. Additionally, Offerors will describe compliance mechanisms offerors have in place or will put in place to address any ITAR issues that arise during the course of agreement administration.

OBJECTIVE: The objective of this topic is to develop innovative approaches to celestial navigation in order to provide non-GPS (Global Positioning System) navigation capabilities to Soldiers on the ground.

DESCRIPTION: Modern navigation systems are heavily reliant on communication with orbital satellites to maintain positional awareness and orientation. This topic seeks innovative research and development to provide feasible celestial-based navigation options, in a light weight, handheld form factor, to serve as an alternate when primary GPS systems are denied (due to a variety of situations such as intentional or unintentional radio frequency interference, signal attenuation from local terrain, or malfunctions on the satellite). Design considerations include:

1. Minimize form factor (size, weight, and power) to maximize portability.
2. Maximize compatibility with commonly used navigation visualization tools (cell phone, laptop, etc.)
3. Minimize external power requirements; maximize use of common battery types.
4. Maximize all-weather operations and ensure day/night usability.
5. Maximize accuracy of internal clock, absolute location, velocity, elevation and heading determination.
6. Maximize ability to navigate on the move, with low latency.
7. Develop position solution requiring no GPS inputs.
8. Require no specialized celestial navigation training (i.e. simple for common operator to use).
9. Capable of developing solution without connection to network or cloud infrastructure.
10. Minimize time from system startup to position acquisition (i.e. maximize system processing ability).
11. Maximize ability to operate system from diverse land-based environments.

PHASE I: Conduct a feasibility study to assess what is in the art of the possible that addresses the design considerations included in the above paragraph entitled "Description." As a part of this feasibility study, the Offerors shall evaluate system concepts that provide a compact form factor "celestial navigator" to provide Special Operations Forces with a supplemental navigation mechanism capable of autonomously (or with minimal user input) determining absolute location by referencing celestial body positions.

Analysis shall also address performance attributes including:

1. Notional Celestial Navigator directivity
2. Notional Celestial Navigator accuracy
3. Notional Celestial Navigator processing speed
4. Notional Celestial Navigator compatibility with existing navigation architectures (Military Grid Reference System, Android Tactical Assault Kit plugin, etc.)
5. Notional Celestial Navigator operational environments

6. Notional Celestial Navigator update rate

The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study (“Technology Readiness Level 3”) to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II: Develop, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility.

PHASE III DUAL USE APPLICATIONS: This system could be used in a broad range of military applications. Additional applications include U.S. law enforcement, U.S. border patrol, and search and rescue of persons by U.S. first responders in local / state / or federal capacity.

REFERENCES:

1. Full listing of Army Field Manuals; <http://www.enlistment.us/field-manuals>.
2. Army Field Manual 3-25.26, Map Reading and Land Navigation, July 20, 2001; <https://www.radford.edu/content/dam/colleges/chbs/rotc/Forms/fm/FM%203-25.26%20Map%20Reading%20and%20Land%20Navigation.pdf>

KEYWORDS: Celestial, Navigation, GPS-Denied, Position, Timing, Automated, Handheld, Day/Night

RT&L FOCUS AREA(S): Microelectronics; General Warfighting Requirements (GWR)
TECHNOLOGY AREA(S): Sensors; Electronics

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic is to develop a next generation multi-platform & multi-sensor capable Artificial Intelligence-Enabled (AIE), high performance computational imaging camera with an optimal Size, Weight and Power – Cost (SWaP-C) envelope. This computational imaging Camera can be utilized in weapon sights, surveillance and reconnaissance systems, precision strike target acquisition, and other platforms. This development should provide bi-directional communication between tactical devices with onboard real-time scene/data analysis that produces critical information to the SOF Operator. As a part of this feasibility study, the Offerors shall address all viable overall system design options with respective specifications on the key system attributes.

DESCRIPTION: A system-of-systems approach “smart-Visual Augmentation Systems” and the integration of an next generation smart sensor enables information sharing between small arms, SOF VAS and other target engagement systems. Sensors and targeting that promote the ability to hit and kill the target as well as ensuring Rules of Engagement are met and civilian casualties/collateral damage is eliminated. The positive identification of the target and the precise firing solution will optimize the performance of the operator, the weapon, and the ammunition to increase precision at longer ranges in multiple environments. This system could be used in a broad range of military applications where Special Operations Forces require: Faster Target Acquisition; Precise Targeting; Automatic Target Classification; Classification-based Multi Target Tracking; Ability to Engage Moving Targets, Decision Support System; Targeting with Scalable Effects; Battlefield Awareness; Integrated Battlefield (Common Operating Picture with IOBT, ATAK, COT across Squad, Platoon).

PHASE I: Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraphs entitled “Objective” and “Description”.

The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study (“Technology Readiness Level 3”) to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II: Develop and demonstrate a prototype system on a weapon sight or handheld binocular.

PHASE III DUAL USE APPLICATIONS: This technology could also be adopted by automobile industry for autonomous navigation.

REFERENCES:

1. The Hyper Enabled Operator,” Small Wars Journal,
https://smallwarsjournal.com/jrn1/art/hyperenabled-operator#_edn2;
2. AI Benchmark: All About Deep Learning on Smartphones in 2019”, 2019 IEEE/CVF International Conference on Computer Vision Workshop (ICCVW), <https://arxiv.org/pdf/1910.06663.pdf>

KEYWORDS: Visual Augmentation, Computational Imaging Camera, Hyper Enabled, Artificial Intelligence, Machine Learning, Multi-Platform, Multi-Sensor,

RT&L FOCUS AREA(S): Network Command, Control, Communications

TECHNOLOGY AREA(S): Information Systems; Sensors; Battlespace; Human Systems

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic is to develop standardized integrations between cyber assessment, monitoring, and exploitation tools with existing and emerging situational awareness / common operational picture (COP) / Mission Command platforms at tactical, operational, and strategic levels. The need for these standardized integrations arises from the convergence of computer, telecommunications, and other networks along with global acceleration of information systems capabilities and proliferation of agents who exploit these systems that has resulted in the modern and future operational environment, including abstract digital domains, co-existing with the physical environment.

DESCRIPTION: USSOCOM is exploring options that provide Special Operations Forces (SOF) with a fused COP for exercising mission command. Integrating digital network topography, assets, and known vulnerabilities into a GEOINT context will expand real-time situational awareness to include visualization of computer systems, networks, network-enabled systems, electromagnetic spectrum, and related capabilities that are becoming critical to battlefield operations. This will inform decision-making required for execution of operations and will enable rapid deployment of offensive and defensive cyber capabilities by SOF operating at the tactical level. By making the invisible visible, this capability adds to the Hyper-Enabled Operator's immediate situational awareness and rapid decision-making ability. Standardized formats and protocols are key to rapid information sharing between operational echelons and among partner forces. The ability to include data from the cyberspace domains as a new type of standardized sensor or information feed into the COP will enable these assets and capabilities to be seamlessly included in mission rehearsal and mission preparation as well as decision support before and during an operation.

Operating system key features shall include but are not limited to:

1. Assess the feasibility of integrating information about digital network topography, assets, and known vulnerabilities into a GEOINT / geospatially-referenced context.
2. Identify existing or in-development cyber-related tools and platforms that could provide data feeds to be used in this integration.
3. Enhance the open standard tactical COP with visualization of geospatially-referenced computer systems, networks, network-enabled systems, electromagnetic spectrum, and related capabilities and vulnerabilities.
4. Modular Open Systems Architecture with documented application program interfaces (APIs), to integrate into current and future Mission Command data and visualization platforms.
5. Use open standard data formats where applicable, new protocols and/or standards where necessary to be developed in conjunction with appropriate standards organizations (e.g. Open Geospatial Consortium, International Standards Organization (ISO), National Institute of Standards and Technology (NIST)).

PHASE I: Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraph entitled “Description.” To stimulate advances in technology and innovation, solutions including reusable code should be considered as well as re-use of open source code and integrations with fielded SOF systems utilizing existing open standards.

The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study (“Technology Readiness Level 3”) to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II: Develop, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study.

PHASE III DUAL USE APPLICATIONS: Once mature, this system could be used in a broad range of military, government, and commercial applications where geospatially-oriented cyber systems and capabilities data can enhance decision support for military operations or civilian cyber security awareness and response.

REFERENCES:

1. “Can Cyberspace be Mapped?”, C4ISRNET, <https://www.c4isrnet.com/intel-geoint/2016/05/18/can-cyberspace-be-mapped-nga-s-working-on-it/>, accessed 4 June 2020
2. “CYBERCOM Official Calls Data Fusion ‘Critical’ Among Intel Agencies,” MeriTalk, <https://www.meritalk.com/articles/cybercom-official-calls-data-fusion-critical-among-intel-agencies/>, accessed 4 June 2020
3. “Cyberspace Operations,” Joint Publication 3-12, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp3_12.pdf, accessed 4 June 2020
4. “The U.S. Army Concept Capability Plan for Cyberspace Operations 2016-2028”, U.S. Army Stand-TO!, https://www.army.mil/article/37870/the_u_s_army_concept_capability_plan_for_cyberspace_operations_2016_2028, accessed 4 June 2020
5. “The United States Army’s Cyberspace Operations Concept Capability Plan 2016-2028”, TRADOC Pamphlet 525-7-8, <https://fas.org/irp/doddir/army/pam525-7-8.pdf>, accessed 4 June 2020
6. “Geospatial Intelligence and Cyberspace,” Penn State College of Earth and Mineral Sciences courseware, <https://www.e-education.psu.edu/geog479/node/4>, accessed 4 June 2020
7. “The Hyper Enabled Operator,” Small Wars Journal, https://smallwarsjournal.com/jrnl/art/hyper-enabled-operator#_edn2, accessed 4 June 2020

KEYWORDS: Cyberspace, Cyber-security, Virtualized Data, Human Machine Interface, Non-traditional ISR, Georeferenced Network Data

UNITED STATES SPECIAL OPERATIONS COMMAND
20.3 Small Business Innovation Research (SBIR)
Direct to Phase II Proposal Submission Instructions

Introduction:

The United States Special Operations Command (USSOCOM) 20.3 Direct to Phase II proposal submission instructions cover Direct to Phase II proposals only and change/append the Department of Defense (DoD) instructions for Phase II submissions as they apply to USSOCOM Direct to Phase II requirements.

A thorough reading of the “Department of Defense Small Business Innovation Research (SBIR) Program, SBIR 20.3 Program Broad Agency Announcement (BAA)”, located at <https://rt.cto.mil/rtl-small-business-resources/sbir-sttr/>, prior to reading these USSOCOM instructions is highly recommended. These USSOCOM instructions explain certain unique aspects of the USSOCOM SBIR Program that differ from the DoD Announcement and its instructions. The Offeror is responsible for ensuring that their proposal complies with the requirements in the most current version of these instructions. Prior to submitting your proposal, please review the latest version of these instructions as they are subject to change before the submission deadline.

These USSOCOM instructions explain USSOCOM specific aspects that differ from the DoD Announcement and its instructions.

Table 1: Consolidated SBIR Topic Information

Topic	Technical Volume (Vol 2)	Additional Info. (Vol 5)	Period of Performance	Award Amount
<i>Direct to Phase II</i> SOCOM203-D007	Not to exceed 10 pages not including Feasibility Appendix	15-page PowerPoint	Typically 18 months	Not to Exceed \$2,500,000.00
<i>Direct to Phase II</i> SOCOM203-D008	Not to exceed 10 pages not including Feasibility Appendix	15-page PowerPoint	Typically 18 months	Not to Exceed \$750,000.00
<i>Direct to Phase II</i> SOCOM203-D009	Not to exceed 10 pages not including Feasibility Appendix	15-page PowerPoint	Typically 18 months	Not to Exceed \$1,500,000.00

Contract Awards:

SBIR awards for these 3 Direct to Phase II topics will be awarded as a fixed price (level of effort type), Other Transactions Agreement (OTA). Successful completion of the prototype under an OTA may result in a follow-on production OTA or contract. Successful completion of the prototype is meeting one or more threshold requirements. Firms may download the template at <https://www.socom.mil/SOF-ATL/Pages/SBIR-20-3.aspx>. The terms and conditions as well as the requirements are included in the OTA template provided in this solicitation. The terms and conditions of the Template OTA and the latest version of the OTA are also subject to change until executed. The document deliverables required for the effort are under attachment 2 of the OTA and the statement of objectives is under attachment 3 of the OTA template. Offerors must review these documents to develop their proposal. The template needs to be filled only by those Offerors selected to present.

Those selected to present would be required to enter their company information, expected milestones (attachment 1), and provide a non-proprietary Statement of Work (SOW) following the format of the Statement of Objectives (SOO) (attachment 3). The Government will evaluate all responsive proposals.

Proposal Submission:

Firms must upload their proposals to the Defense SBIR/STTR Innovation Portal Proposal Submissions at <https://www.dodsbirsttr.mil/submissions/login> . Additional USSOCOM specific submission requirements for each volume are detailed below.

Technical Inquiries:

During the Pre-release Period of the DoD SBIR 20.3 Program BAA, all questions must be submitted in writing either by e-mail to sbir@socom.mil or through Topic Q&A (formerly SITIS). All questions and answers submitted to Topic Q&A will be released to the general public. USSOCOM does not allow inquirers to communicate directly in any manner to the topic authors (differs from Section 4.13.c. of the DoD SBIR 20.3 Program BAA instructions). **All inquiries must include the topic number in the subject line of the e-mail.**

During the Open Period, follow the instructions in section 4.13.d of the DoD SBIR 20.3 Program BAA Instructions.

Site visits will not be permitted during the Pre-release and Open Periods of the DoD SBIR 20.3 Program BAA.

Proposal Volumes:

Volume 1: Cover Page is created as part of the DOD Proposal Submissions process.

Volume 2: Technical Volume

The Technical Volume shall not exceed 10 pages and will include all required items under section 5.4.c. of the DoD SBIR 20.3 instructions. Any additional pages will be deleted from the proposal prior to evaluation.

Offerors must provide documentation to satisfy the Phase I feasibility requirement as specified in the direct to Phase II topic. The documentation shall be included as a Feasibility Appendix in the technical proposal volume; however, it is not included in the 10-page limit. Offerors are required to provide sufficient information to determine, to the extent possible, the scientific, technical, and commercial merit and feasibility of ideas submitted, and that the feasibility assessment was performed by the Offeror and/or the Principal Investigator. **If the Offeror fails to demonstrate the scientific and technical merit, feasibility, and/or the source of the work, USSOCOM will not continue to evaluate the Offeror's proposal.** Refer to the topic's Phase I description under the Direct to Phase II topic to review the minimum requirements needed to demonstrate feasibility. There is no minimum or maximum page limitation for the Feasibility Appendix (Appendix A).

The technical proposal shall include a Statement of Work (SOW) with the planned tasks and descriptions to meet the Statement of Objectives (SOO) and Contract Data Requirement Lists (CDRLs) detailed in Attachments 2 and 3 of the OTA Template. Do not upload the SOO or CDRLs with your proposal. The SOO, and CDRLs will be provided in the OTA Template and can be downloaded from <https://www.socom.mil/SOF-ATL/Pages/SBIR-20-3.aspx>. The proposal must also include a completed

Section K which does not count toward the page limit. Any templates are provided to help the Offerors consider the required work/deliverables when developing the proposal, but it is an Offerors responsibility to provide fully responsive, complete, and clear submissions. If an Offeror is selected for award, the Offeror will be required to submit a separate non-proprietary SOW with the planned tasks and descriptions from the proposal and all other sections of the SOO as Attachment 3 in the OTA Template. The SOW attached to the OTA shall include no proprietary information, data, or markings

The identification of foreign national involvement in a USSOCOM SBIR topic is required to determine if a firm is ineligible for award on a USSOCOM topic that falls within the parameters of the United States Munitions List, Part 121 of the International Traffic in Arms Regulation (ITAR). A firm employing a foreign national(s) (as defined in paragraph 3.7 entitled “Foreign Nationals” of the DoD SBIR 20.3 Announcement) to work on a USSOCOM ITAR topic must possess an export license to receive a SBIR Phase II contract.

Volume 3: Cost Volume

Offerors must complete the cost volume using the Phase II OTA Cost Proposal template posted on the USSOCOM Portal at <https://www.socom.mil/SOF-ATL/Pages/SBIR-20-3.aspx>, and read instructions before completing it. The Cost Proposal information (PDF format) shall be appended to and submitted in Volume 3. Those recommended for award shall submit the original cost proposal in Excel format.

Technical and Business Assistance (TABAs) cost (if applicable) may be provided, not to exceed \$50,000 over the period of performance. For the direct to phase II topics in this announcement, the limit to provide a testable prototype is listed in table 1 titled “Consolidated SBIR Topic Information”. Any proposal submitted with a total price above the provided limit (not including TABAs) will not be considered for award.

USSOCOM may provide TABAs funds in Phase II awards to firms to meet up to Cybersecurity Maturity Model Certification (CMMC) Level 3 certification requirements. Draft of the CMMC is located at <https://www.acq.osd.mil/cmmc/draft.html>.

The TABA information must be included in the firm’s proposal specifically identified as “Discretionary Technical and Business Assistance” and cannot be subject to any profit or fee by the requesting SBIR firm. In addition, the provider of the TABA may not be the requesting firm, an affiliate of the requesting firm, an investor of the requesting firm, or a subcontractor or consultant of the requesting firm otherwise required as part of the paid portion of the research effort (e.g., research partner, consultant, tester, or administrative service provider). Proposed TABAs will be evaluated by the USSOCOM SBIR Program office. The proposed amount is in addition to the award amount for Phase II and cannot exceed \$50,000. The firm’s proposal must (1) clearly identify the need for assistance (purpose and objective of required assistance); (2) provide details on the provider of the assistance (name and point of contact for performer and unique skills/specific experience to carry out the assistance proposed); and (3) the cost of the required assistance (costs and hours proposed or other details on arrangement that would justify the proposed expense).

The final negotiated price of a USSOCOM Phase II SBIR contract will result from a determination of price fairness and reasonableness commensurate with the magnitude and complexity of the required research and development effort. The resulting agreement will be a firm priced.

Proposal information should include the itemized listing (a-h) specified below. The proposal information must include a level of detail that would enable the Government personnel to determine the purpose, necessity, and reasonability of the proposal and show an understanding of the scope of the work. It is

requested that a breakdown of labor hours per labor category and other associated costs be provided by task. The Agreements Officer may request additional information to support price analysis or understand the approach if needed.

a. Special Tooling and Test Equipment and Material: The inclusion of equipment and materials will be carefully reviewed relative to need and appropriateness of the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the Government and relate directly to the specific effort. They may include such items as innovative instrumentation and/or automatic test equipment. The reason for the requirement and the intention of offeror on disposition of the special material / equipment shall be documented in the proposal.

b. Direct Cost Materials: Justify costs for materials, parts, and supplies with an itemized list that includes item description, part number, quantities, and price.

c. Other Direct Costs: This category of costs includes specialized services such as machining or milling, special testing or analysis, and costs incurred in obtaining temporary use of specialized equipment. Proposals that include leased hardware must provide an adequate lease vs. purchase justification or rationale.

d. Direct Labor: For each individual, include the number of hours, and loaded rate to include all indirect costs. Identify key personnel by name if possible and labor category.

e. Travel: Travel costs must relate to the needs of the project. Proposed travel cost must be in accordance with the Federal Travel Regulation (FTR).

1. Per Diem Rates can be obtained at: <http://www.gsa.gov/perdiem>

2. The following information is documented –

- (i) Date (estimated), length and place (city, town, or other similar designation) of the trip;
- (ii) Purpose of the trip; and
- (iii) Number of personnel included in the estimate.

f. Cost Sharing: Cost sharing is permitted. However, cost sharing is not required, nor will it be an evaluation factor in the consideration of a proposal. Please note that cost share contracts do not allow fees/profit.

g. Subcontracts: Involvement of university or other consultants in the planning and/or research stages of the project may be appropriate. If the Offeror intends such involvement, describe in detail and include information in the cost proposal. The proposed total of all consultant fees, facility leases or usage fees, and other subcontract or purchase agreements may not exceed one-half of the total contract price or cost, unless otherwise approved in writing by the Agreements Officer.

Support subcontract costs with copies of the subcontract agreements. The supporting agreement documents must adequately describe the work to be performed (i.e., cost proposal) or provide a statement of work with a corresponding detailed proposal for each planned subcontract.

h. Consultants: Provide a separate agreement letter for each consultant. The letter should briefly state what service or assistance will be provided, the number of hours required and hourly rate.

Volume 4: Company Commercialization Report – Not in use for 20.3 BAA

Not used for 20.3 BAA and not evaluated by USSOCOM.

Volume 5: Supporting Documents

Potential Offerors shall submit a slide deck not to exceed 15 PowerPoint slides.

Volume 6: Fraud, Waste and Abuse Training

Not required by USSOCOM.

Direct to Phase II Evaluations:

USSOCOM evaluates Direct to Phase II proposals using the evaluation criteria specified in section 7.4 of the DoD 20.3 SBIR Announcement with the following exceptions:

1. Proposals missing technical volume, feasibility appendix, cost volume, or slide deck will not be evaluated or those that exceed the maximum price allowed as per Table 1 of this instructions.
2. Feasibility determination. The Feasibility Appendix to the Phase II proposal will be evaluated first to determine that the Offerors demonstrated they have completed research and development to establish the feasibility of the proposed Phase II effort based on the criteria outlined in the topic description. **USSOCOM will not continue evaluating the Offeror's related Phase II proposal if it determines that the Offeror failed to demonstrate that feasibility** has been established **or** the Offeror failed to demonstrate work submitted in the feasibility documentation was substantially performed by the Offeror and/or the Principal Investigator. Refer to the Phase I Topic description included in the Direct to Phase II topic to review the minimum requirements that need to be demonstrated in the feasibility documentation.
3. The technical evaluation will utilize the Evaluation Criteria provided in Section 7.4 of the DoD SBIR 20.3 BAA. The Technical Volume and slide deck will be reviewed holistically. The technical evaluation is performed in two parts:

Part I: The evaluation of the Technical Volume will utilize the Evaluation Criteria provided in Section 7.4 of the DoD SBIR 20.3 BAA. Once the evaluations are completed, all Offerors will be notified as to whether they were selected to present their slide deck portion of their proposal.

Part II: Selected Offerors will receive an invitation to present their slide deck (30-minute presentation time / 30-minute question and answer) to the USSOCOM evaluation team, in November 2020 using a virtual teleconference. All selected firms will be required to provide a teleconference information for the presentation. This presentation will be evaluated by a panel against the criteria listed under Section 7.4 of the DoD SBIR 20.3 BAA. Notifications of selection/non-selection for Phase II award will be completed within a timely manner.

4. The Cost Volume (Volume3) evaluation:

For this direct to phase II, the award amount is set at a not to exceed (NTE), a technical evaluation of the proposal cost will be completed to assess the probability of success to obtain a working prototype. Proposal above the set NTE for the effort will not be considered for award. The team will assess the technical approach presented for the effort based on the number of labor hours by labor categories, the key personnel level of involvement, materials, equipment, subcontractors and consultants (scope of work, expertise, participation and proposed effort), travel and other direct cost as proposed.

The resulting award/s will be a fixed price OTA prototyping agreements and a successful prototype may lead to follow on production. Follow on production awards may be FAR based, Fixed Price or Cost-Plus Fixed Fee contracts. A Defense Contracts Audit Agency approved accounting system will be required to issue a Cost-Plus Fixed Fee contract.

Additionally, input on technical aspects of the proposals may be solicited by USSOCOM from non-Government consultants and advisors who are bound by appropriate non-disclosure requirements. Non-Government personnel will not establish final assessments of risk, rate, or rank Offeror's proposals. These advisors are expressly prohibited from competing for USSOCOM SBIR awards. All administrative support contractors, consultants, and advisors having access to any proprietary data will certify that they will not disclose any information pertaining to this announcement, including any submission, the identity of any submitters, or any other information relative to this announcement; and shall certify that they have no financial interest in any submission. Submissions and information received in response to this announcement constitutes the Offeror's permission to disclose that information to administrative support contractors and non-Government consultants and advisors.

Selection Notifications:

The USSOCOM Contracting Officer notifies the Offeror by e-mail of selection/non-selection for award. The e-mail notification will only be sent to the Corporate Official (Business) identified by the Offeror.

Informal Feedback:

A non-selected Offeror can make a written request to the Contracting Officer, within 30 calendar days of receipt of notification of non-selection, for informal feedback. The Contracting Officer will provide informal feedback after receipt of an Offeror's written request rather than a debriefing as specified in paragraph 4.10, entitled "Debriefing," of the DoD SBIR 20.3 Announcement.

USSOCOM SBIR Program Point of Contact:

Inquiries concerning the USSOCOM SBIR Program should be addressed to sbir@socom.mil.

USSOCOM SBIR 20.3 Direct to Phase II Topic Index

SOCOM203-D007	Maneuver Level Laser Target Designator
SOCOM203-D008	Deployable At-Sea Mid-Wave Infrared Emitter
SOCOM203-D009	Interoperable Simulation and Gaming Mesh

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Battlespace, Weapons, Sensors, Electronics, Human Systems, Air Platform

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic is to develop a maneuver level laser target designator (M-LTD) for use with the emerging class of small, precision guided munitions, organic to maneuver level SOF units (squad, team, platoon, etc.) that is out of the threat Semi Active Laser (SAL) countermeasure wave length.

DESCRIPTION: With the emergence of man portable SAL and image guided precision weapons and with the Size Weight and Power (SwaP) challenges associated with Standardization Agreement (STANAG) 3733 compliant Laser Designators, a new class of laser target designators (LTDs) is required to enable small, handheld and/or rifle mounted designators to engage maneuver level targets (personnel, light vehicles, small structures, etc). The government requires that the designator be separated from STANAG 3733 designators by a different wavelength to prevent conflict or confusion on the battlefield and, more importantly, so that the LTDs cannot be countered by threat SAL countermeasures. The desired designator will be restricted for use with the new family of maneuver level small precision munitions and will have a laser coding system other than Pulse Repetition Frequency (PRF) encoding. The intent of the requirement is for the government to use forms of laser coding other than PRF and employing a new laser wavelength, so that the threat from SAL countermeasure will be ineffective on the battlefield.

Background: Current STANAG laser designators typically have a high optical peak power (2 to 10 megawatts) and a low average optical power (0.5 W to 5 W). They generally operate with a low fixed pulse rate (called Pulse Repetition Frequency - PRF) between 8 and 20 Hz but can be pulse interval modulated around a fixed PRF. The STANAG compliant laser designators are generally large, expensive and not suitable for a rifle mount, as well as require a substantial power source. The current laser designators effective operation time also depends on the unit's cooling capability. Also, many threats and all near peer threats now own and operate SAL countermeasures that significantly reduce the effectiveness of many SOF SAL guided weapons.

Operational Configuration Overview (see Basic Preliminary Requirements for specific values): Laser Diode designator systems are very efficient at converting DC power to light and can fit inside a compact package, including batteries. These designators are inherently very robust, and can withstand gun shock and a practical military environment. The packaging will mount on a standard Picatinny rail of conventional shoulder fired small arms. The designator will be lightweight. The designator will be passively air cooled and will be capable of continuous operation for several minutes. At the operational distance of 2 km, the ideal spot size (beam spread) for tactical systems should be relatively small (sub-meter). The battery should be removable by the operator with gloves on. The power On/Off control of the unit should be outward facing, must be enabled with gloved operation, and should be ambidextrously operable. Coded modulation features should be outward facing and readily adjustable by the gloved operator.

Basic Preliminary Requirements for the M-LTD.

- a. Size shall be ~13cm X ~8cm X 4cm
- b. Weight shall be 500g (Threshold = T), 300g (Objective - O) including batteries
- c. Shall be mountable to Picatinny Rail systems
- d. Physical shape shall not interfere with other weapon feature functionality or access to the weapon when mounted
- e. Powered using CR123 or AA batteries
- f. Batteries shall be accessible by gloved hands without the need for hand tools
- g. Functional Range shall be 2 km (T), 3km (O)
- h. Laser Wavelength shall be 900nm to 999nm
- i. Beam spread (laser spot size) shall be 2.0x2.0m@2km (T), < 1.0 x 1.0m @2km (O)
- j. Designator shall support continuous operation for 3 minutes (T), 5 minutes (O)
- k. Power activation shall be outward facing and accessible by the gloved hand of the operator while mounted on the weapon
- l. Laser pulse shall be modulation codable for operational safety
- m. Laser modulation coding shall have a minimum of 20 discrete settings
- n. Laser modulation coding settings shall be non-volatile and shall not reset when power is reset
- o. Laser modulation coding shall be outward facing and accessible by the gloved hand of the operator while mounted to weapon
- p. Device shall be designed for operation in all inclement weather including heavy rain, blowing sand, frost and snow
- q. Device shall be designed to be shock resistant to drop shock and shock associated with small arms fire of combat weapons IAW MIL-STD-810G Gunfire Shock (see reference below)

PHASE I: Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraph entitled "Description."

The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study ("Technology Readiness Level 3") to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II: Develop, and demonstrate a prototype laser target designator system that was determined to be among the most feasible solutions during the Phase I feasibility study. The testing and demonstration will contain scenarios, environments, and test objectives to demonstrate program and operational objectives.

PHASE III DUAL USE APPLICATIONS: This Laser Target Designation system could be used in a broad range of military applications, to include small Unmanned Aerial Systems (UAS) platforms, small unmanned ground vehicle (UGVs) as well as human platforms, in both an overt and covert applications. The fundamental capability to use a laser to cue an image tracker on another platform to lock on a track a target would have broad application to tagging surveillance and tracking by law enforcement and the Department of Homeland Security.

REFERENCES:

1. MIL-STD-810G Method 519.6 Gunfire Shock;
<https://pdfs.semanticscholar.org/d165/524fa56662a50b6448ad57d1b343ff0d25ab.pdf>
2. 21 CFR 1040 (Performance Standards for Light Emitting Products);
<https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCFR/CFRSearch.cfm?CFRPart=1040&showFR=1>
3. ANSI z136.1, z 136.4, z136.6 (Safe Use of Lasers, NOTAL); <https://www.lia.org/resources/laser-safety-information/laser-safety-standards/ansi-z136-standards>
4. Military Handbook 828C (Range Laser Safety);
https://www.navsea.navy.mil/Portals/103/Documents/NSWC_Dahlgren/Laser/mil-hdbk_828B.pdf
5. MIL-STD 1425A (Safety Design Requirements for Military Lasers); http://everyspec.com/MIL-STD/MIL-STD-1400-1499/MIL_STD_1425A_1274/
6. DoD Instruction 6055.15 (DoD Laser Protection Program) .
<https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/605515p.pdf>

KEYWORDS: Lasers, Laser Target Designator, Targeting Devices, Designators, Markers, Maneuver Weapons, SAL targeting, SAL Weapons

RT&L FOCUS AREA(S): Sensors, Electronics

TECHNOLOGY AREA(S): Electronics

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic is to develop a Deployable At-Sea Mid-Wave Infrared Emitter (DASMWIRE) unit that will allow combat swimmers/divers to provide visual position location via a strobe, primarily employed in a maritime environment (i.e., in the ocean) for the purpose of rendezvous / extraction. This strobe capability will be limited in the direction and range that it emits a signal, such as to not be detectable by enemy forces in the air.

DESCRIPTION: The needed capability shall consist of the following characteristics:

- The Emitter shall have the ability to be seen 360 degrees horizontally and between -5 to +25 degrees vertically.
- Be Class 1 (Eye Safe).
- Shall be a single, fully contained form factor, that weighs equal to or less than 1.5 pounds, including batteries and equal to or less than 10 inches in length and equal to or less than 2 inches in diameter.
- Capable of being hand held and/or attached to an extension pole, while in the water.
- Water proof to 200 feet depth.

PHASE I: Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraph entitled "Description."

The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study ("Technology Readiness Level 3") to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II. Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraph entitled "Description."

The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study ("Technology Readiness Level 3") to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The

funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II: Develop and demonstrate a prototype system determined to be the most feasible solution.

PHASE III DUAL USE APPLICATIONS: Maritime applications in Department of Homeland Security; City, County, and State Law Enforcement

REFERENCES:

1. Koerperick, Edwin John. "High power mid-wave and long-wave infrared light emitting diodes: device growth and applications." PhD (Doctor of Philosophy) thesis, University of Iowa, 2009. <https://doi.org/10.17077/etd.rq2pzdif>
2. Patel, Chandra & Lyakh, Arkadiy & Maulini, Richard & Tsekoun, Alexei & Tadjikov, Boris. (2012). QCL as a game changer in MWIR and LWIR military and homeland security applications. Proceedings of SPIE - The International Society for Optical Engineering. 8373. 67-. 10.1117/12.920476. https://www.researchgate.net/publication/258716122_QCL_as_a_game_changer_in_MWIR_and_LWIR_military_and_homeland_security_applications

KEYWORDS: Emitter, Beacon, Strobe, Mid-Wave Infrared, MWIR

RT&L FOCUS AREA(S): Artificial Intelligence/Machine Learning

TECHNOLOGY AREA(S): Information Systems; Sensors; Battlespace; Human Systems

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This topic seeks to demonstrate automated interoperability of simulation and gaming by taking tactical sensor data collected as gaming mesh that can be correctly georeferenced to the earth's surface and transforming it into Open Geospatial Consortium (OGC) CDB data segmented into appropriate data layers.

DESCRIPTION: USSOCOM provides Special Operation Forces (SOF) with operational intelligence that enables joint SOF mission planning and rehearsal for real-world combat environments. Current processes, mostly manual, leverage source data including imagery of varying types and resolutions, vector data, and elevation data to produce three-dimensional (3D) scene visualization databases and enhanced Geospatial Intelligence (GEOINT) data such as maps, imagery, and terrain models. 3D databases support battlespace visualization and simulation so that SOF units know the areas where they will operate in before they get there. This SBIR topic will investigate automated processes to accelerate production of OGC CDB data stores using sensor data source collected from small tactical UAS in meshed terrain format not traditionally associated with geographic information systems or Defense modeling and simulation.

The solution needs to recognize sensor data as points, imagery raster and/or meshed data and produce the appropriate OGC CDB layers. Most of the tactically collected data has some geo-referencing data to get it close to where the data exists in the real world and the data has good relative accuracy. If the data can be edge matched via pattern recognition to existing imagery to transform it into the correct place on the earth surface, it will improve the geospatial accuracy of the source data. Once the data is in the right location then the data needs to be segmented to provide a good Digital Terrain Model or Digital Elevation Model, and the rest of the 3D features extracted into OGC CDB models. Potential solutions may use OGC CDB raster material data and/or multi- or hyper-spectral imagery signatures to improve segmentation and then apply those material codes to the polygonal surfaces to improve the data for simulation ready applications like Unity and Semi-Automated Forces support. Artificial intelligence and/or machine learning algorithms be used to train and then invoke these procedures, reducing the need for manual intervention to pick tie points between the imagery and the vector data after enough tie points are established to transform the vector data to the imagery to correlate the data. Solutions should learn and, given a set of data, be able to recognize patterns in the data to automatically tie the vectors to the imagery.

High-level goals include:

1. Reduce (T)/eliminate (O) manual intervention necessary to build CDB data layers.
2. Minimal training (T) / no expert knowledge (O) required for basic use.
3. Customization through a drag-and-drop workflow creation/editing tool (O).
4. Implementation of AI/ML techniques to provide for a guided training mode that can be used to improve or customize autonomous processing outcomes (O) (ex: correlation of vector data with underlying imagery).

5. Ability for user to manually identify sets of source data for processing (T/O), including standardized OGC web services (O).
6. Ability to monitor a Watch Folder for input data (T/O).
7. Ability to accept and recursively follow links in the Watch Folder and defined data stores (T/O).
8. Execute autonomous actions and CDB creation workflows when presented with appropriate geospatial input data (T/O).
9. Process appropriate input data formats including, but not limited to, strategic imagery, elevation-data, vector-data, passive/active point cloud, triangular/polygonal mesh, etc. (T/O).

PHASE I: The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study to investigate what is in the art of the possible within the determined trade space that will satisfy the requirements specified by this topic. As a part of this feasibility study, respondents shall investigate all viable system design options and meet or exceed the performance parameter specifications provided herein. It shall also consider programmatic, schedule, and technical risks and potential payoffs of the innovative technology options that are investigated culminating in a recommended development strategy that best achieves the objectives of this technology pursuit. Government funds obligated on Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes shall not be developed with USSOCOM funds during Phase I feasibility studies. If an operational prototype is developed during Phase I with funding from sources other than the SBIR award, that prototype will influence the Government's whether and with whom to pursue a Phase II effort.

PHASE II: Develop, install, and demonstrate a prototype system determined, during the Phase I feasibility study, to be the most feasible and efficacious solution to this technology pursuit. Phase II will likely include additional performance and technical requirements developed during, or revealed by, Phase I investigations. In addition, as a system intended for operational evaluation, the Phase II prototype may be required to satisfy security requirements that will allow its implementation and use on the SOF information enterprise.

PHASE III DUAL USE APPLICATIONS: Once adequately matured, this system would be used in a broad range of military, Government, and commercial applications where it is desirable to construct detailed, OGC CDB compliant databases for use in terrestrial modeling, visualization, and simulation. This capability addresses the intersection of simulation and gaming and has the potential to rapidly move the commercial gaming industry out of artistically rendered fantasy and into the real world.

REFERENCES:

1. Open Geospatial Consortium, CDB Standard, <http://www.opengeospatial.org/standards/cdb>
2. "Overview of the OGC CDB Standard for 3D Synthetic Environment Modeling and Simulation," Saeedi, S.; Liang, S.; Graham, D.; Lokuta, M.F.; Mostafavi, M.A. International Society for Photogrammetry and Remote Sensing, International Journal of Geo-Information. 2017, 6, 306. <https://www.mdpi.com/2220-9964/6/10/306>
3. "The Hyper Enabled Operator," Small Wars Journal, https://smallwarsjournal.com/jrnl/art/hyper-enabled-operator#_edn2, accessed 30 May 2019
4. Open Sensor Hub, Fun Times, and the Future of the Internet of Things," <https://opensensorhub.org/2016/02/05/opensensorhub-funtimes-and-the-future-of-the-internet-of-things/>, accessed 30 May 2019
5. NoCloud: Exploring Network Disconnection through On-Device Data Analysis, <https://www.cs.dartmouth.edu/~dfk/papers/reza-nocloud.pdf>, accessed 30 May 2019
6. Integrated Sensor Architecture, https://www.cerdec.army.mil/news_and_media/Integrate_Sensor_Architecture/, accessed 30 May 2019
7. "Why is the OGC Involved in Sensor Webs?," <http://www.opengeospatial.org/domain/swe>, accessed 30 May 2019

8. Mobile Awareness GEOINT Environment, <http://ngageoint.github.io/MAGE/>, accessed 30 May 2019
9. "How Mobility Solutions are Transforming Military Tactical Operations and Driving Better Mission Outcomes," <https://insights.samsung.com/2018/12/13/how-mobility-solutions-are-transforming-military-tactical-operations-driving-better-mission-outcomes/>, accessed 30 May 2019

KEYWORDS: Open Geospatial Consortium, OGC, Common Data Base, CDB, Imagery Analysis, Imagery, Geospatial Intelligence, GEOINT, point cloud, mesh, terrain, decimation