DEPARTMENT OF DEFENSE
SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM
SBIR 21.3 Program Broad Agency Announcement (BAA)

August 25, 2021: DoD BAA issued for pre-release
September 21, 2021: DoD begins accepting proposals
October 21, 2021: Deadline for receipt of proposals no later than **12:00 p.m. ET**

Participating DoD Components:

- Department of Army (Army)
- Department of Navy (Navy)
- Chemical and Biological Defense (CBD)
- Defense Health Agency (DHA)
- Defense Logistics Agency (DLA)
- Missile Defense Agency (MDA)
- National Geospatial-Intelligence Agency (NGA)
- Office of the Secretary of Defense – Joint Service Small Arms Program (OSD – JSSAP)
- Strategic Capabilities Office (SCO)
- United States Special Operations Command (USSOCOM)

IMPORTANT

Deadline for Receipt: Complete proposals must be certified and submitted in DSIP no later than **12:00 PM** ET on **October 21, 2021**. Proposals submitted after 12:00 p.m. ET will not be evaluated. The final proposal submission includes successful completion of all firm level forms, all required volumes, and electronic corporate official certification. Please plan to submit proposals as early as possible in order to avoid unexpected delays due to high volume of traffic during the final hours before the BAA close. DoD is not responsible for missed proposal submission due to system latency.

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. 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. 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 (SBA), through its SBIR/STTR Policy Directive, purposely departs from normal Government solicitation formats and requirements, thus authorizing 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.

Questions: Visit the Learning & Support section of DSIP at https://www.dodsbirsttr.mil/submissions/learning-support/faqs for DoD SBIR or STTR program-related information. Email the DSIP Help Desk at DoDSBIRSupport@reisystems.com only for assistance with using DSIP. Questions regarding DSIP may be emailed to the DSIP Help Desk and will be addressed in the order received during normal operating hours (Monday through Friday, 9:00 a.m. to 5:00 p.m. ET). See section 4.13 for information on where to direct other BAA and topic-related questions.

TABLE OF CONTENTS

ATTACHMENTS

1.0 INTRODUCTION

Army (Fundamentals), Navy, CBD, DHA, DLA, NGA, SCO, 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 this BAA 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**. Missile Defense Agency (MDA), Joint Service Small Arms Program (OSD-JSSAP), SCO, and USSOCOM are offering Direct to Phase II topics for this BAA – see the Component-specific instructions for more information.

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.

2.2 Technology and Program Protection to Maintain Technological Advantage

In accordance with DoD Instruction 5000.83, Technology and Program Protection to Maintain Technological Advantage, dated July 20, 2020, and as a means to counter the threat from strategic competitor nations, the DoD will employ risk-based measures to protect systems and technologies from adversarial exploitation and compromise of U.S. military vulnerabilities and weaknesses in: (1) systems, (2) components, (3) software, (4) hardware, and (5) supply chains. Any offeror submitting a proposal under this BAA will be required to disclose via self-report any foreign ownership or control. Offerors shall also require any proposed subcontractors included in their proposal under this BAA to disclose via self-report any foreign ownership or control. Reporting and disclosing such information will enable the DoD to identify national security risks posed by foreign participation, through investment, ownership, or influence, in the defense industrial base. This information will be used by DoD program offices to determine risks posed by SBIR contract awardees and their subcontractors to the DoD and the defense industrial base.

OUSD(R&E) Modernization Priorities

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/STTR Policy Directive updated on October 1, 2020. 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/STTR Policy Directive is available at: https://www.sbir.gov/sites/default/files/SBA_SBIR_STTR_POLICY_DIRECTIVE_OCT_2020_0.pdf.

2.3 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:

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.

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.

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.

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.

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.

Foreign Entity

Foreign entity means any branch, partnership, group or sub-group, association, estate, trust, corporation or division of a corporation, non-profit, academic institution, research center, or organization established, directed, or controlled by foreign owners, foreign investors, foreign management, or a foreign government.

Foreign Government

Foreign government means any government or governmental body, organization, or instrumentality, including government owned-corporations, other than the United States Government or United States state, territorial, tribal, or jurisdictional governments or governmental bodies. The term includes, but is not limited to, non-United States national and subnational governments, including their respective departments, agencies, and instrumentalities.

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.

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/tutorial-1. See Section 4.17 for reporting Fraud, Waste and Abuse.

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.

Historically Black Colleges and Universities and Minority Institutions (HBCU/MI)

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.

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).

Performance Benchmark Requirements for Phase I

Companies with multiple SBIR/STTR awards must meet minimum performance requirements to be eligible to apply for a new Phase I or Direct-to-Phase II award. The purpose of these requirements is to ensure that Phase I applicants that have won multiple prior SBIR/STTR awards are making progress towards commercializing the work done under those awards. The Phase I to Phase II Transition Rate addresses the extent to which an awardee progresses a project from Phase I to Phase II. The Commercialization Benchmark addresses the extent to which an awardee has moved past Phase II work towards commercialization. Additional information on performance benchmarking for Phase I applicants can be found at https://www.sbir.gov/performance-benchmarks.

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.

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.

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/.

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.

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.

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.

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.

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).

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.)

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.

Subcontractor

Subcontractor means any supplier, distributor, vendor, firm, academic institution, research center, or other person or entity that furnishes supplies or services pursuant to a subcontract, at any tier.

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.

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:

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.

Please note, **this BAA is for Phase I proposals only** unless the Component is participating in the **Direct to Phase II Program**.

a. 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 DoD to make a SBIR Phase II award to a small business concern with respect to a project, without regard to whether the small business concern was provided an award under Phase I of the SBIR program with respect to such project. Missile Defense Agency (MDA), Joint Service Small Arms Program (OSD-JSSAP), SCO, and USSOCOM are conducting a "Direct to Phase II" implementation of this authority for select topics under this BAA. DoD does not guarantee Direct to Phase II opportunities will be offered in future BAAs.

Each eligible topic requires that proposers provide documentation to demonstrate feasibility described in the Phase I section of the topic has been met. **Feasibility documentation cannot be based upon or logically extend from any prior or ongoing federally funded SBIR or STTR work.** 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.

If the proposer fails to demonstrate technical merit and feasibility equivalent to the Phase I level as described in the associated topic, the related Phase II proposal will not be accepted or evaluated, in accordance with the Component-specific Direct to Phase II instructions.

Please refer to the Component-specific Direct to Phase II instructions for full details regarding Component Direct to Phase II processes and proposal preparation requirements.

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 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 or Direct to Phase II award for a period of one year from that date.
- Because this requirement only affects a company's eligibility for new Phase I or Direct to Phase II 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. Proposers must disclose joint ventures with existing (or planned) relationships/partnerships with any foreign entity or any foreign government-controlled companies.

4.4 Majority Ownership in Part by Multiple Venture Capital, Hedge Fund, and Private Equity Firms

Unless otherwise noted in the participating Component instructions, small businesses that are owned in majority part by multiple venture capital operating companies (VCOCs), hedge funds, or private equity funds are ineligible to submit applications or receive awards for opportunities in this BAA. Component instructions will specify if participation by a small business majority owned in part by VCOCs, hedge funds, or private equity funds is allowable for a specific topic in the BAA. If a Component authorizes such participation, any proposer that is owned, in whole in or in part, by any VCOC, hedge fund, and/or private equity fund must identify each foreign national, foreign entity, or foreign government holding or controlling greater than a 5% equity stake in the proposer, whether such equity stake is directly or indirectly held. The proposer must also identify any and all of its ultimate parent owner(s) and any other entities and/or individuals owning more than a 5% equity stake in its chain of ownership.

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 Organizational Conflicts of Interest

FAR 9.5 Requirements
In accordance with FAR 9.5, proposers are required to identify and disclose all facts relevant to potential OCIs involving the proposer's organization and any proposed team member (sub-awardee, consultant). Under this Section, the proposer is responsible for providing this disclosure with each proposal submitted to the BAA. The disclosure must include the proposer's, and as applicable, proposed team member's OCI mitigation plan. The OCI mitigation plan must include a description of the actions the proposer has taken, or intends to take, to prevent the existence of conflicting roles that might bias the proposer's judgment and to prevent the proposer from having unfair competitive advantage. The OCI mitigation plan will specifically discuss the disclosed OCI in the context of each of the OCI limitations outlined in FAR 9.505-1 through FAR 9.505-4.

Agency Supplemental OCI Policy
In addition, DoD Components may have a supplemental OCI policy that prohibits contractors/performers from concurrently providing Scientific Engineering Technical Assistance (SETA), Advisory and Assistance Services (A&AS) or similar support services and being a technical performer. Therefore, as part of the FAR 9.5 disclosure requirement above, a proposer must affirm whether the proposer or any proposed team member (sub-awardee, consultant) is providing SETA, A&AS, or similar support to any DoD Component office(s) under: (a) a current award or sub-award; or (b) a past award or sub-award that ended within one calendar year prior to the proposal's submission date.

If SETA, A&AS, or similar support is being or was provided to any DoD Component office(s), the proposal must include:

- The name of the DoD Component office receiving the support;
- The prime contract number;

- Identification of proposed team member (sub-awardee, consultant) providing the support; and
- An OCI mitigation plan in accordance with FAR 9.5.

Government Procedures
In accordance with FAR 9.503, 9.504 and 9.506, the Government will evaluate OCI mitigation plans to avoid, neutralize or mitigate potential OCI issues before award and to determine whether it is in the Government's interest to grant a waiver. The Government will only evaluate OCI mitigation plans for proposals that are determined selectable under the BAA evaluation criteria and funding availability.

The Government may require proposers to provide additional information to assist the Government in evaluating the proposer's OCI mitigation plan.

If the Government determines that a proposer failed to fully disclose an OCI; or failed to provide the affirmation of Government support as described above; or failed to reasonably provide additional information requested by the Government to assist in evaluating the proposer's OCI mitigation plan, the Government may reject the proposal and withdraw it from consideration for award.

4.7 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 Counterintelligence and Security Agency (DCSA) website at: https://www.dcsa.mil/mc/ctp/fc/.

4.8 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).

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.**

4.9 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).

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.**

4.10 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.

4.11 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.

4.12 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).

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

NOTE: CONTACT FOR PROTESTS ONLY. All other inquiries will not be answered or considered.

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

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 above (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.

4.13 Phase I Award Information

All Phase I 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 regarding award size.

d. **Timing**. Proposing firms will be notified of selection or non-selection status for a Phase I award by the DoD Component that originated the topic within 90 days of the closing date for this BAA. Please refer to the Component-specific instructions for details.

   The SBA SBIR/STTR 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.

This information in this section is applicable to Phase I proposals only. If the Component is participating in the **Direct to Phase II Program**, refer to the Component-specific Direct to Phase II instructions for award information.

4.14 Questions about this BAA and BAA Topics

a. **General SBIR Questions/Information**.

(1) **DSIP Help Desk**:
Email the DSIP Help Desk at DoDSBIRSupport@reisystems.com for assistance with using DSIP. Questions regarding DSIP can be emailed to the DSIP Help Desk and will be addressed in the order received, during normal operating hours (Monday through Friday, 9:00 a.m. to 5:00 p.m. ET).

The DSIP Help Desk cannot provide updates to proposal status after submission, such as proposal selection/non-selection status or contract award status. Contact the DoD Component that originated the topic in accordance with the Component-specific instructions given at the beginning of that Component's topics.

(2) **Websites**:
The Defense SBIR/STTR Innovation Portal (DSIP) at https://www.dodsbirsttr.mil/submissions/login, which provides the following resources:

- SBIR and STTR Program Opportunities
- Topics Search Engine
- Topic Q&A
- 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.

DoD SBIR/STTR website at https://rt.cto.mil/rtl-small-business-resources/sbir-sttr/, which provides the following resources:

- SBIR and STTR Program Opportunities
- Dates for Current and Upcoming Opportunities
- Past SBIR and STTR Program Opportunities

(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, subscribe to the Listserv by selecting “DSIP Listserv” under Quick Links on the DSIP login page.

b. **General Questions about a DoD Component.** General questions pertaining to a particular DoD Component and the Component-specific BAA instructions 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 **August 25, 2021 to September 21, 2021**, 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. After this period questions must be asked through Topic Q&A as described below.

d. **Topic Q&A.** Once DoD begins accepting proposals on **September 21, 2021**, 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, all questions and answers are posted electronically for general viewing. Identifying information for the questioner and respondent is not posted.

Questions submitted through the Topic Q&A 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, or administrative questions, such as SBIR or STTR program eligibility, technical proposal/cost proposal structure and page count, budget and duration limitations, or proposal due date WILL NOT receive a response. Refer to the Component-specific instructions given at the beginning of that Component's topics for help with an administrative question.

Proposing firms may use the Topic Search feature on DSIP to locate a topic of interest. 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 **August 25, 2021** and closes to new questions on **October 7, 2021 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.

4.15 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). SAM allows firms interested in conducting business with the federal government to provide basic information on business structure and capabilities as well as financial and payment information. To register, visit www.sam.gov. It is in the firm's interest to visit SAM and ensure the firm's registration is active and representations and certifications are up-to-date to avoid delay in award.

SAM.gov merged into the modernized beta.SAM.gov environment on May 24, 2021. Legacy SAM.gov has been decommissioned and the new environment has retired the "beta" and is renamed SAM.gov. The system provides a modern portal for entities to register, update, renew, and check the status of their registration in the rebranded SAM.gov. Core functions of SAM and core data has not changed. Entities with an active registration do not need to take action and the process to register to do business with the government has not changed.

Follow instructions found during SAM registration 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.

4.16 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.

4.17 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) 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).

4.18 Fraud and Fraud Reporting

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 https://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.

4.19 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.

4.20 Discretionary Technical and Business Assistance (TABA)

DoD has not mandated the use of TABA 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 TABA is being offered and follow specific proposal requirements for requesting TABA 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. 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.

This information in this section is applicable to Phase I proposals only. If the Component is participating in the **Direct to Phase II Program**, refer to the Component-specific Direct to Phase II instructions for more information on proposal preparation.

Guidance on allowable proposal content may vary by Component. Accordingly, it is the proposing firm's responsibility to consult the Component-specific instructions for detailed guidance, including

required proposal documentation, cost and duration limitations, budget structure, TABA allowance and proposal page limits.

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
Volume 5: Supporting Documents
a. Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Attachment 1)
b. Foreign Ownership or Control Disclosure (Proposers must review Attachment 2: Foreign Ownership or Control Disclosure to determine applicability.)
c. Other supporting documentation (Refer to Component-specific instructions for additional Volume 5 requirements)
Volume 6: Fraud, Waste and Abuse Training

All proposers must complete the following:

- Volume 4: Company Commercialization Report (upload of CCR from SBIR.gov to DSIP is required for proposers with prior Federal SBIR or STTR awards)
- Volume 5(a): Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Attachment 1)
- Volume 5(b): Foreign Ownership or Control Disclosure (Proposers must review Attachment 2: Foreign Ownership or Control Disclosure to determine applicability)
- Volume 6: Fraud, Waste and Abuse training.

Refer to Section 5.3 below for full details on these proposal requirements.

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 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.

5.3 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) 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 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 to the same level of detail as the prime contractor costs. 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:

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 principal investigator 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 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 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, such as labor, travel, equipment, materials, must be detailed at the same level as prime contractor costs. Provide detailed substantiation of subcontractor costs in your cost proposal. Volume 5, Supporting Documents, 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 https://www.dcaa.mil/Guidance/Audit-Process-Overview/.

e. **Company Commercialization Report (Volume 4)**

The Company Commercialization Report (CCR) allows companies to report funding outcomes resulting from prior SBIR and STTR awards. SBIR and STTR awardees are required by SBA to update and maintain their organization's CCR on SBIR.gov. Commercialization information is required upon completion of the last deliverable under the funding agreement. Thereafter, SBIR and STTR awardees are requested to voluntarily update the information in the database annually for a minimum period of 5 years.

If the proposing firm has prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards, regardless of whether the project has any commercialization to date, a PDF of the CCR must be downloaded from SBIR.gov and uploaded to the Firm Forms section of DSIP by the Firm Admin. Firm Forms are completed by the DSIP Firm Admin and are applied across all proposals the firm submits. The DSIP CCR requirement is fulfilled by completing the following:

1. Log into the firm account at https://www.sbir.gov/.
2. Navigate to My Dashboard > My Documents to view or print the information currently contained in the Company Registry Commercialization Report.
3. Create or update the commercialization record, from the company dashboard, by scrolling to the "My Commercialization" section, and clicking the create/update Commercialization tab under "Current Report Version". Please refer to the "Instructions" and "Guide" documents contained in this section of the Dashboard for more detail on completing and updating the CCR. **Ensure the report is certified and submitted.**
4. Click the "Company Commercialization Report" PDF under the My Documents section of the dashboard to download a PDF of the CCR.
5. Upload the PDF of the CCR (downloaded from SBIR.gov in previous step) to the Company Commercialization Report in the Firm Forms section of DSIP. This upload action must be completed by the Firm Admin.

This version of the CCR, uploaded to DSIP from SBIR.gov, is inserted into all proposal submissions as Volume 4.

During proposal submission, the proposer will be prompted with the question: "Do you have a new or revised Company Commercialization Report to upload?". There are three possible courses of action:

a. If the proposing firm has prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards, and **DOES have a new or revised CCR from SBIR.gov to upload to DSIP**, select YES.

- If the user is the Firm Admin, they can upload the PDF of the CCR from SBIR.gov directly on this page. It will also be updated in the Firm Forms and be associated with all new or in-progress proposals submitted by the firm. If the user is not the Firm Admin, they will receive a message that they do not have access and must contact the Firm Admin to complete this action.
- **WARNING:** Uploading a new CCR under the Firm Forms section of DSIP or clicking "Save" or "Submit" in Volume 4 of one proposal submission is considered a change for ALL proposals under any open BAAs or CSOs. If a proposing firm has previously certified and submitted any Phase I or Direct to Phase II proposals under ***any*** BAA or CSO ***that is still open***, those proposals will be automatically reopened. Proposing firms will have to recertify and resubmit such proposals. If a proposing firm does not recertify or resubmit such proposals, they will not be considered fully submitted and will not be evaluated.

b. If the proposing firm has prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards, and **DOES NOT have a new or revised CCR from SBIR.gov to upload to DSIP**, select NO.
   - If a prior CCR was uploaded to the Firm Forms, the proposer will see a file dialog box at the bottom of the page and can view the previously uploaded CCR. This read-only access allows the proposer to confirm that the CCR has been uploaded by the Firm Admin.
   - If no file dialog box is present at the bottom of the page that is an indication that **there is no previously uploaded CCR in the DSIP Firm Forms**. To fulfill the DSIP CCR requirement the Firm Admin must follow steps 1-5 listed above to download a PDF of the CCR from SBIR.gov and upload it to the DSIP Firm Forms to be included with all proposal submissions.

c. If the proposing firm has **NO** prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards, the upload of the CCR from SBIR.gov is not required and firm will select NO. The CCR section of the proposal will be marked complete.

While all proposing firms with prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards must report funding outcomes resulting from these awards through the CCR from SBIR.gov and upload a copy of this report to their Firm Forms in DSIP, **please refer to the Component-specific instructions for details on how this information will be considered during proposal evaluations.**

f. **Supporting Documents (Volume 5)**

Volume 5 is provided for proposers to submit additional documentation to support the Coversheet (Volume 1), Technical Volume (Volume 2), and the Cost Volume (Volume 3).

All proposers are REQUIRED to submit the following documents to Volume 5:

1. Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Attachment 1) (REQUIRED)
2. Foreign Ownership or Control Disclosure (BAA Attachment 2) (Proposers must review Attachment 2: Foreign Ownership or Control Disclosure to determine applicability)

Any of the following documents may be included in Volume 5 if applicable to the proposal. Refer to Component-specific instructions for additional Volume 5 requirements.

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

g. **Contractor Certification Regarding Provision of** Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment

The DoD must comply with Section 889(a)(1)(B) of the National Defense Authorization Act (NDAA) for Fiscal Year 2019, and is working to reduce or eliminate contracts with entities that use any equipment, system, or service that uses covered telecommunications equipment or services (as defined in BAA Attachment 1) as a substantial or essential component of any system, or as critical technology as part of any system.

All proposals must include certifications in Defense Federal Acquisition Regulation Supplement (DFARS) provisions 252.204-7016, 252.204-7017, and clause 252.204-7018, executed by the proposer's authorized company representative. The DFARS provisions and clause may be found in BAA Attachment 1. **These certifications must be signed by the authorized company representative and uploaded as a separate PDF file in the supporting documents sections of Volume 5 for all proposal submissions.**

The effort to complete the required certification clauses includes due diligence on the part of the proposer and for any contractors that may be proposed as a part of the submission including research partners and suppliers. Therefore, proposers are strongly encouraged to review the requirements of these certifications early in the proposal development process. Failure to submit or complete the required certifications as a part of the proposal submission process may be cause for rejection of the proposal submission without evaluation.

h. **Foreign Ownership or Control Disclosure**

Proposers must review Attachment 2: Foreign Ownership or Control Disclosure to determine applicability. If applicable, an authorized firm representative must complete the Foreign Ownership or Control Disclosure (BAA Attachment 2). The completed and signed disclosure must be uploaded to Volume 5 of the proposal submission.

i. **Fraud, Waste and Abuse Training (Volume 6)**

The Fraud, Waste and Abuse (FWA) training is **required** for Phase I and Direct to Phase II proposals. FWA training provides information on what represents FWA in the SBIR/STTR program, the most common mistakes that lead to FWA, as well as the penalties and ways to prevent FWA in your firm. This training material can be found in the Volume 6 section of the proposal submission module in DSIP and must be thoroughly reviewed once per year. Plan ahead and leave ample time to complete this training based on the proposal submission deadline. FWA training must be completed by one DSIP firm user with read/write access (Proposal Owner, Corporate Official or Firm Admin) on behalf of the firm.

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 or budget data submitted with the proposals will be considered during evaluation.

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 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.

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/STTR Policy Directive provides 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 SBA Company Commercialization Report via "My Dashboard" on SBIR.gov 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 https://www.dcaa.mil/Guidance/Audit-Process-Overview/ and https://www.dcaa.mil/Checklists-Tools/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 osd.ncr.ousd-r-e.mbx.sbir-sttr@mail.mil.

8.0 CONTRACTUAL REQUIREMENTS

8.1 Additional 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.

Examples of general provisions:

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.

Applicable Federal Acquisition Regulation (FAR) and/or Defense Federal Acquisition Regulation Supplement (DFARS) Clauses:

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. **Disclosure of Information.** In accordance with FAR 252.204-7000, Government review and approval will be required prior to any dissemination or publication, regardless of medium (e.g., film, tape, document), pertaining to any part of this contract or any program related to this contract except within and between the Contractor and any subcontractors, of unclassified 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 SBC receiving an SBIR/STTR award is required to provide adequate security on all covered contractor information systems. Specific security requirements and cyber incident reporting requirements are listed in DFARS 252.204.7012. Compliance is mandatory.

x. **Safeguarding Covered Defense Information Controls.** As prescribed in DFARS 252.204-7008, for covered contractor information systems that are not part of an information technology service or system operated on behalf of the Government, the SBC represents that it will implement the security requirements specified by National Institute of Standards and Technology (NIST) Special Publication (SP) 800-171, "Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations".

y. **Limitations on the Use or Disclosure of Third- Party Contractor Reported Cyber Incident Information.** As required in DFARS 252.204-7009, the Contractor must agree that certain conditions apply to any information it receives or creates in the performance of a resulting contract that is information obtained from a third-party's reporting of a cyber incident pursuant to DFARS clause 252.204-7012, Safeguarding Covered Defense Information and Cyber Incident Reporting (or derived from such information obtained under that clause).

z. **Notice of NIST SP 800-171 DoD Assessment Requirements.** As prescribed by DFARS 252.204-7019, in order to be considered for award, the SBC is required to implement NIST SP 800-171. The SBC shall have a current assessment (see 252.204-7020) for each covered contractor information system that is relevant to the offer, contract, task order, or delivery order. The Basic, Medium, and High NIST SP 800-171 DoD Assessments are described in the NIST SP 800-171 DoD Assessment Methodology located at https://www.acq.osd.mil/dpap/pdi/cyber/strategically_assessing_contractor_implementation_of_NIST_SP_800-171.html. In accordance with DFARS 252.204-7020, the SBC shall provide access to its facilities, systems, and personnel necessary for the Government to conduct a Medium or High NIST SP 800-171 DoD Assessment, as described in NIST SP 800-171 DoD Assessment Methodology, linked above. Notification of specific requirements for NIST SP 800-171 DoD assessments and assessment level will be provided as part of the component instructions, topic, or award.

aa. **Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment.** In accordance with DFARS Subpart 204.21, DFARS provisions 252.204-7016, 252.204-7017, and clause 252.204-7018 are incorporated into this solicitation. This subpart implements section 1656 of the National Defense Authorization Act for Fiscal Year 2018 (Pub. L. 115-91) and section 889(a)(1)(A) of the National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232). Full text of the provisions and clause and required offeror representations can be found in Attachment 1 of this BAA.

bb. **Disclosure of Ownership or Control by a Foreign Government**. DFARS 252.209-7002, Disclosure of Ownership or Control by a Foreign Government (JUN 2010), is incorporated into this solicitation. In accordance with DFARS 252.209-7002, any SBC submitting a proposal in response to this solicitation is required to disclose, by completing Attachment 2 to this solicitation, Foreign Ownership or Control Disclosure, any interest a foreign government has in

the SBC when that interest constitutes control by a foreign government, as defined in DFARS provision 252.209-7002. If the SBC is a subsidiary, it is also required to disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable interest concerning the SBC's immediate parent, intermediate parents, and the ultimate parent.

8.2 Basic Safeguarding of Covered Contractor Information Systems

FAR 52.204-21, Basic Safeguarding of Covered Contractor Information Systems, is incorporated into this solicitation. In accordance with FAR 52.204-21, the contractor shall apply basic safeguarding requirements and procedures when the contractor or a subcontractor at any tier may have Federal contract information residing in or transiting through its information system.

FAR 52.204-21 Basic Safeguarding of Covered Contractor Information Systems (JUN 2016)

(a) Definitions. As used in this clause -

Covered contractor information system means an information system that is owned or operated by a contractor that processes, stores, or transmits Federal contract information.

Federal contract information means information, not intended for public release, that is provided by or generated for the Government under a contract to develop or deliver a product or service to the Government, but not including information provided by the Government to the public (such as on public Web sites) or simple transactional information, such as necessary to process payments.

Information means any communication or representation of knowledge such as facts, data, or opinions, in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual (Committee on National Security Systems Instruction (CNSSI) 4009).

Information system means a discrete set of information resources organized for the collection, processing, maintenance, use, sharing, dissemination, or disposition of information (44 U.S.C. 3502).

Safeguarding means measures or controls that are prescribed to protect information systems.

(b) Safeguarding requirements and procedures.

(1) The Contractor shall apply the following basic safeguarding requirements and procedures to protect covered contractor information systems. Requirements and procedures for basic safeguarding of covered contractor information systems shall include, at a minimum, the following security controls:

(i) Limit information system access to authorized users, processes acting on behalf of authorized users, or devices (including other information systems).

(ii) Limit information system access to the types of transactions and functions that authorized users are permitted to execute.

(iii) Verify and control/limit connections to and use of external information systems.

(iv) Control information posted or processed on publicly accessible information systems.

(v) Identify information system users, processes acting on behalf of users, or devices.

(vi) Authenticate (or verify) the identities of those users, processes, or devices, as a prerequisite to allowing access to organizational information systems.

(vii) Sanitize or destroy information system media containing Federal Contract Information before disposal or release for reuse.

(viii) Limit physical access to organizational information systems, equipment, and the respective operating environments to authorized individuals.

(ix) Escort visitors and monitor visitor activity; maintain audit logs of physical access; and control and manage physical access devices.

(x) Monitor, control, and protect organizational communications (i.e., information transmitted or received by organizational information systems) at the external boundaries and key internal boundaries of the information systems.

(xi) Implement subnetworks for publicly accessible system components that are physically or logically separated from internal networks.

(xii) Identify, report, and correct information and information system flaws in a timely manner.

(xiii) Provide protection from malicious code at appropriate locations within organizational information systems.

(xiv) Update malicious code protection mechanisms when new releases are available.

(xv) Perform periodic scans of the information system and real-time scans of files from external sources as files are downloaded, opened, or executed.

(2) **Other requirements**. This clause does not relieve the Contractor of any other specific safeguarding requirements specified by Federal agencies and departments relating to covered contractor information systems generally or other Federal safeguarding requirements for controlled unclassified information (CUI) as established by Executive Order 13556.

(c) Subcontracts. The Contractor shall include the substance of this clause, including this paragraph (c), in subcontracts under this contract (including subcontracts for the acquisition of commercial items, other than commercially available off-the-shelf items), in which the subcontractor may have Federal contract information residing in or transiting through its information system.

8.3 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.

8.4 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.

8.5 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 8.6.

8.6 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, at the end of the technical volume. The contract cannot be awarded until assertions have been approved.

8.7 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.

8.8 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 https://discover.dtic.mil/submit-documents/. 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-O0007 (see Section 8.5, 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-O0007.

ATTACHMENT 1

Department of Defense (DoD)
Small Business Innovation Research (SBIR) Program
Small Business Technology Transfer (STTR) Program

CONTRACTOR CERTIFICATION REGARDING PROVISION OF PROHIBITION ON CONTRACTING FOR CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT (DFARS SUBPART 204.21)

Contractor's Name	
Company Name	
Office Tel #	
Mobile #	
Email	

Name of person authorized to sign: _____

Signature of person authorized: _____

Date: _____

The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

DFARS PROVISIONS INCORPORATED IN FULL TEXT:

252.204-7016 Covered Defense Telecommunications Equipment or Services—Representation

COVERED DEFENSE TELECOMMUNICATIONS EQUIPMENT OR SERVICES—REPRESENTATION (DEC 2019)

(a) *Definitions*. As used in this provision, "covered defense telecommunications equipment or services" has the meaning provided in the clause 252.204-7018 , Prohibition on the Acquisition of Covered Defense Telecommunications Equipment or Services.

(b) *Procedures*. The Offeror shall review the list of excluded parties in the System for Award Management (SAM) (https://www.sam.gov/) for entities excluded from receiving federal awards for "covered defense telecommunications equipment or services".

(c) *Representation*. The Offeror represents that it ☐ does, ☐ does not provide covered defense telecommunications equipment or services as a part of its offered products or services to the Government in the performance of any contract, subcontract, or other contractual instrument.

252.204-7017 Prohibition on the Acquisition of Covered Defense Telecommunications Equipment or Services—Representation

PROHIBITION ON THE ACQUISITION OF COVERED DEFENSE TELECOMMUNICATIONS EQUIPMENT OR SERVICES—REPRESENTATION (MAY 2021)

*The Offeror is not required to complete the representation in this provision if the Offeror has represented in the provision at 252.204-7016 , Covered Defense Telecommunications Equipment or Services—Representation, that it "**does not** provide covered defense telecommunications equipment or services as a part of its offered products or services to the Government in the performance of any contract, subcontract, or other contractual instrument."*

(a) *Definitions*. "Covered defense telecommunications equipment or services," "covered mission," "critical technology," and "substantial or essential component," as used in this provision, have the meanings given in the 252.204-7018 clause, Prohibition on the Acquisition of Covered Defense Telecommunications Equipment or Services, of this solicitation.

(b) *Prohibition*. Section 1656 of the National Defense Authorization Act for Fiscal Year 2018 (Pub. L. 115-91) prohibits agencies from procuring or obtaining, or extending or renewing a contract to procure or obtain, any equipment, system, or service to carry out covered missions that uses covered defense telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

(c) *Procedures*. The Offeror shall review the list of excluded parties in the System for Award Management (SAM) at https://www.sam.gov for entities that are excluded when providing any equipment, system, or service to carry out covered missions that uses covered defense telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless a waiver is granted.

Representation. If in its annual representations and certifications in SAM the Offeror has represented in paragraph (c) of the provision at 252.204-7016 , Covered Defense Telecommunications Equipment or Services—Representation, that it "does" provide covered defense telecommunications equipment or services as a part of its offered products or services to the Government in the performance of any contract, subcontract, or other contractual instrument, then the Offeror shall complete the following additional representation:

The Offeror represents that it ☐will ☐will not provide covered defense telecommunications equipment or services as a part of its offered products or services to DoD in the performance of any award resulting from this solicitation.

(e) *Disclosures*. If the Offeror has represented in paragraph (d) of this provision that it "will provide covered defense telecommunications equipment or services," the Offeror shall provide the following information as part of the offer:

(1) A description of all covered defense telecommunications equipment and services offered (include brand or manufacturer; product, such as model number, original equipment manufacturer (OEM) number, manufacturer part number, or wholesaler number; and item description, as applicable).

(2) An explanation of the proposed use of covered defense telecommunications equipment and services and any factors relevant to determining if such use would be permissible under the prohibition referenced in paragraph (b) of this provision.

(3) For services, the entity providing the covered defense telecommunications services (include entity name, unique entity identifier, and Commercial and Government Entity (CAGE) code, if known).

(4) For equipment, the entity that produced or provided the covered defense telecommunications equipment (include entity name, unique entity identifier, CAGE code, and whether the entity was the OEM or a distributor, if known).

(End of provision)

252.204-7018 Prohibition on the Acquisition of Covered Defense Telecommunications Equipment or Services

PROHIBITION ON THE ACQUISITION OF COVERED DEFENSE TELECOMMUNICATIONS EQUIPMENT OR SERVICES (JAN 2021)

Definitions. As used in this clause—

"Covered defense telecommunications equipment or services" means—

(1) Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation, or any subsidiary or affiliate of such entities;

(2) Telecommunications services provided by such entities or using such equipment; or

(3) Telecommunications equipment or services produced or provided by an entity that the Secretary of Defense reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

"Covered foreign country" means—

(1) The People's Republic of China; or

(2) The Russian Federation.

"Covered missions" means—

(1) The nuclear deterrence mission of DoD, including with respect to nuclear command, control, and communications, integrated tactical warning and attack assessment, and continuity of Government; or

(2) The homeland defense mission of DoD, including with respect to ballistic missile defense.

"Critical technology" means—

(1) Defense articles or defense services included on the United States Munitions List set forth in the International Traffic in Arms Regulations under subchapter M of chapter I of title 22, Code of Federal Regulations;

(2) Items included on the Commerce Control List set forth in Supplement No. 1 to part 774 of the Export Administration Regulations under subchapter C of chapter VII of title 15, Code of Federal Regulations, and controlled—

(i) Pursuant to multilateral regimes, including for reasons relating to national security, chemical and biological weapons proliferation, nuclear nonproliferation, or missile technology; or

(ii) For reasons relating to regional stability or surreptitious listening;

(3) Specially designed and prepared nuclear equipment, parts and components, materials, software, and technology covered by part 810 of title 10, Code of Federal Regulations (relating to assistance to foreign atomic energy activities);

(4) Nuclear facilities, equipment, and material covered by part 110 of title 10, Code of Federal Regulations (relating to export and import of nuclear equipment and material);

(5) Select agents and toxins covered by part 331 of title 7, Code of Federal Regulations, part 121 of title 9 of such Code, or part 73 of title 42 of such Code; or

(6) Emerging and foundational technologies controlled pursuant to section 1758 of the Export Control Reform Act of 2018 (50 U.S.C. 4817).

"Substantial or essential component" means any component necessary for the proper function or performance of a piece of equipment, system, or service.

(b) *Prohibition*. In accordance with section 1656 of the National Defense Authorization Act for Fiscal Year 2018 (Pub. L. 115-91), the contractor shall not provide to the Government any equipment, system, or service to carry out covered missions that uses covered defense telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless the covered defense telecommunication equipment or services are covered by a waiver described in Defense Federal Acquisition Regulation Supplement 204.2104 .

(c) *Procedures*. The Contractor shall review the list of excluded parties in the System for Award Management (SAM) at https://www.sam.gov for entities that are excluded when providing any equipment, system, or service, to carry out covered missions, that uses covered defense telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless a waiver is granted.

(d) *Reporting*.

(1) In the event the Contractor identifies covered defense telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of

any system, during contract performance, the Contractor shall report at https://dibnet.dod.mil the information in paragraph (d)(2) of this clause.

(2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause:

(i) Within 3 business days from the date of such identification or notification: the contract number; the order number(s), if applicable; supplier name; brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.

(ii) Within 30 business days of submitting the information in paragraph (d)(2)(i) of this clause: any further available information about mitigation actions undertaken or recommended. In addition, the Contractor shall describe the efforts it undertook to prevent use or submission of a covered defense telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

(e) *Subcontracts*. The Contractor shall insert the substance of this clause, including this paragraph (e), in all subcontracts and other contractual instruments, including subcontracts for the acquisition of commercial items.

(End of clause)

Department of Defense (DoD)
Small Business Innovation Research (SBIR) Program
Small Business Technology Transfer (STTR) Program

DISCLOSURE OF OFFEROR'S OWNERSHIP OR CONTROL BY A FOREIGN GOVERNMENT

In accordance with DFARS provision 252.209-7002, an offeror is required to disclose, by completing this form (and adding additional pages, as necessary), any interest a foreign government has in the offeror when that interest constitutes control by a foreign government, as defined in DFARS provision 252.209-7002. If the offeror is a subsidiary, it is also required to disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable interest concerning the offeror's immediate parent, intermediate parents, and the ultimate parent.

DISCLOSURE		
Offeror's Point of Contact for Questions about Disclosure	Name:	
	Phone Number:	
Offeror	Name:	
	Address:	
Entity Controlled by a Foreign Government	Name:	
	Address:	
Description of Foreign Government's Interest in the Offeror		
Foreign Government's Ownership Percentage in Offeror		
Identification of Foreign Government(s) with Ownership or Control		

DFARS 252.209-7002 Disclosure of Ownership or Control by a Foreign Government (JUN 2010)

(a) Definitions. As used in this provision—

(1) "Effectively owned or controlled" means that a foreign government or any entity controlled by a foreign government has the power, either directly or indirectly, whether exercised or exercisable, to control the election, appointment, or tenure of the Offeror's officers or a majority of the Offeror's board of directors by any means, e.g., ownership, contract, or operation of law (or equivalent power for unincorporated organizations).

(2) "Entity controlled by a foreign government"—

(i) Means—

(A) Any domestic or foreign organization or corporation that is effectively owned or controlled by a foreign government; or

(B) Any individual acting on behalf of a foreign government.

(ii) Does not include an organization or corporation that is owned, but is not controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(3) "Foreign government" includes the state and the government of any country (other than the United States and its outlying areas) as well as any political subdivision, agency, or instrumentality thereof.

(4) "Proscribed information" means—

(i) Top Secret information;

(ii) Communications security (COMSEC) material, excluding controlled cryptographic items when unkeyed or utilized with unclassified keys;

(iii) Restricted Data as defined in the U.S. Atomic Energy Act of 1954, as amended;

(iv) Special Access Program (SAP) information; or

(v) Sensitive Compartmented Information (SCI).

(b) Prohibition on award. No contract under a national security program may be awarded to an entity controlled by a foreign government if that entity requires access to proscribed information to perform the contract, unless the Secretary of Defense or a designee has waived application of 10 U.S.C. 2536(a).

(c) Disclosure. The Offeror shall disclose any interest a foreign government has in the Offeror when that interest constitutes control by a foreign government as defined in this provision. If the Offeror is a subsidiary, it shall also disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable interest concerning the Offeror's immediate parent, intermediate parents, and the ultimate parent. Use separate paper as needed, and provide the information in the following format:

Offeror's Point of Contact for Questions about Disclosure
(Name and Phone Number with Country Code, City Code and Area Code, as applicable)

Name and Address of Offeror

Name and Address of Entity Controlled by a Foreign Government

Description of Interest, Ownership Percentage, and Identification of Foreign Government

(End of provision)

VERSION 2

ARMY
21.3 Small Business Innovation Research (SBIR)
Proposal Submission Instructions

INTRODUCTION

The U.S. Army Combat Capabilities Development Command (CCDC) is responsible for execution of the Army SBIR Program. Information on the Army SBIR Program can be found at the following Website: https://www.armysbir.army.mil/.

Broad Agency Announcement (BAA), topic, and general questions regarding the SBIR Program should be addressed according to the DOD Program BAA. For technical questions about the topic during the pre-release period, contact the Topic Authors listed for each topic in the BAA. To obtain answers to technical questions during the formal BAA period, visit https://www.dodsbirsttr.mil/topics-app/ Specific questions pertaining to the Army SBIR Program should be submitted to:

Monroe Harden
Fundamental Portfolio Manager, Army SBIR
usarmy.apg.ccdc.mbx.sbir-program-managers-helpdesk@mail.mil
U.S. Army Combat Capabilities Development Command
6662 Gunner Circle
Aberdeen Proving Ground, MD 21005-1322
TEL: 866-570-7247

The Army participates in up to three DOD SBIR BAAs each year. Proposals not conforming to the terms this BAA will not be considered. Only Government personnel will evaluate proposals.

PHASE I PROPOSAL SUBMISSION

SBIR Phase I proposals have six Volumes: Proposal Cover Sheet, Technical Volume, Cost Volume, Company Commercialization Report, Supporting Documents, and Fraud, Waste and Abuse training. Please refer to the DoD SBIR Program BAA for full details on the requirements of each proposal volume.

The Technical Volume .pdf document has a 20-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. The Company Commercialization Report (CCR) allows companies to report funding outcomes resulting from prior SBIR and STTR awards. Information contained in the CCR will be considered during proposal evaluations.

Small businesses submitting a Phase I 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 Sheet, the Cost Volume, and how to upload the Technical Volume. For general inquiries or problems with proposal electronic submission, contact the DOD SBIR Help Desk at DoDSBIRSupport@reisystems.com.

The small business will also need to register at the Army SBIR Small Business website: https://sbir.army.mil/SmallBusiness/ in order to receive information regarding proposal status/debriefings, summary reports, impact/transition stories, and Phase III plans. PLEASE NOTE: If this is your first time submitting an Army SBIR proposal, you will not be able to register your firmat the Army SBIR Small

Business website until after all of the proposals have been downloaded and we have transferred your company information to the Army Small Business website. This can take up to one week after the end of the proposal submission period.

Do not include blank pages, duplicate the electronically generated cover pages or put information normally associated with the Technical Volume such as descriptions of capability or intent in other sections of the proposal as these will count toward the 20-page limit.

Only the electronically generated Cover Sheets and Cost Volume are excluded from the 20-page limit. Army Phase I proposals submitted containing a Technical Volume .pdf document containing over 20 pages will be deemed NON-COMPLIANT and will not be evaluated. It is the responsibility of the Small Business to ensure that once the proposal is submitted and uploaded into the system that the technical volume .pdf document complies with the 20 page limit.

Phase I proposals must describe the "vision" or "end-state" of the research and the most likely strategy or path for transition of the SBIR project from research to an operational capability that satisfies one or more Army operational or technical requirements in a new or existing system, larger research program, or as a stand-alone product or service.

Phase I proposals will be reviewed for overall merit based upon the criteria in the DOD BAA.

21.3 Phase I Key Dates

BAA Closes, Proposal Due	See DoD BAA for Dates
Phase I Evaluations	25 Oct 2021 – 7 Jan 2022
Phase I Selections Announced	18 Jan 2022
Phase I Award Goal	21 Mar 2022*

**Subject to the Congressional Budget process*

PHASE I OPTION MUST BE INCLUDED AS PART OF PHASE I PROPOSAL

The Army implements the use of a Phase I Option that may be exercised to fund interim Phase I activities while a Phase II contract is being negotiated. Only Phase I efforts selected for Phase II awards through the Army's competitive process will be eligible to have the Phase I Option exercised. The Phase I Option, which **must** be included as part of the Phase I proposal, should cover activities over a period of up to four months and describe appropriate initial Phase II activities that may lead to the successful demonstration of a product or technology. The Phase I Option must be included within the 20-page limit for the Phase I proposal. Do not include blank pages, duplicate the electronically generated cover pages or put information normally associated with the Technical Volume such as descriptions of capability or intent, in other sections of the proposal as these will count toward the 20 page limit.

PHASE I COST VOLUME

A firm fixed price or cost plus fixed fee Phase I Cost Volume with maximum dollar amount of **$167,500** must be submitted in detail online. Proposers that participate in this BAA must complete a Phase I Cost Volume not to exceed a maximum dollar amount of **$111,500** for the six months base period and a Phase I Option Cost Volume not to exceed a maximum dollar amount of **$56,000** for the four months option period. The Phase I and Phase I Option costs must be shown separately but may be presented side-by-side

in a single Cost Volume. The Cost Volume DOES NOT count toward the 20-page Phase I proposal limitation when submitted via the submission site's on-line form. When submitting the Cost Volume, complete the Cost Volume form on the DOD Submission site, versus submitting it within the body of the uploaded proposal.

PHASE II PROPOSAL SUBMISSION

Only Small Businesses that have been awarded a Phase I contract for a specific topic can submit a Phase II proposal for that topic. 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 Sheet, theCost Volume, and how to upload the Technical Volume. For general inquiries or problems with proposal electronic submission, contact the DOD Help Desk at DoDSBIRSupport@reisystems.com

For projects awarded in cycle 21.3, there will be **ONE window for submission** of Phase II proposals. A single Phase II proposal can be submitted by a Phase I awardee within one, and only one, Phase II submission window. The submission window opens at 0001hrs (12:01 AM) eastern time on the first day and closes at 2359 hrs (11:59 PM) eastern time on the last day. Any subsequent or Sequential Phase II proposal (i.e., a second Phase II subsequent to the initial Phase II effort) shall be initiated by the Government Technical Point of Contact for the initial Phase II effort and must be approved by Army SBIR PM in advance.

The Phase II proposal submission window for Phase I contracts awarded under cycle 21.3 opens for submission on 1 March 2023 and closes on 31 March 2023.

Army SBIR Phase II Proposals have six Volumes: Proposal Cover Sheet, Technical Volume, Cost Volume, Company Commercialization Report, Supporting Documents, and Fraud, Waste and Abuse training. Only the first four volumes will be considered for evaluation. The Technical Volume .pdf document has a 38-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), data assertions and any attachments. Do not include blank pages, duplicate the electronically generated cover pages or put information normally associated with the Technical Volume in other sections of the proposal as these will count toward the 38 page limit. As with Phase I proposals, it is the proposing firm's responsibility to verify that the Technical Volume .pdf document does not exceed the page limit after upload to the DOD SBIR/STTR Submissionsite by clicking on the "Verify Technical Volume" icon.

Only the electronically generated Cover Sheet, Cost Volume, CCR, Supporting Documents, and Fraud, Waste and Abuse training are excluded from the 38-pageTechnical Volume.

Army Phase II Proposals submitted containing a Technical Volume .pdf document over 38 pages will be deemed NON-COMPLIANT and will not be evaluated.

Army Phase II Cost Volumes must contain a budget for the entire 24 month Phase II period not to exceed the maximum dollar amount of **$1,100,000.** During contract negotiation, the contracting officer may require a Cost Volume for year one and year two. The proposal cost volumes must be submitted using the Cost Volume format (accessible electronically on the DOD submission site), and may be presented side-by-side on a single Cost Volume Sheet. The total proposed amount should be indicated on the Proposal Cover Sheet as the Proposed Cost. Phase II projects will be evaluated after the first year prior to

extending funding for the second year.

Small businesses submitting a proposal are required to develop and submit a technology transition and commercialization plan describing feasible approaches for transitioning and/or commercializing the developed technology in their Phase II proposal.

DOD is not obligated to make any awards under Phase I, II, or III. For specifics regarding the evaluation and award of Phase I or II contracts, please read the DOD Program BAA very carefully. Phase II proposals will be reviewed for overall merit based upon the criteria in the DOD BAA.

BIO HAZARD MATERIAL AND RESEARCH INVOLVING ANIMAL OR HUMAN SUBJECTS

Any proposal involving the use of Bio Hazard Materials must identify in the Technical Volume whether the contractor has been certified by the Government to perform Bio Level - I, II or III work.

Companies should plan carefully for research involving animal or human subjects, or requiring access to government resources of any kind. Animal or human research must be based on formal protocols that are reviewed and approved both locally and through the Army's committee process. Resources such as equipment, reagents, samples, data, facilities, troops or recruits, and so forth, must all be arranged carefully. The few months available for a Phase I effort may preclude plans including these elements, unless coordinated before a contract is awarded.

FOREIGN NATIONALS

If the offeror proposes to use a foreign national(s) [any person who is NOT a citizen or national of the United States, a lawful permanent resident, or a protected individual as defined by 8 U.S.C. 1324b (a) (3) – refer to Section 3.5 of this BAA for definitions of "lawful permanent resident" and "protected individual"] as key personnel, they must be clearly identified. **For foreign nationals, you must provide 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. Please ensure no Privacy Act information is included in this submittal.**

OZONE CHEMICALS

Class 1 Ozone Depleting Chemicals/Ozone Depleting Substances are prohibited and will not be allowed for use in this procurement without prior Government approval.

CONTRACTOR MANPOWER REPORTING APPLICATION (CMRA)

The Contractor Manpower Reporting Application (CMRA) is a Department of Defense Business Initiative Council (BIC) sponsored program to obtain better visibility of the contractor service workforce. This reporting requirement applies to all Army SBIR contracts.

Offerors are instructed to include an estimate for the cost of complying with CMRA as part of the Cost Volume for Phase I (**$111,500 maximum**), Phase I Option (**$56,000 maximum**), and Phase II (**$1,100,000 maximum**), under "CMRA Compliance" in Other Direct Costs. This is an estimated total cost (if any) that would be incurred to comply with the CMRA requirement. Only proposals that receivean award will be required to deliver CMRA reporting, i.e. if the proposal is selected and an award is made, the contract will include a deliverable for CMRA.

VERSION 2

To date, there has been a wide range of estimated costs for CMRA. While most final negotiated costs have been minimal, there appears to be some higher cost estimates that can often be attributed to misunderstanding the requirement. The SBIR Program desires for the Government to pay a fair and reasonable price. This technical analysis is intended to help determine this fair and reasonable price for CMRA as it applies to SBIR contracts.

- The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains the secure CMRA System. The CMRA Web site is located here: https://www.ecmra.mil/.

- The CMRA requirement consists of the following items, which are located within the contractdocument, the contractor's existing cost accounting system (i.e. estimated direct labor hours, estimated direct labor dollars), or obtained from the contracting officer representative:

  (1) Contract number, including task and delivery order number;
  (2) Contractor name, address, phone number, e-mail address, identity of contractor employeeentering data;
  (3) Estimated direct labor hours (including sub-contractors);
  (4) Estimated direct labor dollars paid this reporting period (including sub-contractors);
  (5) Predominant Federal Service Code (FSC) reflecting services provided by contractor (andseparate predominant FSC for each sub-contractor if different);
  (6) Organizational title associated with the Unit Identification Code (UIC) for the Army Requiring Activity (The Army Requiring Activity is responsible for providing the contractorwith its UIC for the purposes of reporting this information);
  (7) Locations where contractor and sub-contractors perform the work (specified by zip code inthe United States and nearest city, country, when in an overseas location, using standardized nomenclature provided on Web site);
- The reporting period will be the period of performance not to exceed 12 months ending September30 of each government fiscal year and must be reported by 31 October of each calendar year.

- According to the required CMRA contract language, the contractor may use a direct XML data transfer to the Contractor Manpower Reporting System database server or fill in the fields on theGovernment Web site. The CMRA Web site also has a no-cost CMRA XML Converter Tool.

Given the small size of our SBIR contracts and companies, it is our opinion that the modification of contractor payroll systems for automatic XML data transfer is not in the best interest of the Government. CMRA is an annual reporting requirement that can be achieved through multiple means to include manual entry, MS Excel spreadsheet development, or use of the free Government XML converter tool. The annual reporting should take less than a few hours annually by an administrative level employee.

Depending on labor rates, we would expect the total annual cost for SBIR companies to not exceed $500.00 annually, or to be included in overhead rates.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA) (FORMERLY KNOWN AS DISCRETIONARY TECHNICAL ASSISTANCE)

VERSION 2

In accordance with section 9(q) of the Small Business Act (15 U.S.C. 638(q)), the Army will provide technical assistance services to small businesses engaged in SBIR projects through a network of scientists and engineers engaged in a wide range of technologies. The objective of this effort is to increase Army SBIR technology transition and commercialization success thereby accelerating the fielding of capabilities to Soldiers and to benefit the nation through stimulated technological innovation, improved manufacturing capability, and increased competition, productivity, and economic growth.

The Army has stationed two Technical Assistance Advocates (TAAs) across the Army to provide technical assistance to small businesses that have Phase I and Phase II projects with the participating organizations within their regions.

For more information go to: https://www.armysbir.army.mil, then click the "SBIR" tab, and thenclick on Transition Assistance/Technical Assistance.

This technical and business assistance to SBIR awardees to assist in:

- Making better technical decisions on SBIR projects
- Solving technical problems that arise during SBIR
- projects;
- Minimizing technical risks associated with SBIR projects; and
  Developing and commercializing new commercial products and processesresulting from such projects including intellectual property protections.

Army may provide up to $5,000 of SBIR funds for the technical assistance described abovefor each Phase I award, and $10,000 per Phase II project to these vendors for direct supportto SBIR awardees.

Alternatively, an SBIR firm may directly acquire the technical assistance services describedabove and not through the vendor selected by the Components. Firms must request this authority from the agency and clearly identify the need for assistance (purpose and objectiveof required assistance), provide details on the provider of the assistance (name and point of contact for performers) and why the proposed TABA providers are uniquely skilled to conduct the work (specific experience in providing the assistance proposed), and the cost of the required assistance (costs and hours proposed or other details on arrangement). This information must be included in the Explanatory Material section of the firm's cost proposalspecifically identified as "Discretionary Technical and Business Assistance."

If the awardee demonstrates this requirement sufficiently, the agency shall permit the awardee to acquire such technical assistance itself, in an amount up to $5,000 for each Phase I award and $10,000 for each Phase II project, as an allowable cost of the SBIR award. The per year amount will be in addition to the award and is not subject to any profitor fee by the requesting (SBIR) firm and is inclusive of all indirect rates.

The TABA provider may not be the requesting firm, an affiliate of the requesting firm, aninvestor 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 or research institution).

Failure to include the required information in the Phase I and/or Phase II proposal will result in the request for discretionary technical and business assistance being disapproved. Requests for TABA funding outside of the Phase I or Phase II proposal submission will notbe considered. If the firm is approved for TABA from a source other than that provided by the agency, the firm may not be eligible

for the technical assistance services normally provided by those organizations. Small business concerns that receive technical or business assistance as described in this section are required to submit a description of the assistance provided, and the benefits and results achieved. Contact the Army SBIR Program Office forany other considerations.

NOTE: The Small Business Administration (SBA) is currently developing regulationsgoverning TABA. All regulatory guidance produced by SBA will apply to any SBIR contracts where TABA is utilized.

It should also be noted that if approved for discretionary technical and business assistancefrom an outside source, the firm will not be eligible for the Army's Technical Assistance Advocate support. All details of the TABA agency and what services they will provide must be listed in the technical proposal under "consultants". The request for TABA must include details on what qualifies the TABA firm to provide the services that you are requesting, the firm name, a point of contact for the firm, and a web site for the firm. Listall services that the firm will provide and why they are uniquely qualified to provide these services. The award of TABA funds is not automatic and must be approved by the Army SBIR Program Manager. The maximum TABA dollar amount that can be requested in a Phase I Army SBIR proposal is $5,000. The maximum TABA dollar amount that can be requested in a Phase II Army SBIR proposal is $5,000 per year (for a total of $10,000 for two years).

COMMERCIALIZATION READINESS PROGRAM (CRP)

The objective of the CRP effort is to increase Army SBIR technology transition and commercialization success and accelerate the fielding of capabilities to Soldiers. The CRP: 1) assesses and identifies SBIR projects and companies with high transition potential that meet high priority requirements; 2) matches SBIR companies to customers and facilitates collaboration; 3) facilitates detailed technology transition plans and agreements; 4) makes recommendations for additional funding for select SBIR projects that meet the criteria identified above; and 5) tracks metrics and measures results for the SBIR projects within the CRP.

Based on its assessment of the SBIR project's potential for transition as described above, the Army utilizes a CRP investment fund of SBIR dollars targeted to enhance ongoing Phase II activities with expanded research, development, test and evaluation to accelerate transition and commercialization. The CRP investment fund must be expended according to all applicable SBIR policy on existing Phase II availability of matching funds, proposed transition strategies, and individual contracting arrangements.

NON-PROPRIETARY SUMMARY REPORTS

All award winners must submit a non-proprietary summary report at the end of their Phase I project andany subsequent Phase II project. The summary report is unclassified, non-sensitive and non-proprietary and should include:

- A summation of Phase I results
- A description of the technology being
- developedThe anticipated DOD and/or
- non-DOD customer
- The plan to transition the SBIR developed technology to the customer
- The anticipated applications/benefits for government and/or private sector use an image depicting the developed technology

The non-proprietary summary report should not exceed 700 words, and is intended for public viewing on

the Army SBIR/STTR Small Business area. This summary report is in addition to the required final technical report and should require minimal work because most of this information is required in the final technical report. The summary report shall be submitted in accordance with the format and instructions posted within the Army SBIR Small Business Portal at: https://sbir.army.mil/SmallBusiness/ and is due within 30 days of the contract end date.

ARMY SBIR PROGRAM COORDINATORS (PCs) for Army SBIR PHASE 21.3

Participating Organizations	Program Coordinator	Phone
Army Futures Command (AFC)	Casey Perley	716-754-6311
Armaments Center (AC)	Sheila Speroni	973-724-6935
Aviation and Missile Center (AvMC-A)	Dawn Gratz	256-842-3272
Aviation and Missile Center (AvMC-M)	Dawn Gratz	256-842-3272
Army Research Laboratory (ARL)	Francis Rush Nicole Fox	919-549-4347 919-549-4395
Army Test & Evaluation Command (ATEC)	Kendra Raab	443-861-9344
Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR)	Lauren Marzocca	410-395-4665
Chemical Biological Center (CBC)	Martha Weeks	410-436-5391
Engineer Research & Development (ERDC)	Melonise Wills	703-428-6281
Ground Vehicle Systems Center	George Pappageorge	586-282-4915
PEO Aviation	Randy Robinson	256-313-4975
PEO Command, Control and Communications Tactical (PEO C3T)	Meisi Amaral	443-395-6725
PEO Intelligence, Electronic Warfare& Sensors (PEO IEW&S)	Michael Voit	443-861-7851
PEO Missiles & Space	David Tritt	256-313-3431
PEO Soldier	Mary Harwood	703-704-0211
PEO STRI	Robert Forbis	407-384-3884
Space and Missile Defense Command (SMDC)	Jason Calvert	256-955-5630
Soldier Center (SC)	Cathy Polito	508-206-3497

VERSION 2

ARMY SUBMISSION OF FINAL TECHNICAL REPORTS

A final technical report is required for each project. Per DFARS clause 252.235-7011 (http://www.acq.osd.mil/dpap/dars/dfars/html/current/252235.htm#252.235-7011), each contractor shall (a) Submit two copies of the approved scientific or technical report delivered under the contract to the Defense Technical Information Center, Attn: DTIC-O, 8725 John J. Kingman Road, Fort Belvoir, VA 22060-6218; (b) Include a completed Standard Form 298, Report Documentation Page, with each copy of the report; and (c) For submission of reports in other than paper copy, contact the Defense Technical Information Center or follow the instructions at http://www.dtic.mil.

Protest Procedures

As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to: usarmy.apg.ccdc.mbx.sbir-program-managers-helpdesk@mail.mil

Notification of Selection or Non-selection

Proposing firms will be notified of selection or non- selection status for a Phase I award or a PH II award within 90 days of the closing date of the BAA. The two individuals named on the Proposal Cover Sheet will receive an email for each proposal submitted from with instructions to retrieve their official notification of proposal selection or non-selection.

DEPARTMENT OF THE ARMY PROPOSAL CHECKLIST

This is a Checklist of Army Requirements for your proposal. Please review the checklist to ensure that your proposal meets the Army SBIR requirements. You must also meet the general DOD requirements specified in the BAA. **Failure to meet these requirements will result in your proposal not being evaluated or considered for award**. Do not include this checklist with your proposal.

1. The proposal addresses a Phase I effort (up to **$111,500** with up to a six-month duration) AND an optional effort (up to **$56,000** for an up to four-month period to provide interim Phase II funding).

2. The proposal is limited to only **ONE** Army BAA topic.

3. The technical content of the proposal, including the Option, includes the items identified in the DoD SBIR Program BAA.

4. SBIR Phase I proposals have six Volumes: Proposal Cover Sheet, Technical Volume, Cost Volume, Company Commercialization Report, Supporting Documents, and Fraud, Waste and Abuse training. Please refer to the DoD SBIR Program BAA for full details on the requirements of each proposal volume. The Technical Volume .pdf document has a 20-page limit including, but not limited to: 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 all attachments).

However, offerors are instructed to NOT leave blank pages, duplicate the electronically generated cover pages or put information normally associated with the Technical Volume in other sections of the proposalsubmission as THESE WILL COUNT AGAINST THE 20-PAGE LIMIT. Any

information that details work involved that should be in the technical volume but is inserted into other sections of the proposal will count against the page count. ONLY the electronically generated Cover Sheet and Cost Volume are excluded from the Technical Volume .pdf 20-page limit. Army Phase I proposals submitted with a Technical Volume .pdf document of over 20-pages will be deemed NON-COMPLIANT and will not be evaluated.

5. The Cost Volume has been completed and submitted for both **the Phase I and Phase I Option** and the costs are shown separately. The Army requires that small businesses complete the Cost Volume form on the DOD Submission site, versus submitting within the body of the uploaded proposal. The totalcost should match the amount on the cover pages.

6. Requirement for Army Accounting for Contract Services, otherwise known as CMRA reporting is included in the Cost Volume (offerors are instructed to include an estimate for the cost ofcomplying with CMRA).

7. If applicable, the Bio Hazard Material level has been identified in the Technical Volume.

8. If applicable, plan for research involving animal or human subjects, or requiring access togovernment resources of any kind.

9. The Phase I Proposal describes the "vision" or "end-state" of the research and the most likely strategy or path for transition of the SBIR project from research to an operational capability that satisfiesone or more Army operational or technical requirements in a new or existing system, larger research program, or as a stand-alone product or service.

10. If applicable, Foreign Nationals are to be identified in the proposal.

VERSION 2

ARMY SBIR 21.3 Phase I Topic Index

VERSION 2

A21-101 TITLE: Modern, Safe, and Affordable Processes for Production of Energetic Polymers (BAMO-AMMO)

OUSD (R&E) MODERNIZATION PRIORITY: General 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: Develop safe, novel, and cost-effective processes for the commercial manufacture of energetic polymers (BAMO-AMMO) suitable for formulating advanced, high-performance materials.

DESCRIPTION: To achieve the goal of extending the range of current and future precision fire munitions for the US Army's mission of performance overmatch, materials with energy greater than currently available are necessary. One of the methods to increase overall performance of a propulsion system is the use of high energy thermoplastic elastomers (ETPEs). These materials are formed by linking two or more polymeric building blocks, one of which is typically crystalline in nature and one of which is amorphous, into a single polymer chain. The specific properties of a given ETPEs is controlled by a number of factors including characteristics of the building block molecules and linking agents, average polymer molecular weight, and distribution of molecular weights. ETPEs have been shown to have promising key properties such as good flame temperature, stability and performance. BAMO-AMMO, one of the ETPE material, an energetic block copolymer, offers desirable performance, good mechanical properties, high energy, is clean burning, and is chemically compatible with a wide range of materials such as nitramines. Significant efforts have been performed in developing BAMO-AMMO such as tailoring the "soft" AMMO and "hard" BAMO blocks of the copolymer to tailor the final mechanical properties. However, the current manufacturing processes for BAMO-AMMO prevent the ETPE from being affordable or manufactured with high throughput. The polymerization reactions need excessive amounts of reaction time (up to 96 hours) and extensive workup and isolation. The focus of this SBIR project shall include multidisciplinary research and development effort focusing on a robust, scalable and affordable manufacturing process for BAMO-AMMO and its precursors using modern technologies.

PHASE I: Develop and demonstrate lab-scale synthesis method (~25-50gms per batch) using novel processing concepts to produce BAMO-AMMO material. Material from each small batch will be further characterized to compare properties with legacy material. Study the material residue after burning of the selected BAMO-AMMO batch materials. Perform analysis of rheological and physical properties of the BAMO-AMMO materials at various temperature, humidity and treatments. Additional characterization tests will be performed including, thermal analysis, gel permeation chromatography (GPC), dynamic mechanical analysis (DMA), melt viscosity, Teflon adhesion test, and nuclear magnetic resonance (NMR). Other testing may be performed to determine specific safety properties and other performance or structural characteristics of interest. Complete feasibility studies at the laboratory scale will focus on the polymerization process: chemical process steps, isolation of product, and waste stream processing with particular emphasis on safety and throughput. Material produced from the proof of concept demonstration (25-50 gram scale) will be sent to the Army for further characterization to ensure results are consistent

and meet expectations. Chemical stability, in addition to multi-ingredient compatibility (including nitramines and other oxidizers) will be assessed by methods such as Vacuum Thermal Stability (VTS) as outlined in MIL-STD-286C or equivalent.

PHASE II: Review the results from the Phase I feasibility study. Down select and optimize the synthesis process of the desired BAMO-AMMO material. Demonstrate the process by producing hundreds of grams of BAMO-AMMO in the scale of 250-500gms per batch according to desired material properties. Perform thermal and necessary safety testing for proper handling and shipping material to USG. Characterize BAMO-AMMO material properties and ensure results are consistent and meet expectations. In support with USG, formulate and produce propellant geometry using BAMO-AMMO to characterize final product for thermal analysis, mixing, rheological, mechanical, and combustion properties. Provide with the full process design for BAMO-AMMO manufacture and transition plan. Provide cost analysis on the synthesis process to manufacture BAMO-AMMO in larger quantities. The design and transition plan will guide Phase 3 efforts, which will focus on qualification of the material in propellant applications selected by the US Army.

PHASE III DUAL USE APPLICATIONS: If this program is demonstrated to be successful, this energetic polymeric material technology can be applied to various military applications. Military application includes propellants primarily for large caliber (60mm, 81mm, 105mm, 120mm, 155mm), medium caliber (20mm, 25mm, 30mm and 40mm) as well as small arms (5.56mm, 7.62mm and 0.50 calibers) ammunitions. The likely transition partner is the Joint Program Executive Officer for Armaments & Ammunitions.

REFERENCES:

1. Braithwaite, P.; Sanderson, A.; Wardle, R. “Optimization of BAMO-AMMO for gun propellants”, JANNAF conference, 2000.;
2. Sikder, A.K.; Reddy, S. “Review on Energetic Thermoplastic Elastomers (ETPEs) for Military Science” Propellants, Explosives, Pyrotechnics, 2013, 38, 14-28.;
3. Wardle, R.B.; Cannizzo, L.F.; Hamilton, R.S.; Hinshaw, J.C. Final Report “Energetc oxetane thermoplastic elastomer binders” AD-A278307, Thiokol Corporaton, 1992.;
4. "Thermoplastic elastomer-based low vulnerability ammunition gun propellants " US Patent#US4919737A; "High energy thermoplastic elastomer propellant" US Patent# WO1998021168A1

KEYWORDS: High Energetic Polymers, Energetic thermoplastic elastomers (ETPE), BAMO-AMMO

VERSION 2

A21-102 TITLE: Dynamic Characterization of Critical Material Properties

OUSD (R&E) MODERNIZATION PRIORITY: Microelectronics

TECHNOLOGY AREA(S): Materials, Sensors

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 development of high throughput techniques which can measure material properties in a variety of systems including aqueous slurries, molten organic mixtures, and consolidated pellets.

DESCRIPTION: Currently, many industrial processes for the US Army function as ‘black boxes’ as they are poorly understood from a dynamic sense. While inputs are known and outputs are well characterized, the process itself is not well monitored. This results in tremendous deficiencies, and overall a lower quality product for the Warfighter. This also contributes to the difficulties associated with transitioning new technologies to the Warfighter, as implementation is inhibited by an ignorance of how new materials behave when used with current manufacturing techniques. An additional difficulty is that many parameters critical for understanding and assessing them are difficult to measure, especially across a wide of variety of environmental conditions. This impedes maturation of new materials, as costly, time consuming testing becomes required at every developmental stage. This is especially relevant now, as the potential of some of the most advanced models is impeded by a lack of materials characterization. Succinctly, the development of new materials at nearly every technology and manufacturing readiness level is negatively impacted by a lack of high throughput characterization.

By measuring a suite of critical properties efficiently across a wide number of environments, these issues can be solved. At first, this would provide a boon to lab scale efforts, as they would allow a much broader number of materials to be examined and down-selected far more quickly than currently possible. This would make implementation of pilot scale-up to low-rate-production much easier by providing a far more comprehensive understanding of the materials in question. Furthermore, the technology can be implemented at these stages to function at first as a method of easing transition of novel materials, but later on as method of optimizing efficiency and functioning as seamless quality control. While not a requirement, it would be preferred if the developed probes operated under ‘first principles’ and therefore required little calibration to use with new materials. This would ensure that they have the broadest impact in the quickest manner, while minimizing cost.

These technologies are expected to have dramatic impact across a variety of industries. For example, pharmaceutical companies could use probes under the developed effort to speed the transition of new drugs. Ceramics and metals, especially those using nanomaterials, would also benefit. The plastics industry could use these types of online tools to replace much of the characterization they do offline. Oil and gas industries as well as new green energy technology such as solar cells and geothermal plants would also benefit, as they are constantly evaluating new materials, and must be able to do so while extrapolating performance to extreme environments.

VERSION 2

PHASE I: Design a lab scale system which can demonstrate the ability to measure the properties described previously over a temperature range of -100 C to 200 C. These results should be validated by comparison to literature values or by some other independent process which is widely recognized in the scientific and engineering disciplines. In general, accuracies of ± 5 % are desired. The system should be able to measure the following properties in the given ranges: porosity (from 0.1 % to 25 %), shear viscosity (1 Pa·s to 10^8 Pa·s), particle size (100 nm to 1 mm), phase changes (melt, glass transition, crystallization, change from one crystal order to another), the Anderson-Grüneisen parameters, the Grüneisen parameters, and the density of the material (0.1 g/cm^3 to 10 g/cm^3). The probes should be demonstrated to operate in common batch processes and continuous flow systems.

PHASE II: Test the system on a suite of materials of relevance to the US DoD. This includes nitrocellulose, aluminum, lead, HMX (Octogen), RDX (Hexogen), HTPB (Hydroxyl-terminated polybutadiene), CAB (Cellulose Acetate Butyrate), Viton, Teflon, copper and steel, but more will be identified and can be provided to the contractor at their request. The General User Interface (GUI) should be relatively straightforward and systems should be provided to the US Army for further testing and verification. These probes should be certified as explosion-proof, and shown to be resistant to environments with a pH of 4 to a pH 11. A user manual should be drafted.

PHASE III DUAL USE APPLICATIONS: Based on feedback from Phase 2, improvements will be made to the system to enable transition to industry partner/production facilities. This includes further improvements of user interface. Furthermore, demonstration of long-term stability of the system should be undertaken. This would include long-range studies which will measure the accuracy of the probes over long periods of time, and the demonstration of reliable usage over the course of a year. Limited maintenance for electronics and software will be allowed, but generally the probes should be used for longer periods of time without significant upkeep.

These technologies are expected to have dramatic impact across a variety of industries. For example, pharmaceutical companies could use probes under the developed effort to speed the transition of new drugs. Applications involving ceramics and metals, especially those using nanomaterials, would also benefit. The plastics industry could use these types of online tools to replace much of the characterization they do offline. This would be a boon for the oil and gas industries as well as new green energy technology such as solar cells and geothermal plants, as they are constantly evaluating new materials, and must be able to do so while extrapolating performance to extreme environments.

REFERENCES:

1. Mechanics of Materials, By Ferdinand Beer and E. Johnston and John DeWolf and David Mazurek, McGraw Hill 2012;
2. Particle Size Measurements, Henk G. Merkus, Technology and Engineering, Springer Science & Business Media, 2009;
3. Chemical Reactor Modeling: Multiphase Reactive Flows, Hugo A. Jakobsen, Springer Science & Business Media, 2008;
4. Spectroscopy: Principles and Instrumentation, Mark F. Vitha, Wiley, 2018;
5. Ultrasonic Testing of Materials, Josef Krautkrämer, Herbert Krautkrämer, Springer Verlag Berlin, 1990

KEYWORDS: Material characterization, particle size analysis, Grüneisen, viscosity, particle size, bulk modulus, density

VERSION 2

A21-103 TITLE: Easily Processed High Tg polymers

OUSD (R&E) MODERNIZATION PRIORITY: Space

TECHNOLOGY AREA(S): Space Platform, 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: Polymers are required which exhibit extremely high glass transition temperatures (> 350 C) but are soluble in commonly used organic solvents such as acetone, ethyl acetate, and chloroform.

DESCRIPTION: Novel munition systems currently must contend with extraordinary thermal demands. This has necessitated the development of polymers which can match the rigors associated with state of the art systems. Chiefly, they must maintain great strength and stiffness while under high thermal loads. In order to be processable, however, they must maintain high solubility levels in commonly used solvents so they can still be worked into desired shapes. For example, for many applications they must be able to be cast into thin films. Furthermore, if they can be easily processed, they could then be used in novel energetic formulations as binders. Here, they could impart great stability to energetic formulations, a critical goal in many novel munition systems which will put tremendous thermal load on energetic formulations.

Unfortunately, while not mutually exclusive properties, it appears as if many polymers with high glass transition temperatures exhibit poor solubilities. To further the difficulty of the problem, it appears, few, if any polymers currently available have a high enough glass transition temperature to satisfy the needs for the US Army. Therefore, new polymers are required with high glass transition temperatures, but these polymers must also be easily molded into desired shapes, which means they must have high solubility in commonly used organic solvents. They should also exhibit superior mechanical properties through a wide temperature range, as envisioned applications will required relatively high stresses, and often, very high strain rates.

These polymers must be manufactured in an environmentally friendly manner, and should be sourced domestically. When possible, issues with foreign/sole sourcing of precursor materials must be addressed. If successful, it is expected this effort would spawn off numerous other programs, for example MANTECHs, and this effort should produce sufficient information to pursue follow on efforts. While interesting in other cases, this effort should NOT focus on use of additives such as nanoclays, carbon nanomaterials etc. The goal of this effort is to obtain the desired properties purely with the polymer. For many use cases, the additives would be a hindrance.

PHASE I: Develop polymers at the laboratory scale (~5 grams) and characterize solubility in the following solvents: acetone, ethyl acetate, tetrahydrofuran, ethanol, water, methyl ethyl ketone, methanol, toluene, acetonitrile, and heptane. The polymers should exhibit significant solubility in at least one organic solvent, preferably two or more, and they should be insoluble in water. Important thermal properties such as the glass transition temperature, crystallization temperature, and bulk modulus across a

wide temperature range should be reported. The chemistry of the polymer should be mostly optimized at this point.

PHASE II: Polymers will be produced in the 100s of gram scale. Here the production of the polymers will be optimized, and any issues with the supply chain must be addressed (such as sourcing precursor materials from foreign and/or sole sources). Pricing of the polymers will be estimated under the assumption of an annual buy of ~100 Kg. The polymer properties should be optimized at this phase for the most likely applications, to be further explored in phase 3. Molecular weight is a key consideration in this phase. Aging studies should be conducted at this stage, to determine the suitability for long term usage. High strain testing of the properties of these materials should be conducted, but the US Army will be able to provide such characterization at this stage if required. The polymers should now be ready for use in engineering type tests, where they should be provided to the US DoD in the desired configuration. The US DoD will require 500 grams of each polymer for further evaluation in this phase.

PHASE III DUAL USE APPLICATIONS: Kilogram scale quantities of the 1-3 downselected polymers will be produced to support identified applications of interest. The polymers must be processed into a form usable for the US government. The polymers must be delivered to a US DoD installation, or a US DoD funded contractor before the end of project for a full scale evaluation. At this point, engineering tests should be performed on the polymers in the desired system, and if issues arise, further customization might be required.

High Tg polymers also offer a number of advantages in numerous industries, with the most dramatic example being those in space. This is because high Tg polymers are generally speaking offer extremely good strength to weight ratios, while maintaining properties across a wide temperature range. They are even useful for ‘exotic’ propulsion such as those using solar sails. A significant advance in high Tg polymers, therefore, should attract commercial interest as well.

REFERENCES:

1. Disordered Materials: An Introduction by Paolo M. Ossi, Springer-Verlag Berlin Heidelberg, 2006;
2. Principles of Polymerization, Fourth Edition, George Odian, John Wiley & Sons, Inc. 2004;
3. Physical Properties of Polymers Handbook, James E. Mark, ACS Professional 1994;
4. The Glass Transition, Relaxation Dynamics in Liquids and Disordered Materials, E. Donth, Springer 2001;
5. Relaxation in glassforming liquids and amorphous solids, C. Austin Angell, Kia L. Ngai, Gregory McKenna, Paul F. McMillan, Steve W. Martin, Journal of Applied Physics 2008

KEYWORDS: Polymers, High Glass Transition, Thermally Stable, Solubility, Strength, Stiffness, Mechanical Properties, High Crystallization Temperature

VERSION 2

A21-104 TITLE: High-pressure pumps with minimal mechanical interfaces for low lubricity fuels

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Air Platform

OBJECTIVE: Design, develop, and demonstrate innovative methods of pressurizing low-viscosity and low-lubricity fuels for delivery to high-pressure fuel injection systems that avoid or reduce sliding mechanical interfaces vulnerable to inadequate lubrication.

DESCRIPTION: High pressure common rail (HPCR) injection systems are used in internal combustion (IC) engines for several Army aviation and ground engines to deliver necessary propulsion power under harsh operating conditions. The HPCR IC engines and their components are designed for diesel fuels, however, they are typically operated with F-24 jet fuel by the US Army and other DoD branches. The properties of F-24 that are important to HPCR IC engine operation vary widely, such that some fuels that meet F-24/JP-8 specifications[1,2] may cause premature failure of HPCR fuel delivery components. Further, tactical independence of US Army units requires ability to operate outside of the established supply chains that provide fuel within established specifications. The broadening of the allowable fuel-property envelope will increase the ability of fast-moving, forward operating units to use the fuel resources that are immediately available in their environment. HPCR fuel pumps are sensitive to the lubricity of the fuels that they are pumping and are liable to fail prematurely when fuel lubricity falls below those of diesel and additivized jet fuel.[3,4] Fuel lubricity is based on chemical and rheological properties (viscosity) and can vary widely between diesel, jet fuel, synthetics, ethanol, and gasoline. Current high-pressure fuel pumps typically use cylinder-piston and cam designs that undergo sliding, reciprocating, and/or intermittent contact motions with significant loads at the points where various components come into physical contact. The vulnerabilities of these pumps is largely due to inadequate lubrication at those sliding and impacting mechanical interfaces combined with the tight tolerances that are needed to reach the desired fuel pressures. Innovative concepts and methods are sought to reliably pressurize low-lubricity fuels to high pressures of at least 2,500 bar while providing adequate flow. The resulting pump design is expected to increase robustness and reduce vulnerability to varying fuel properties by avoiding materials failures from inadequate lubrication of sliding and impacting mechanical interfaces by the working fluid. The target for the pump design are HPCR IC engines from commercial engine manufacturers used in class III unmanned aviation systems (UAS) and small-to-medium manned and unmanned ground systems (20 to 350 horsepower) for operation on standard military fuels (F-24, JP-8) and lower lubricity fuels (synthetic, ethanol blend, etc.).

PHASE I: Formulate details of proposed pumping method that eliminates vulnerability to low lubricity fuels through novel designs, materials, and operational concepts that eliminate sliding and impacting interfaces, or reduce their severity (sliding speed and distance, contact pressure, etc.) and number significantly. Proposed methods to produce the required pressure and fluid flow rate may use a single stage or multiple stages, however, any method and surrounding design must significantly reduce the number and harshness of mechanical interfaces from current HPCR pump designs. Possible methods of producing pressurization and flow are centrifugal motion, magnetic fields, solid-state compression, and microfluidics, but solutions are not limited to these methods. Develop design of major pump components and concept of how they work together to achieve compression and flow while minimizing sliding mechanical interfaces. Demonstrate feasibility of pumping method(s) to meet the required pressure and flow metrics in Phase II in a conceptual pump design through a comparison of instrumented benchtop experiments and analytical and/or numerical modeling/simulation. Determine estimated power requirements of design. Analytically/numerically determine contact pressures, stresses, and sliding speeds

of any sliding or impacting mechanical interfaces and provide an assessment of damage vulnerability to lubrication with low-viscosity fuels. Deliverables are the conceptual pump design, quantitative feasibility results, power requirements, and vulnerability assessment.

PHASE II: Finalize component and pump designs from Phase I. Fabricate components and ensure expected operation through testing and comparison to feasibility model from Phase I. Integrate components together into working prototype. Demonstrate reliable operation of prototype using conditions for the North Atlantic Treaty Organization Allied Engineering Publication 5 (NATO AEP-5) standard (400 hours endurance plus before and after performance runs) on two fuels provided by the Army, F-24 jet fuel and one hydrocarbon fuel with no lubricity additives of 1 centiStoke viscosity at 40 °C, with the following requirements: simultaneously achieve at least a pressure of 2,500 bar (36,260 psi) at a flow rate exceeding 1.3 liters/minute; digital control of pump pressure and flow; use a readily-available vehicle power source (12- to 28-V electrical power, mechanical power on shaft); dry weight of less than 15 lbs.; combined length, width, and height of less than 40 inches. Provide evidence that pump could achieve operation for 3000 hours with no maintenance to meet typical IC engine overhaul intervals through accelerated endurance testing with start/stop cycles and flow rate variations. Deliver a working prototype to CCDC Army Research Laboratory for evaluation.

PHASE III DUAL USE APPLICATIONS: Integrate prototype fuel pump into a HPCR IC engine from a commercial engine manufacturer in the 20 to 350 horsepower range and conduct engine tests of prototype with both a standard military fuel and a low-lubricity fuel. Such engines are also relevant to the multi-billion-dollar markets for lightand medium-duty commercial transport vehicles, farm equipment, and construction/warehouse equipment (cranes, loaders, etc.), as well as power generators in remote locations. A successful demonstration of a high-pressure pump tolerant to widely-varying fuel properties would enable flexible fuel standards and open up the widespread use of synthetic and alcohol fuel blends to meet increasingly stringent US and international fuel use standards.

REFERENCES:

1. [1] Department of Defense Standard Practice Quality Assurance/Surveillance for Fuels, Lubricants and Related Products, MIL-STD-3004-1; NATO Standard AFLP–3747, “Guide Specifications (Minimum Quality Standards) for Aviation Turbine Fuels (F-24, F-27, F-34, F-35, F-37, F-40, and F-44),” Edition A, Version 1.;
2. [2] Detail Specification: Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37), MIL-DTL-83133J, 16 December 2015.;
3. [3] J.K. Klein, “PROPULSION AND POWER RAPID RESPONSE RESEARCH AND DEVELOPMENT (R&D) SUPPORT Delivery Order 0011: Production;
4. [4] G.R. Bessee, S.A. Hutzler, E. Frame, D.M. Yost, G.R. Wilson, N. Jeyashekar, and A.C. Brandt, “PROPULSION AND POWER RAPID RESPONSE RESEARCH;
5. [5] D.M. Yost, A.C. Brandt, and G.T. Hansen, “RAPID RESPONSE RESEARCH AND DEVELOPMENT (R&D) FOR THE AEROSPACE SYSTEMS DIRECTORATE,;
6. [6] D.M. Yost and E. Frame, “Rotary Fuel Injection Pump Wear Testing Using a 30%/70% ATJ/F-24 Fuel Blend,” U.S. Army TARDEC Fuels and Lubricants Research

KEYWORDS: Fluidics, Lubricants and Hydraulic Fluids, Fuels, Reciprocating and Rotating Engines, Fluid Mechanics, Mechanics, Thermodynamics

VERSION 2

A21-105 TITLE: Unmanned aerial system for organic squad-level situational awareness

OUSD (R&E) MODERNIZATION PRIORITY: Control and Communications

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: Develop an unmanned aerial system (UAS) airframe (< 150 g) with extremely low SWAP-C to support squad-level situational awareness. Tactical ground control station and payload development are outside of scope.

DESCRIPTION: The Army is currently attempting to field personal UASs for organic squad-level situational awareness and understanding (SA/SU). However, in the sub-150 g space, there are few if any options which meet all of the needs of the Soldier, and carry a substantial cost. Clearly, there is need for disruptive innovation to fold additional capabilities into a lower SWAP-C airframe. An airframe below 150 g is an Army Key System Attribute threshold, with an objective of 25 g. The airframe must have a payload capacity of ≥ 5 g, although payload development is outside of the scope of this effort (minimally, a “dummy” payload should be used). Visual and audible signature must be extremely low: it is an Army Key Performance Parameter that the audible signature not exceed 40 dB at 30 m. The UAS must have a flight time of 20–40 minutes. The UAS shall be capable of flight in sustained 15 knot winds and survive gusts of 20–30 knots.

While development of an appropriate radio may fall outside of the scope of this effort, the airframe should minimally incorporate a COTS radio for demonstration purposes. In this case, it shall be capable of later integrating a radio with 900–1500 m line of sight and 300–600 m non-line of sight (-30 dB) range, encryption, and live video feed. That is, the airframe shall possess appropriate SWAP allowances on the system level to incorporate such a radio.

Desirable features include threat detection and cueing; cursor on target; GPS and GPS denied operations; ability to integrate with ATAK/Nett Warrior (Android Tactical Assault Kit) and Adaptive Squad Architecture; obstacle avoidance; and GPS-denied return to home. Many or all of these features are likely beyond scope of this effort, but the airframe shall include appropriate hardware (e.g. processors, memory) to allow feature implementation without hardware change to the UAS. Maintenance shall be performed by the user and without special tools whenever possible. Operating temperatures are ≥ 0–20°C and ≤ 40–50°C and storage temperatures are (-30)–55°C. Ease of use and high mean time between essential function failure and system abort are important. Ultimate manufacturability of the UAS and materials/component selection are an important consideration during this development effort for keeping final unit costs low.

PHASE I: Develop an initial concept design to meet the requirements above. Perform an analysis of key system-level design trade-offs (e.g. how does optimizing for one requirement such as range affect other requirements, such as payload capacity). Provide a high-level bill of materials for key components in the

design, and consider potential suppliers. Deliver draft CAD or other designs/models for your concept, and discuss technical and commercial feasibility.

PHASE II: Refine the design from Phase I using a detailed analysis of system trades and input from appropriate stakeholders. Fabricate, test, and deliver at least one prototype airframe meeting the above requirements, along with any supporting hardware (e.g. ground control station) and user manuals. Deliver a detailed plan to integrate any desired features into future designs which could not be included into the Phase II delivery prototype.

PHASE III DUAL USE APPLICATIONS: As appropriate, partner with relevant suppliers and/or prime contractors. Further develop the UAS and relevant sub-components to meet all of the desired specifications, and integrate the UAS into a low SWAP-C tactical kit with everything required to operate the UAS (e.g. ground control station, spare components, display, etc.). Develop firmware and interfaces required to meet sensor interoperability protocols for integration. Determine best system integration path as a capability upgrade for a relevant Army Program of Record.

The desired end state is a UAS providing SA/SU to the Squad or first responder with low/no cognitive burden and user input. That is, the Soldier should not be taken out of the fight (head up, hand on weapon), and the system should be fully integrated with the rest of his kit and network. Squad-level SA could then be propagated through to higher echelons as desired. This allows the individual Squad to know what is around the next corner or over the next hill, assist with building and route clearance, and provide life-saving real-time local intelligence.

Commercially, this technology has many applications for first responders. Police agencies can make use of it in many of the same ways as would the DoD. It would also be useful for search and rescue, especially in areas where it is difficult or dangerous for first responders to reach. A thermal payload, for example, would allow fire fighters to assess buildings and rooms before entry, and allow for much easier location of people via their thermal signature. Fitted with appropriate payloads, it could also discover chemical, biological, nuclear, or other threats, such as near a chemical spill or reactor meltdown.

REFERENCES:

1. SBIR.gov. “Miniaturized small-pixel Uncooled Infrared Imager for Nano Unmanned Air Vehicles,” http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20163/index.shtml (2016);
2. SAM.gov. “Soldier Borne Sensor OTA RWP,” https://beta.sam.gov/opp/4af8d1483d1a4e2faa290ee748416779/view (2020);
3. Market Watch. “FLIR Systems Awarded $39.6 Million Contract for Black Hornet Personal Reconnaissance Systems for U.S. Army Soldier Borne Sensor Program,” https://www.marketwatch.com/press-release/flir-systems-awarded-396-million-contract-for-black-hornet-personal-reconnaissance-systems-for-us-army-soldier-borne-sensor-program-2019-01-24 (2019);
4. Ferraris, Patrick. “Soldiers train with Army's first personal Unmanned Aerial System,” https://www.army.mil/article/221990/?fbclid=IwAR3aLDFIdXbXHUDGbFcgHuyeULDc39HwZw1lHe1OODNkfXvD_XZWTdpKYy8 (2019)

KEYWORDS: UAS, UAV, drone, squad, soldier lethality, situational awareness (SA), situational understanding (SU)

VERSION 2

A21-106 TITLE: Reconfigurable Navigation Sensors and Optimized PNT Solutions for Ground Combat Systems

OUSD (R&E) MODERNIZATION PRIORITY: Control and Communications, Autonomy, Artificial Intelligence/Machine Learning

TECHNOLOGY AREA(S): Sensors, Information Systems, Electronics, 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: The design goals are :
- To develop multipurpose Positioning, Navigation, and Timing (PNT) sensor that can be reconfigured in realtime or near realtime to correspond with various threats to PNT signals.
- To optimize PNT sensor configurations for Ground Combat PNT system that is capable to automatically deploy corresponding PNT capability to mitigate the emerging threats.
- To leverage Modular Open Systems Approach (MOSA) and C5ISR/EW Modular Open Suite of Standards (CMOSS) architecture for hardware and software interfaces of the new developing sensor.

DESCRIPTION: There is currently no single silver bullet to solve the PNT problem for Ground Combat Soldiers in a GPS challenged environment. PNT systems of the future will be expected to utilize an array of PNT sensor inputs in order to provide an assured-PNT solution that is resilient from adversarial threats, interference, and other challenging environments. A layered approach having multiple PNT sensors including those rooted in traditional RF signals from space and terrestrial systems alongside emerging complementary PNT sensors is viewed as having greater potential for providing a military PNT solution at a level of assurance and integrity that is not currently found with GPS (reference 1). Beside a military GPS receiver and MEMS IMU, for example, a combat vehicle in the future may be equipped with additional PNT technologies such as Multi-GNSS, RF Ranging, EW sensors, Vision Aided Navigation, SOoP, AltNAV, Celestial Navigation, etc. An identified challenge of a layered sensor fusion approach in future PNT systems is the ability to manage and assess large amounts of sensor data in real-time to determine how the PNT system can optimally configured while experiencing complex and emerging threat scenarios. Another significant problem for the multi sensor solution is the limitation of military platforms to be able to equip a large amount sensors with minimal impacts performance of existing systems/subsystems as well as constrains for SWaP_C. For example, a future vehicle PNT systems will comply with the C5ISR/EW Modular Open Suite of Standard (CMOSS) and PNT sensors will be made in card form factor for a common chassis. Under the OpenVPX configuration, however, there will be limited slots for PNT sensors. Some of the PNT sensors in future will be hardware agnostic or have similar hardware designs that can be retasked with a different software load. Many sensors and systems will have intelligent deep-learning architectures requiring inherent configuration flexibility and advanced processing schemes (reference 2). Thus Reconfigurable PNT Sensors will be highly valuable along with a better choice of sensor fusion algorithm to optimize platform SWaP_C as opposed to deploying all PNT sensors concurrently which may not always be needed for a given mission (reference 3). The US Army is requiring future PNT systems to comply with MOSA where all PNT sensors will be designed modularly and work as truly plug and play sensors for the purpose of increasing interoperability and reducing costs,

including those of future enhancements, and capturing the largest amount of industry innovation. Such a system would benefit from an optimization algorithm having Reconfigurable PNT Sensors enabled by software defined receiver (SDR) technology or other advanced signal processing methodologies that can efficiently and effectively provide real-time signal monitoring, analysis, and then reassign PNT sensors/resources to counter the detected threat with optimized configuration for the PNT system.

PHASE I: Using modeling, simulation, and experiment to determine the technical feasibility of the design goals described above and provide a specifications for the potential product in the end of this phase. The study in phase I should focus on a feasible approach to design multitasking or reconfigurable PNT sensor and to investigate optimal configurations for the developing sensor for mitigating PNT threats.

PHASE II: Develop the system prototypes based on the specifications and hardware/software identification found in from phase I. Demonstration system capability in TRL 5. Evaluate and provide the test results of the system prototypes to the government POC. Deliver five units of the developed prototypes to the government for evaluation, including all hardware and software necessary to operate and collect data from the delivered units.

PHASE III DUAL USE APPLICATIONS: Modify design based upon T&E results from Phase 2 to achieve a better small size, weight, and power (SWaP) system applicable to the mounted platform and comply with CMOSS architecture. Transition the technology to the U.S. Army. Integrate this technology into the PM PNT Mounted System and apply the new developing technology to the commercial market.

REFERENCES:

1. “Concepts of Comprehensive PNT and related Key Technologies,” Z. Zuo, X Qiao and Y Wu, International Conference on Modeling, Analysis, Simulation Technologies and Applications (2019).;
2. “Identifying Interactions for Information Fusion System Design using Machine Learning Techniques, “A. Raz, P. Wood, L. Mockus, J. Llinas, and D. DeLaurentis, 21st International Conference on Information Fusion (2018).;
3. “An Optimal Selection of Sensors in Multi-Sensor Fusion Navigation with Factor Graph,” C. Han, L. Pei, D. Zou, K. Liu, Y. Li, Y. Cao, Ubiquitous Positioning, Indoor Navigation and Location Based Services Conference 2018.;
4. Executive Order on Strengthening National Resilience through Responsible Use of Positioning, Navigation, and Timing Services, https://www.whitehouse.gov/presidential-actions/executive-order-strengthening-national-resilience-responsible-use-positioning-navigation-timing-services

KEYWORDS: PNT, Reconfigurable Sensors, Optimized, MOSA, CMOSS, GPS Challenged Environment, Assured PNT, SDR

VERSION 2

A21-107 TITLE: Chip-Scale Optical Receivers for Communications

OUSD (R&E) MODERNIZATION PRIORITY: Control and Communications

TECHNOLOGY AREA(S): Electronics

OBJECTIVE: Develop a small SWAP-C (chip-scale) optical receiver that overcomes current limitations such as field-of-view (FOV) and pointing and tracking (PAT) enabling communications for highly mobile vehicular and personal/on-body applications.

DESCRIPTION: The radio frequency (RF) spectrum, relied upon for wireless communications, is increasingly congested and subject to interference that reduces system performance. Obtaining the bandwidth necessary for the high data rates demanded by modern applications is extremely expensive within licensed bands, and permissible use of the unlicensed bands entails various design restrictions. Free space optics (FSO) systems that can communicate using lasers eliminate these problems since the optical bands are unregulated, and the extreme directivity of lasers prevent interference with nearby receivers. Furthermore, the large amounts of available bandwidth with this approach can offer very high data rates.

Unfortunately, while current commercially available FSO systems are suitable for fixed-site point-to-point applications with mast/tower-mounting, they are unsuitable for highly mobile applications with stringent size, weight, and power (SWAP) requirements. Additionally, the high-cost of FSO makes it impractical to field in very large quantities for military use and rules out potential civilian applications. Photonic integrated circuit (PIC) based FSO address all of these problems. Designed to be fabricated on an integrated circuit, PIC-based FSO can achieve size and weight reductions of multiple orders of magnitude relative to traditional FSO designs, and, when fabricated in production quantities, the costs of these PICs are minimal compared to FSO system component costs. In addition, because optoelectronic techniques enabling extremely rapid beam-steering can be used instead of mechanical steering, chip-scale systems can support on-the-move applications. Because of these capabilities and attributes the use of chip-scale FSO holds great promise for incorporation into networks as a means to alleviate the growing demand for RF spectrum while providing high data rate communications in a low SWAP-C design. Although chip-scale FSO components have been fabricated and demonstrated at various levels of maturity, additional development of the components and receiver design is needed in order to realize the promise of the technology. Current designs are limited in field-of-view (FOV) especially across wide bandwidths and implementation of high-speed pointing and tracking (PAT) is limited. C5ISR Center seeks the design and development of a chip-scale optical receiver that overcomes these challenges and enables low SWAP-C high data rate communications for highly mobile applications. In particular, C5ISR Center seeks a wide FOV (>= 45 degrees) wide-bandwidth (1 – 10 GHz) receiver capable of pointing and tracking and high rates (<= 500 us slew time across FoV). This includes significant increases in field of view in both azimuth and elevation planes across high bandwidths (e.g. 1 – 10 GHz or higher) as well as the ability to support high-speed beam-tracking, node acquisition/network entry, and angle of arrival calculations.

Work under this SBIR aligns with Army network S&T investments, including the Nova Specter project.

PHASE I: During Phase I the selected company(s) will design a chip-scale optical receiver capable of beam-tracking for highly mobile applications (e.g. vehicles, drones). The design must support wide bandwidths (at least 1 GHz and ideally 10 GHz) over a wide field-of-view (>=45 degrees in azimuth and elevation) in a compact form-factor (<= 1 cm^3) and have a clear and well defined path towards full 360 degree coverage. A pointing and tracking (PAT) mechanism will be designed with high slew rates (<=

500 us across FoV) that maintains low probability of detection and does not incorporate a side-channel or locator beacon. For eye-safety, designs must operate between 1200 nm – 1700 nm. A report documenting the design will be delivered to the government at the end of Phase I.

PHASE II: The Phase II effort will fabricate the chip-scale optical receiver and incorporate it into a demonstration/prototype communications system capable of demonstrating the ability to beam-track while sending high data rate communications (>1 Gbps). The optical receiver and demonstration/prototype communication system shall be delivered to the government at the conclusion of the Phase II effort along with a user's guide and an interface control document documenting the physical, electronic, and signaling interfaces necessary to incorporate the optical receiver into a third party design.

PHASE III DUAL USE APPLICATIONS: The Phase III effort will focus on commercialization of the technology, which could include civilian applications such as wireless access networks or drone communications. This will entail maturing and optimizing the chip-scale receiver from performance, cost, and ruggedization standpoints. This will also necessitate an innovative packaging design that incorporates a protective layer(s)/housing to prevent damage to the optical components and minimize the impact/likelihood of dirt, debris, condensation, water, or other obfuscating substances as well as scratches, cracks, or other damage to the protective covering.

The Phase III system will produce a compact optical receiver with impactful capability for both Army/DoD and civilian applications. For the Army/DoD FSO based communications will enable significant advancement in network capacity and improvements in low probability of detection (LPD). This can be used for air-to-air, air-to-ground, as well as ground-to-ground applications such as inter-vehicular communications. The lack of spectrum approval required for the use of FSO will represent an enormous time savings for spectrum managers, and the ability to use optical spectrum for a much wider range of communications will enable RF spectrum to be conserved for where it is most needed (e.g. non-line-of-sight links). In the civilian sector chip-scale optical communications holds tremendous opportunities. Billions of dollars are spent by commercial companies to secure the use of RF spectrum. The ability to use the optical spectrum instead which entails no spectrum costs, can therefore save enormous amounts of money. In addition to communications, certain optical receiver designs can also be applied towards LiDAR, which is a key component in some approaches to autonomous vehicle technology.

REFERENCES:

1. P. F. McManamon et al., "Optical phased array technology", Proc. IEEE, vol. 84, no. 2, pp. 268-298, Feb. 1996.;
2. Moshe Zadka et al., "On-chip platform for a phased array with minimal beam divergence and wide field-of-view", Optics Express, vol. 26, pp. 2528-2534, 2018.;
3. Michael Gehl, Galen Hoffman, Paul Davids, Andrew Starbuck, Christina Dallo, Zeb Barber, Emil Kadlec, R. Krishna Mohan, Stephen Crouch, Christopher Long, "Phase optimization of a silicon photonic two-dimensional electro-optic phased array", Lasers and Electro-Optics (CLEO) 2019 Conference on, pp. 1-2, 2019.;
4. Jie Sun et al., "Large-scale nanophotonic phased array", Nature, vol. 493, pp. 195-199, 2013.;
5. SungWon Chung et al., "A monolithically integrated large-scale optical phased array in silicon-on-insulator CMOS", IEEE J Solid-St Circ, vol. 53, pp. 275-296, 2018.

KEYWORDS: Communications, Optoelectronics, Photonics, Photonic Integrated Circuits, Optical Phased Arrays, Free Space Optics

VERSION 2

A21-108 TITLE: Real Time EW Receiver Surrogate (RTERS)

OUSD (R&E) MODERNIZATION PRIORITY: Control and Communications

TECHNOLOGY AREA(S): Sensors, 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 and build a portable Real Time Electronic Warfare Receiver Surrogate (RTERS) prototype with a set of hardware, firmware and software of a simulated EW radar receiver and display to show the effects of the countermeasure techniques.

DESCRIPTION: Battle damage assessment of Non-U.S. EW systems are hard to come by for the evaluation of the effectiveness of U.S. Electronic Attacks (EA) signals of an airborne EW system in a real time scenario. EW receiver surrogates are available to display normal radar signals on a Plan Position Indicator (PPI) but it cannot display the real time effects under the influence of EW techniques. The RTERS will evaluate EW techniques and Electronic Intelligence (ELINT) information as a surrogate radar receiver system when non-U.S. threat systems are not available. The RTERS prototype shall perform two major functions. The RTERS shall able to receive the proper signals of a CW, modulated waveforms and pulse radar information and stored these parameters in the prototype for comparison with the configured parameters in real time. The simulated radar display shall include the range and target indication display with regular radar signals. The second function shall show the effects on the simulated PPI when countermeasure signals are presented at the RTERS antenna inputs. The PPI shall display the EA effects on the simulated receiver display based on the EA techniques, dynamic changes in real time and the signal parameters that caused the effects are also overlaid on the same display in real time simultaneously.

The RTERS prototype shall include but not limited to the ability to receive, process and display radar signals from L, S, C, X and Ku bands. The usage of Commercial-Off-The-Shelf (COTS) Software Define Receiver (SDR) and portable real-time spectrum analyzer & monitoring receiver instrumentation for prototype design are encouraged to minimize lengthy RF circuits and RF subsystem designs. The prototype shall have the capability to accept and to process the Red hawk framework plug-ins and RaptorX framework plug-ins to demonstrate developed applications.

The prototype physical configuration shall include but not limited to a receiver/ processor, a display, a mouse, a keyboard, and a Double Layer DVD RW drive to perform command, control, data exchange and data storage of the RTERS system. For operation security, the prototype memories of the system shall be accessible and removable from the front panel of the system. Once the memories of the system are removed, RTERS shall be inoperable. No data, firmware and software can be retrieved from the RTERS prototype. The total system weight shall be less than 25 lbs. The system shall operate on a 120 volts AC household outlet.

The prototype receiver system shall include multiband antennas to receive the required radar frequency

band signals. The antennas shall have a 360 degree field of view. The antenna subsystem shall able to scan 360 degrees continuously through mechanical and/ or electronic means to receive the proper radar signals. When the prototype system operates in synchronized mode with the simulated emitter, the prototype receiver system shall able to switch off the receiver antennas function during simulated emitter transmission period to a avoid co-site interference or high power transmitted signals damage to the receiver. For demonstration in an anechoic chamber, the prototype receiver is outside of the anechoic chamber. The antennas are placed inside the chamber, the cable separation could be as long as 25 feet from the receiver. Compensation of the signals are required to avoid signal power losses over the cables. The prototype receiver shall have the capability to process incoming radar signals and countermeasure signals continuously. The prototype system shall able to store 10 seconds or more of real time signals with a bandwidth of 500MHz or wider bandwidth signals. The stored signals shall be labeled for data retrieval in real time. The porotype system shall provide demodulated In-phase and Quadrature component (I/Q) digital signals for external RF recording.

The RTERS prototype shall have the interfaces to synchronize with GPS timing and external emitter simulator timing to perform real time operation. The prototype shall able to operate with Low-Voltage Differential signaling (LVDS) interface to connect to real time RF recorder for events recording. The system shall have Display Port interface connector and High-Definition Multimedia Interface (HDMI) connectors for external secondary display. The system interface shall have Secure Digital (SD) memory slot for down load and revise of configuration profile of 128 Gigabytes (GB) of data and files. The prototype system shall able to network through Bluetooth, Gigabit Ethernet interface and regular Local Area Network (LAN) interface.

PHASE I: The Phase I RTERS prototype system development shall provide the following results in a report:

i. Identify and define the technologies, COTS systems and components that could support the design and built the RTERS prototype.
ii. Provide a concept hardware, firmware and software design of the RTERS prototype system.
iii. Perform an analysis of the system performance
iv. Provide the outline feasibility of producing a demonstration of RTERS in phase II, and will outline demonstration success criteria in Phase II

PHASE II: The Phase II program shall continue with the phase I concept to design and fabricate RTERS prototype system for a successful demonstration of the system requirements. The phase II program shall include:

i. Develop, demonstrate, and validate the RTERS design concept of Phase I
ii. Implement the best approach from Phase I into hardware and software system
iii. Establish performance parameters through experiments and prototype fabrication
iv. Develop, test, and demonstrate the prototype design
v. Define field test objectives and conduct limited lab testing
vi. Construct and demonstrate the operation of the RTERS prototype
vii. Demonstrate the prototype in accordance with the test objectives
viii. Provide a monthly report with detailed technical progress and program expenses
ix. Provide a plan for practical deployment of the proposed commercial applications

PHASE III DUAL USE APPLICATIONS: Phase III of the prototype system will be oriented towards technology transition to Acquisition Programs of Record and/or commercialization of the technology. In Phase III, the contractor is expected to obtain funding from non-SBIR government sources and/or the private sector to develop or transition the prototype into a viable product or service for sale in the military or private sector markets.

VERSION 2

REFERENCES:

1. Chi, Y. K., "Evaluation of Radar Performance Degradation due to Standoff Jamming ", DTIC, September 1992;
2. Heriana O., Kurniawan, D., Rahman A., Hardiati, S., Pristiant, E., " Implementation of Plan Position Indicator Display for Low Probability of Intercept Radar", International Conference on Radar, Antenna, Microwave, Electronics, and Telecommunications (ICRAMET), 2018.;
3. Pelan, J.D., "Modular Multi-Signal Tracking Pulse Descriptor Word (PDW) Generator with Field Programmable Gate Array (FPGA) Implementation, Wright State University Thesis paper, 20016", https://corescholar.libraries.wright.edu/etd_all/156;
4. Perala, H., Vaila M., Jylha, J., "M-SPURT–Compressing the Target Characterization for a Fast Monostatic RCS Simulation", International Conference on Radar, 2018.;
5. Rukezo S., Inggs, M., Mishra, A., "Tutorial Review of an L Band Radar Transceiver for Use with a Software Defined Radar Baseband system", 13th International Radar Symposium, 2012.

KEYWORDS: Electronic Attack, Electronic Warfare, radar, ELINT, EW surrogate receiver, plan position Indicator, multiple display screens, Pulse Descriptor Words, data comparison and validation, analog waveforms, pulse waveforms, Wideband antennas and SDR.

VERSION 2

A21-109 TITLE: IoT Network Access Control

OUSD (R&E) MODERNIZATION PRIORITY: Cybersecurity

TECHNOLOGY AREA(S): Sensors, Information Systems

OBJECTIVE: Develop & demonstrate a decentralized, secure, low power, Internet of Things (IoT) network architecture where every device on the network is uniquely identified, authenticated & authorized access, over standard wired and wireless protocols.

DESCRIPTION: This effort will research new and existing models for uniquely identifying devices and models for granting access to authorized devices and preventing rogue IoT devices from gaining access. The innovation for this Topic is the security that network access control (NAC) introduces. NAC ensures that every device is uniquely identified, Authenticated & then authorized. Commercial IoT implementations are focused on connectivity & convenience. Think of the numerous sensors in the tactical environment. How are they being uniquely identified? How can they be distinguished from malicious sensors or IoT devices? This topic addresses capabilities outlined in NIST's IoT Device Cybersecurity Core baseline publication, NISTIR 8259A, specifically, unique identification and logical access control.

PHASE I: Identify the minimum performance parameters for an IoT network in constrained tactical networks. Generate a proof of concept design/breadboard demonstration of IoT devices that are securely and uniquely identified, authenticated & authorized for access to this conceptual network. A report documenting the Proof of concept (POC) design will be delivered to the government at the end of Phase 1.

PHASE II: Demonstrate a dynamic, decentralized, network access control implementation on IoT devices. Demonstrate ability to add/join/verify new IoT devices to the network on the fly. Fully document network architecture, approach used to securely and uniquely identify, authenticate and authorize IoT devices, identify any standards or proprietary technologies used, identify any dependencies, and provide instructions for installation, configuration, management and demonstration.

PHASE III DUAL USE APPLICATIONS: The Phase III effort will focus on commercialization of the technology, which could include use by commercial applications such as wireless sensor & access networks, asset tracking in manufacturing, interactive teller machines, mobile banks, wearables etc. This will entail maturing the Proof of Concept (PoC) Network Access Control for IoT devices designed in phase I from a performance, cost, usability & ruggedization perspective.

Phase III will produce a simple, secure, scalable, automated, and standards-based access control system that allows IoT devices to be uniquely identified, authenticated and authorized access to Army and DoD networks. This solution will mature the Proof of Concept (PoC) design/breadboard developed and demonstrated in Phase II. A Network Access Control (NAC) system for the numerous IoT devices/sensors on the tactical networks will ensure a secure Battlefield of IoT and reduce the enormous cyber vulnerabilities that unauthorized and insecure devices connected to defense networks bring. A dynamic, decentralized NAC for IoT System will not only secure defense networks but reduce/eliminate cost, manpower & lifecycle processes and burden that come with traditional methods of identifying and validating devices on government networks.

REFERENCES:

1. NISTR 8259A – IoT Device Cybersecurity Capability Core baseline.

https://nvlpubs.nist.gov/nistpubs/ir/2020/NIST.IR.8259A.pdf;
2. Considerations for Managing Internet of Things (IoT) Cybersecurity & Privacy risks https://csrc.nist.gov/publications/detail/nistir/8228/final;
3. Before Connecting an IoT Device, Check out a new NIST Report for Cybersecurity Advice https://www.nist.gov/news-events/news/2019/06/connecting-iot-device-check-out-new-nist-report-cybersecurity-advice;
4. Security and Privacy Controls for Information Systems and Organizations (Final Public Draft) https://csrc.nist.gov/publications/detail/sp/800-53/rev-5/draft;
5. Internet of Battlefield Things https://www.arl.army.mil/business/collaborative-alliances/current-cras/iobt-cra/

KEYWORDS: Identification, Authentication, Authorization, Network Access Control, secure, unique, Internet of Things (IoT)

VERSION 2

A21-110 TITLE: Advanced Remote Military Yoke (ARMY) – Hub Advanced Payload System (HAPS)

OUSD (R&E) MODERNIZATION PRIORITY: Space, Network Command, Control and Communications

TECHNOLOGY AREA(S): Information Systems, 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: Develop a means for a small satellite yoke to co-host a small communications hub controller that enables new radio waveforms. Provide receive-store & forward, and direct transmit-receive frequency translation system to be co-hosted on multiple Geosynchronous Earth Orbit (GEO) platforms operating in the UHF and L frequency bands. Develop applications to support payload employment by strategic and tactical users.

DESCRIPTION: Multiple tactical users have various waveform requirements. Mobile User Objective System (MUOS) is now operational. Advanced waveforms beyond MUOS waveform have been created since the initial fielding of MUOS in 2012. Additional MUOS payloads are now on the roadmap. The opportunity to expand MUOS constellation adaptability is now. Additional waveform capabilities risks can be greatly reduced by developing payloads in advance to interface with the follow-on MUOS GEO platform. Additionally required is the capacity to receive multiple 256Kb streams of up to 1 MB File Transfer Protocol (FTP) into temporary digital storage. Each shall have a programmable Time-To-Live (TTL) before crypto-keyed commanded release for transmit or deletion. Additionally, direct translation for low power density waveforms, allowing a full-on transmit & receive functionality in both UHF and L bands, will enable live communications in real-time and serve as an overflow for overloaded capacities and alternative payloads.

PHASE I: Generate and deliver a hub design that enables thousands of Ultra-High Frequency (UHF) satellite communications (SATCOM) users the ability to transmit non-conflicting Right Hand Circular Polarization (RHCP) and receive non-conflicting MUOS RHCP at 225 MHz to 450 MHz and for L-Band SATCOM users the ability to transmit RHCP and receive RHCP at 950 MHz to 2100 MHz. The Hub design must include the configuration capability via S-band. The design must also incorporate the ability for multiple users, using 256Kbps streams, to store up to 1 MB encrypted files with programmatically specified TTL for scheduled release or deletion. The design must utilize the existing capabilities on an existing bus such as the MUOS and be scalable in capability.

PHASE II: Demonstrate and deliver a communications hub prototype meeting the approved Phase I design that is certifiable for space deployment and meeting space flight requirements.

PHASE III DUAL USE APPLICATIONS: Provide a scalable, payload standards-based interface communications hub that enables user's rapid access to prototyping space-based communications payloads to support commercial industries and the DoD.

VERSION 2

REFERENCES:
1. GONZALES, “Corps’ Satellite Communications System Exceeding Performance Expectations,” 3 JUN 2020, https://www.marines.mil/News/News-Display/Article/2206295/corps-satellite-communication-system-exceeding-performance-expectations/;
2. SMITH/NASA RSDO, “LM400”, 2018, https://rsdo.gsfc.nasa.gov/images/catalog/LM400_Brochure_reva.pdf;
3. EVERSDEN, “Where the next iteration of the Army’s network capabilities is heading” May 7 , 2020, https://www.c4isrnet.com/battlefield-tech/c2-comms/2020/05/07/where-the-next-iteration-of-the-armys-network-capabilities-is-heading/;
4. DID Daily Staff, “Soldier Battle JTRS: The HMS Radio Set + SANR,” May 21, 2020, https://www.defenseindustrydaily.com/cat/aircraft/uavs/

KEYWORDS: Tactical Radio, Payload, Store & Forward, Controller, Hub, Access, Satellite, UHF, Telemetry, MUOS, Control, Direct Sequence Spread, GEO

VERSION 2

A21-111 TITLE: MOBILE OPERATIONS UNIFIED SYSTEM EXTENSION (MOUSE)

OUSD (R&E) MODERNIZATION PRIORITY: Network Command, Control and Communications

TECHNOLOGY AREA(S): Information Systems, 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: CREATE MUOS RADIO 5G BRIDGE EXTENSION

DESCRIPTION: The need for expanding communications to meet increasing data requirements continues. Operation in open and closed military environments, and commercially enabled environments requires maximization of bandwidth efficiency to meet new challenges. The US Army, in conjunction with the Mobile User Objective System (MUOS) program, is interested in acquiring a communications hub controller for broadening tactical radio capabilities within the current MUOS satellite constellation. In addition to this capability, the interests are furthered in respect to follow-on MUOS satellite builds. In operating parallel to the existing MUOS communications hub controller, a new communications hub controller must be developed under this effort to perform signal processing to access, host and power correct Radio Frequency (RF) signals as needed for non MUOS waveforms. As with most network hub receivers, multiple remotes must be handled by a network controller. All remote terminals using Division Multiple Access (DMA) are associated with at least four different time windows. Time Division Multiple Access (TDMA) time windows must include guard time, transmission connect time, transmit duration time, and termination time. In a Code DMA (CMDA) the time windows are not as paramount, but still require innovative design to provide this capability, while not interfering with the current MUOS communications hub controller. It is crucial that each remote user, upon access of the communications hub controller, is de-conflicted with the MUOS network. The de-confliction will only be required when the MUOS waveform is present. The communications hub controller will interface to the existing architecture via RF at the frequency range of L-band. The data will interface with a secure network that requires standard Ethernet data interface packets. The requirement of this effort is to design and build a scalable communications hub controller to handle multiple Multi Product UHF L-band System Extension (MPULSE) Quadrature Phase Shift Keying (QPSK) waveform radio accesses that are deploying Direct Sequence Spread Spreading (DSSS) for broad use. MOUSE design must allow additional PSK waveforms to be incorporated later with minimum adjustments required.

PHASE I: The work to be done in Phase I is to deliver a design document. The design document should include the strategy, proposed hardware elements, such as Field Programmable Gate Array (FPGA) components, high-speed multi-FPGA backplane and the standards utilized in accomplishing the tasks to create the communications hub controller. It is significant to note that expectations of accessing thousands of users simultaneously will require a significant amount of parallel processing.

PHASE II: The work to be done in Phase II includes the delivery of the communications hub controller prototype based on the designed developed in Phase I with windows-based management software and standard user documentation.

VERSION 2

PHASE III DUAL USE APPLICATIONS: Success in building the MOUSE controller will prove value to other military and commercial architectures that are upgrading spectrum efficiencies, especially those particular to de-conflicting pre-existing legacy waveforms. A phase III strategy should include the means to develop and market to commercial and military entities.

REFERENCES:
1. RAMLALL “An automated framework for testing MUOS voice calls", 2015, https://ieeexplore.ieee.org/document/7356511;
2. AKCAN, “Direct Sequence Spread-Spectrum Based Covert Communication Using Random Pulse Width Modulation," 2019, https://ieeexplore.ieee.org/document/8806617;
3. MEDINA, Mobile User Objective System (MUOS) to legacy UHF Gateway Component(MLGC)", 2010, https://ieeexplore.ieee.org/document/5680271;
4. OKRAH, “Channel and interference mitigation in the MUOS base-to-user link”, 2008, https://ieeexplore.ieee.org/document/4753492

KEYWORDS: Hub, Satellite, Control, Controller, Direct Sequence Spread, MUOS, Tactical Radio, GEO

VERSION 2

A21-112 TITLE: Small Form Factor Hardware Standards

OUSD (R&E) MODERNIZATION PRIORITY: Control and Communications

TECHNOLOGY AREA(S): Sensors, Electronics

OBJECTIVE: Define and demonstrate small form factor hardware standards that allow modularity smaller than 3U OpenVPX.

DESCRIPTION: Command, Control, Communications, Computers, and Cyber (C5ISR)/Electronic Warfare (EW) Modular Open Suite of Standards (CMOSS), Sensor Open Systems Architecture (SOSA), and Hardware Open Systems Technology (HOST) hardware form factors leverage 3U and 6U OpenVPX to define hardware standards for military C5ISR systems. These standards allow multiple vendors to provide payload modules for C5ISR systems without the need to build to proprietary interfaces or replace entire systems. This increases competition and reduces the cost and effort required to upgrade C5ISR systems. While OpenVPX is suitable for many military ground and airborne platforms, it is not designed for small size, weight, and power (SWaP) platforms such as small unmanned aerial and ground vehicles. To address this gap and provide the benefits of CMOSS to more military programs, this effort will develop initial prototypes implementing open small form factor hardware specifications. As CMOSS, SOSA, and HOST leverage OpenVPX to define hardware standards, the proposed small form factor hardware specifications may leverage existing standards.

Additional requirements for small form factor hardware standards:
- Modularity is smaller than 3U VPX, with modules roughly MXM size (~ 80x80mm surface area)
- Ethernet and PCIe connectivity
- RF connectivity similar to VITA 67
- Optical connectivity similar to VITA 66
- Operates from -40°C to 85°C at cooling surface
- Provide modularity similar to CMOSS standards [i.e. modularity between vendor payloads in a chassis (or equivalent) without modifications to the backplane (or equivalent)]

The initial prototype should include a cooling solution, processing and transceiver modules, an Ethernet switch, and shared position, navigation and timing. Switch and PNT capabilities may be module-based or built into the chassis (or equivalent). Specific prototype performance requirements are not defined. The initial prototype shall be tested in a relevant environment to validate the specifications. These validation efforts will support further development of the specifications to mature them for transition to CMOSS.

This effort will also develop verification requirements for the small form factor hardware specifications. These requirements will define the verification methodology to be used to test hardware for conformance to each specification requirement. In addition, this effort will design and develop a conformance test kit to automate conformance testing to the greatest extent possible.

PHASE I: Develop an understanding of the key technical challenges that exist to support this concept. Conduct trade off studies on the use of existing small form factor hardware standards. Deliver initial open small form factor hardware standards. Provide an analysis of any performance limitations due to the hardware form factor.

PHASE II: Design and develop prototype using the developed standards with a cooling solution, processing and transceiver modules, an Ethernet switch, and shared position, navigation and timing.

VERSION 2

Demonstrate the hardware with a relevant representative environment. Develop updated small form factor hardware standards for transition to existing relevant standards body. Develop an initial standards conformance plan and test kit for the small form factor hardware.

PHASE III DUAL USE APPLICATIONS: Transition small form factor standards to existing standards body. Develop a payload for small SWaP platforms such as small unmanned aerial vehicles. Provide conformance testing and conformance test kits for small form factor hardware developers.

REFERENCES:

1. Grovak, Mark. Multivendor interoperability is real: The TSOA Interoperability Demo. n.d. http://mil-embedded.com/articles/multivendor-interoperability-is-real-the-tsoa-interoperability-demo/;
2. PCIe/104. n.d. https://pc104.org/hardware-specifications/pcie104/;
3. Ripley, Bill and Wayne McGee. VNX: Extending VPX into small form factor systems. n.d. http://vita.mil-embedded.com/articles/vnx-form-factor-systems/;
4. Smart Mobility ARChitecture (SMARC). n.d. https://sget.org/standards/smarc/

KEYWORDS: C5ISR/EW Modular Open Suite of Standards (CMOSS), Sensor Open Systems Architecture (SOSA), Hardware Open Systems Technologies (HOST), Modular Open Systems Approach (MOSA)

VERSION 2

A21-113 TITLE: Ionization Sources for Direct Real-Time Trace Vapor and Aerosol Characterization in Conjunction with a Man-Portable Mass Spectrometer

OUSD (R&E) MODERNIZATION PRIORITY: Biotechnology

TECHNOLOGY AREA(S): Chem Bio Defense

OBJECTIVE: To develop an atmospheric sampler and ion source for attachment to a mass spectrometer. The portable sampler will efficiently ionize atmospheric threats that are biological and chemical in nature.

DESCRIPTION: It is vital to continue the development of a small compact mass spectrometer equipped with an ion source which could be employed for use in chemical and biological defense (CBD) for the direct analysis of vapor and aerosols in near real time. The main goal is to develop an 'air-breathing' ionization source for an existing and ideally commercially available portable instrument. Portable instruments should be compact (<2.5ft3), under <60 lbs, and able to run on batteries and/or 120V AC. The current state of the art largely involves the use of some form of pre-concentration, akin to sorbent tubes, which is then desorbed by flash heating or using a solvent system thereby introducing the sample into the mass spectrometer for analysis and identification. Although pre-concentration strategies are not excluded from this topic, proposers should keep in mind that analysis should be as close to near real-time as possible (e.g. <10 secs). There are a large number of ionization strategies that could be utilized with an 'air-breathing' source; however, proposed efforts should be beyond a basic research effort. Designs that require frequent human intervention are not desired.

The goal of this work is to detect volatile organic chemistry (VOCs) that could be linked to the production of harmful threat material such as toxic industrial chemicals (TICS), energetics, chemical warfare agents (CWAs), and pharmaceutical-based agents (PBAs). Careful consideration should be taken to ensure that confounding chemistry (<75Da) does not significant interfere with the analysis process. Tackling this hurdle requires addressing limitations with both the mass analyzer and the ionization technique. These strategies should be clearly addressed in the proposal.

Proposals which can also be used for biodetection (bacteria, virus or toxin) or address how the system may be modified for these applications are highly desirable.

PHASE I: Conduct feasibility studies of different proposed approaches including modelling, simulation, and calculation of collection and ionization components. Further, consider optimization of the components and subsystems, including fluid dynamics of air intakes for efficient aerosol and vapor collection. The source should allow an instrument that can quickly detect, identify, and quantitate a large variety of chemical/biological species with high accuracy, selectivity, and sensitivity to trace amounts of analyte in complex vapor, and/or aerosol forms in situ is of increasing interest. The instrument response should ideally be within seconds (i.e., in real- time) of exposure to the analyte. The signal of interest should be distinguishable from complex chemical backgrounds (e.g., atmosphere air sampling, vehicle exhaust, smoke, and out-gassing materials) and detectable under varying environmental conditions (e.g., rural/urban settings, range of humidity, and temperature fluctuations).

In preparation for Phase II, transfer functional prototype to CCDC CBC for independent benchtop verification and validation. Training of Government personnel will be provided by the performer in the proper use of the prototype. Performer will offer test support including addressing technical issues.

PHASE II: Investigate use of concentrators and other venturi effects to reduce background signal further. Perform two optimizations: (1) towards targets 250 m/z and below, (2) towards targets 250 m/z to high

end mass range of instrument. This will allow for specific deployments to be utilized. Investigate split flow, ion funnels, and other means of efficient ion transmission to preserve ions as pressure is reduced. In preparation for Phase III, transfer functional prototype to CCDC CBC for independent benchtop verification and validation. Training of Government personnel will be provided by the performer in the proper use of the prototype. Performer will offer test support including addressing technical issues.

PHASE III DUAL USE APPLICATIONS: Fully integrate solution into a full-scale, fully-functional prototype. Demonstrate ability of the technology to be incorporated into an end user system. Expand applications to other commercial detectors.

Transfer fully-functional prototype to CCDC CBC for independent verification. Training of Government personnel will be provided by the performer in the proper use of the prototype. Performer will offer test support including addressing technical issues.

REFERENCES:

1. Y. Hashimoto, H. Nagano, et al., Real-time explosives particle detection using a cyclone particle concentrator. Rapid Commun. Mass Spectrom. 28: 1376, 2014;
2. Y. Takada, H. Nagano, et al., High-throughput walkthrough detection portal for counter terrorism: Detection of triacetone triperoxide (TATP) vapor by atmospheric-pressure chemical ionization ion trap mass spectrometry. Rapid Commun. Mass Spectrom. 25: 2448–2452, 2011;
3. S. Kumano, M. Sugiyama, et al. Development of a portable mass spectrometer characterized by discontinuous sample gas introduction, a low-pressure dielectric barrier discharge ionization source, and a vacuumed headspace technique. Anal. Chem. 85: 5033–5039, 2013;
4. R. G. Ewing, D. A. Atkinson, et al., Direct real-time detection of RDX vapors under ambient conditions. Anal. Chem. 85: 389–397, 2013;
5. W.E. Steiner, S.J. Klopsch, W.A. English, et al., Detection of a chemical warfare agent simulant in various aerosol matrixes by ion mobility time-of-flight mass spectrometry, Anal. Chem. 77 (2005) 4792-4799;
6. S.A. McLuckey, D.E. Goeringer, K.G. Asano, et al., High explosives vapor detection by glow dischargeeion trap mass spectrometry, Rapid Commun. Mass Spectrom. 10 (1996) 287-298;
7. J.N. Smith, R.J. Noll, R.G. Cooks, Facility monitoring of chemical warfare agent simulants in air using an automated, field-deployable, miniature mass spectrometer, Rapid Commun. Mass Spectrom. 25 (2011) 1437-1444;
8. Meyer, C.; Müller, E.; Gurevich, E. L.; Franzke, J., Dielectric barrier discharges in analytical chemistry, Analyst 2011, 136, 2427−2440

KEYWORDS: atmospheric sampler, environmental, ionization source, tandem mass spectrometry

VERSION 2

A21-114 TITLE: Novel Processor Architectures for Probabilistic Computing in Survivability Controllers

OUSD (R&E) MODERNIZATION PRIORITY: Artificial Intelligence/Machine Learning

TECHNOLOGY AREA(S): Ground Sea

OBJECTIVE: Identify novel processor architectures as alternatives to the traditional Von Neumann/Harvard/modified Harvard architecture processors for probabilistic computing and develop a low-cost computing platform utilizing probabilistic processor architectures suitable for the Space, Weight and Power (SWaP) and environment constraints of the Army ground vehicle fleet.

DESCRIPTION: Future military ground vehicles, especially those with active defense and survivability components, will have increased automation requiring more and more computing capacity to distill incoming sensor data and rapidly make autonomous decisions in real-time. While traditional processor architectures are very well suited for deterministically processing relatively small data sets in real-time, as the size of the data sets grows, scaling of traditional processors within the constraints of the ground platform SWaP, environment, and cost targets becomes infeasible. The goal of this project is to identify and examine alternative candidate computing solutions for probabilistic data processing and decision making that would be cost-effective and scalable to the growing processing needs of the Army's ground vehicle fleet.

PHASE I: Phase I entails a feasibility study, concept development, theoretical performance analysis, risk analysis, cost analysis and concept design of a probabilistic processor computing platform. The study shall identify candidate processor architecture solutions, describe the pros and cons of each processor architecture, and provide a recommendation for processor selection for the next Phase. The performance analysis shall describe the theoretical worst- and best-case computational throughput and latency for a range of likely scenarios. The risk and cost analysis shall present multiple options that may reduce risk or cost or provide additional capabilities or performance. The concept design shall provide a detailed technical description of how the recommended processor technology can be integrated into a test bed for performance evaluation.

Expected Deliverables:
1) Analytical report (performance, risk, cost) with conclusions and recommendations
2) Design concept report for the recommended solution

PHASE II: Phase II of this effort shall focus on developing a prototype test bed based on the technology described in Phase I with various risk and cost options selected in consultation with the government POC. The contractor shall develop a prototype test bed to assess the actual performance of the selected processor solution under a range of likely scenarios and computational loads as compared to the theoretical performance documented in Phase I. The causes of any discrepancies between actual and theoretical performance shall be determined and possible solutions shall be identified.

Expected Deliverables:
1) Prototype hardware and software
2) Technical Data Package (includes hardware designs, drawings, schematics; software source code and documentation)
3) Test Report

PHASE III DUAL USE APPLICATIONS: In the final Phase of the project, the contractor shall mature

the test bed developed in Phase II, into a final product form factor (embedded processor card, board, or box) and integrate and test the solution with other devices in a vehicle platform and demonstrate a path to commercialization. A solution that has wide appeal and relevance to other fields is preferred. The proposed processor computing platform solution will have applicability to facilitate intelligent decision making for survivability, lethality, and mobility missions for ground vehicle platforms in military applications. The commercial utility of this technology applies to autonomous driving assistance capabilities in consumer and commercial vehicle fleets.

REFERENCES:

1. Neuromorphic Computing https://www.intel.com/content/www/us/en/research/neuromorphic-computing.html;
2. Edge TPU https://cloud.google.com/edge-tpu;
3. Ultra-Fast Data-Mining Hardware Architecture Based on Stochastic Computing https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4425430/;
4. Jetson AGX Xavier https://www.nvidia.com/en-us/autonomous-machines/embedded-systems/jetson-agx-xavier/;
5. Intelligence Processing Unit https://www.graphcore.ai/products/ipu

KEYWORDS: Novel processor, computer architecture, probabilistic computing, neuromorphic, artificial intelligence, machine learning

VERSION 2

A21-115 TITLE: Vehicle Cybersecurity, Hacking, and Electronic Control Unit (ECU) Simulator

OUSD (R&E) MODERNIZATION PRIORITY: Cybersecurity

TECHNOLOGY AREA(S): Ground Sea, Information Systems, Electronics, Sensors

OBJECTIVE: Develop physics-based modeling and simulation of vehicle components and electronics, including virtual emulation of controllers and other devices, for conducting cybersecurity assessments and vulnerability research.

DESCRIPTION: In order to mitigate the risk of cybersecurity incidents and their likelihood of occurring it is important to continually perform cybersecurity assessments and vulnerability research on Army vehicles. One objective in performing these kinds of cybersecurity evaluations is searching for vulnerabilities in both hardware and software, as they can significantly impact a vehicle system's cyber resiliency (i.e. the ability to withstand a cyber-attack and recover). However, the tools, techniques, and technologies currently utilized in performing these tasks are insufficient and generate substantial risks, costs, and schedule impacts. Many of the issues related to these testing methods can be attributed to their reliance on physical hardware. Accordingly, a solution that develops vehicle cybersecurity simulation technologies will reduce many of the hardware dependencies seen in evaluating a vehicle system during all phases of its lifecycle. Advanced cybersecurity simulators will also have the added benefit of reducing barriers to entry such as high starting costs and the degree of expertise needed for conducting evaluations. To currently minimize hardware dependency, cybersecurity researchers and engineers are able to evaluate systems by utilizing Hardware-in-the-Loop (HIL) and Software-in-the-Loop (SIL) simulators before performing evaluations on physical vehicles. These simulators are capable of emulating hardware and software components, but have their own drawbacks that can diminish their effectiveness in minimizing hardware dependency. For instance, SIL simulators are designed to run code on simulated hardware representations, based on high-level hardware functions. As such, they are ineffective in simulating hardware and may not provide completely accurate results in software simulations. HIL simulators on the other hand validate the performance and functionality of controllers and other electronic devices, but don't provide many capabilities in performing cybersecurity evaluations. Although HIL simulators emulate simple electronics such as sensors and actuators, they generally do not emulate more complex ones and instead require a physical component to interface with. These drawbacks require extensive evaluations to be performed on physical hardware instead.

Many evaluations can be performed in a lab environment using a hardware workstation. This workstation is typically referred to as a test bench setup and incorporates all of the connectors, controllers, and other electronic devices from a vehicle platform. Evidently, this method also has drawbacks with cost and schedule burdens. Firstly, setups lack flexibility, requiring that each platform variant or vehicle model have its own uniquely tailored test bench. Their cumbersome size and lack of portability alone creates logistical burdens in acquiring, transporting, and storing existing setups. All of these issues are reflected in cost and schedule impacts and can multiply for each piece of hardware if there's a need to build a setup from the ground up.

To address the capability gaps in performing cybersecurity assessments and vulnerability research, advanced simulation technologies would primarily need to be able to: emulate any and all kinds of controllers or other electronic devices with physics-based modeling and simulation, even down at the component level (e.g. transistors, resistors, capacitors, etc.), and conduct cybersecurity testing for exploits and vulnerabilities to provide additional utility to cybersecurity researchers and engineers. Notably, simulation tools and illustrative visuals can enable non-cybersecurity professionals to better understand cyber resiliency and critical vulnerabilities throughout a component's lifecycle, promoting more secure

and safer vehicles for both the automotive industry and the Army.

PHASE I: Determine technical feasibility for a software-based solution to simultaneously emulate many vehicle ECUs and other electronics devices of varying complexity (e.g. number of transistors, I/Os, and registers, size of memory, dimensions, etc.). Additionally, the solution should outline the capability of emulating software and firmware for these virtualized controllers and devices. Hardware will be virtualized using physics-based modeling and simulation in order to enable the capability of testing for cyber-attacks that utilize the electromagnetic spectrum and other electrical properties, likely drawing on concepts from electromagnetic simulation technology. Inherently, functionality testing evaluates that a system does what it should while cybersecurity testing evaluates that a system does not do more than it should. This is an important consideration for minimizing the attack surfaces of vehicle systems. As such, the solution should also have the inherent capability of testing for known and unknown functionalities in simulated systems.

Design a concept for the solution with open architecture or open-source principles in mind. This flexibility will enable 3rd-party developed systems and components to be seamlessly integrated into the simulator to facilitate and improve various cybersecurity evaluations. Possible use cases include: cybersecurity researchers and engineers uploading tools and reproducible cyber-attacks for conducting cybersecurity assessments and vulnerability research, and Original Equipment Manufacturers (OEMs) uploading their own proprietary controllers and devices in order to conduct cybersecurity evaluations throughout the product development lifecycle. The solution will also outline a common test architecture for integrating known attack scenarios, exploits, and vulnerability scans into the simulator. A common test architecture will improve turnaround times when evaluating system cyber-resiliency against newly discovered vulnerabilities and exploits.

PHASE II: Develop the solution to achieve the capabilities outlined in Phase I. Demonstrate that the solution meets the first major milestone of emulating a target ECU, such as a MIL-PRF-32565 Li-ion 6T Battery Management System, and validate the performance against a HIL simulator using the physical ECU. Demonstrate that the solution meets the second major milestone of simulating all hardware-based and software-based systems for a target military platform, such as the Stryker or Joint Light Tactical Vehicle (JLTV).

Develop a default library of prevalent hacks, exploits, and cyber-attacks for the simulator. Due to some attacks occurring over a long period of time, the solution must also be capable of simulating systems at different points in time. Many different kinds of cybersecurity evaluations can be performed during a session simulating vehicle systems. The results of a session should be recorded or inserted in a report produced by the simulator to easily document or share the findings of cybersecurity evaluations. Sessions should provide metrics on the cyber resiliency of evaluated systems, the details of any vulnerabilities and their severity, the consequences of exploits, and other system information. The solution will demonstrate the capability of generating physics-based models of controllers and devices from preexisting files and schematics such as transistor diagrams and CAD drawings. An intuitive method of generating models for simulation is necessary for efficiently reevaluating systems after design modifications are made to improve functionality or mitigate existing vulnerabilities. These capabilities will also support the efforts of engineers and developers in evaluating their systems without extensive backgrounds in cybersecurity. Deliverables should include a prototype of the software-based solution and source-code, simulator tools for fuzzing, glitching, and reproducible cyber-attacks, and reports and demonstrations assessing the full capabilities of the solution.

PHASE III DUAL USE APPLICATIONS: Expand the capabilities of the solution to simulate different environments and conditions to better reflect the operating environments of Army vehicles. The solution

should ultimately be able to conduct cybersecurity evaluations against side-channel and sensor attacks, normally only possible to conduct on physical hardware due to the intricacies and physical properties involved in electronics and the electromagnetic spectrum. For instance, a side-channel attack is designed to pull critical data from electronics through the analysis of hardware power consumption or leaked electromagnetic waves. Physics-based modeling and simulation is necessary in order to emulate these attack scenarios and ultimately reduce hardware dependency for conducting cybersecurity evaluations. Through a combination of sophisticated algorithms and automation, tests could be conducted simultaneously on any number of components, including ports, connections, wires, chips, and devices. Generally, this task is made difficult for even a team of evaluators to perform due to the amount of factors at hand. This simulator would also need to be able to provide developers and engineers, who aren't versed in cybersecurity, the means to evaluate their software and hardware designs against ever expanding libraries of prefabricated cyber-attacks. User training and instructions should be developed to properly utilize this vehicle cybersecurity simulation software. These capabilities would promote the creation of more cyber-resilient systems throughout automotive and defense industries. Automotive companies could easily integrate this simulation technology into their processes for determining the cyber resiliency of their systems. Since tacking on cybersecurity measures becomes more expensive later on in the product development lifecycle, automotive companies could go as far as to require that their suppliers also utilize this solution to perform cybersecurity evaluations early on in development. Likewise, Army components such as Project Managers (PMs) can also implement similar requirements for defense contractors. Due to the flexibility of the solution, similar applications will be displayed in other fields with cyber-physical systems such as in aerospace and industrial control systems.

REFERENCES:

1. "Cybersecurity and Secure Deployments: Creating Effective Security with Simulation Technology" https://www.windriver.com/whitepapers/security/cybersecurity-and-secure-deployments/;
2. "Hacking the CAN Bus: Basic Manipulation of a Modern Automobile Through CAN Bus Reverse Engineering" https://www.sans.org/reading-room/whitepapers/awareness/hacking-bus-basic-manipulation-modern-automobile-through-bus-reverse-engineering-37825;
3. "Automobile CAN Bus Network Security and Vulnerabilities" https://canvas.uw.edu/files/47669787/download?download_frd=1;
4. "Side-Channel Vulnerabilities of Automobiles" http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.680.3844&rep=rep1&type=pdf;
5. "Hardware-in-the-Loop (HIL)" https://www.ni.com/en-us/innovations/automotive/hardware-in-the-loop.html

KEYWORDS: HARDWARE IN THE LOOP, BUS NETWORKS, GROUND VEHICLES, CYBERATTACKS, CYBER-PHYSICAL SYSTEMS, CYBERSECURITY, VULNERABILITY SCANNERS, COMPUTER SIMULATIONS, ELECTROMAGNETIC FIELDS, ELECTRONICS

VERSION 2

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

IMPORTANT

- **The following instructions apply to SBIR topics only:**
  - **N213-140 through N213-142**
- **The information provided in the DON Proposal Submission Instructions 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 SUBMISSION CONSIDERATIONS.**
- Phase I Technical Volume (Volume 2) and Supporting Documents (Volume 5) templates, specific to DON topics, are available at 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.

INTRODUCTION

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 on DON's mission can be found on the DON website at www.navy.mil.

The Director of the DON SBIR/STTR Programs is Mr. Robert Smith. For questions regarding this BAA, use the information in Table 1 to determine who to contact for what types of questions.

TABLE 1: POINTS OF CONTACT FOR QUESTIONS REGARDING THIS BAA

Type of Question	When	Contact Information
Program and administrative	Always	Program Managers list in Table 2 (below)
Topic-specific technical questions	BAA Pre-release	Technical Point of Contact (TPOC) listed in each topic. Refer to the Proposal Fundamentals section of the DoD SBIR/STTR Program BAA for details.
	BAA Open	DoD SBIR/STTR Topic Q&A platform (https://www.dodsbirsttr.mil/submissions)

		Refer to the Proposal Fundamentals section of the DoD SBIR/STTR Program BAA for details.
Electronic submission to the DoD SBIR/STTR Innovation Portal (DSIP)	Always	DoD Help Desk via email at dodsbirsupport@reisystems.com
Navy-specific BAA instructions and forms	Always	Navy-sbir-sttr.fct@navy.mil

TABLE 2: DON SYSTEMS COMMANDS (SYSCOM) SBIR PROGRAM MANAGERS

Topic Numbers	Point of Contact	SYSCOM	Email
N213-140	Mr. Timothy Petro	Naval Facilities Engineering Center (NAVFAC)	timothy.petro@navy.mil
N213-141 and N213-142	Mr. Shadi Azoum	Naval Information Warfare Systems Command (NAVWAR)	shadi.azoum@navy.mil

PHASE I SUBMISSION INSTRUCTIONS

The following section details what is required for a Phase I proposal submission to the DoD SBIR/STTR Programs.

(NOTE: Proposers are advised that support contract personnel will be used to carry out 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.)

DoD SBIR/STTR Innovation Portal (DSIP). Proposers are required to submit proposals via the DoD SBIR/STTR Innovation Portal (DSIP); follow proposal submission instructions in the DoD SBIR/STTR Program BAA on the DSIP at https://www.dodsbirsttr.mil/submissions. Proposals submitted by any other means will be disregarded. Proposers submitting through DSIP 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. Proposals that are not successfully certified electronically in DSIP by the Corporate Official prior to BAA Close will NOT be considered submitted and will not be evaluated by DON. Please refer to the DoD SBIR/STTR Program BAA for further information.

Proposal Volumes. The following six volumes are required.

- **Proposal Cover Sheet (Volume 1).** As specified in DoD SBIR/STTR Program BAA.

- **Technical Proposal (Volume 2)**
  - Technical Proposal (Volume 2) must meet the following requirements or it will be REJECTED:
    - 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. Phase I Options are exercised upon selection for Phase II.
- Phase I Base Period of Performance must be exactly six (6) months.
- Phase I Option Period of Performance must be exactly six (6) months.

- Additional information:
  - It is highly recommended that proposers use the Phase I proposal template, specific to DON topics, at https://navysbir.com/links_forms.htm to meet Phase I Technical Volume (Volume 2) requirements.
  - A font size smaller than 10-point is allowable for headers, footers, imbedded tables, figures, images, or graphics that include text. However, proposers are cautioned that if the text is too small to be legible it will not be evaluated.

- **Cost Volume (Volume 3).**
  - Cost Volume (Volume 3) must meet the following requirements or it will be REJECTED:
    - The Phase I Base amount must not exceed $140,000.
    - 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.
  - Additional information:
    - Provide sufficient detail for subcontractor, material, and travel costs. 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.
    - Inclusion of cost estimates for travel to the sponsoring SYSCOM's facility for one day of meetings is recommended for all proposals.
    - The "Additional Cost Information" of Supporting Documents (Volume 5) may be used to provide supporting cost details for Volume 3. 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).

- **Company Commercialization Report (Volume 4)**. DoD collects and uses Volume 4 and DSIP requires Volume 4 for proposal submission. Please refer to the Phase I Proposal section of the DoD SBIR/STTR Program BAA for details to ensure compliance with DSIP Volume 4 requirements.

- **Supporting Documents (Volume 5).** Volume 5 is for the submission of administrative material that DON may or will require to process a proposal, if selected, for contract award.
  All proposers must review and submit the following items, as applicable:
  - **Telecommunications Equipment Certification.** Required for all proposers. The DoD must comply with Section 889(a)(1)(B) of the FY2019 National Defense Authorization Act (NDAA) and is working to reduce or eliminate contracts, or extending or renewing a contract with an entity that uses any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As such, all proposers must include as a part of their submission a written certification in response to the clauses (DFAR clauses 252.204-7016, 252.204-7018, and subpart 204.21). The written certification can

be found in Attachment 1 of the DoD SBIR/STTR Program BAA. This certification must be signed by the authorized company representative and is to be uploaded as a separate PDF file in Volume 5. Failure to submit the required certification as a part of the proposal submission process will be cause for rejection of the proposal submission without evaluation. Please refer to the instructions provided in the Phase I Proposal section of the DoD SBIR/STTR Program BAA.

- **Disclosure of Offeror's Ownership or Control by a Foreign Government.** All proposers must review to determine applicability. In accordance with DFARS provision 252.209-7002, a proposer is required to disclose any interest a foreign government has in the proposer when that interest constitutes control by foreign government. All proposers must review the Foreign Ownership or Control Disclosure information to determine applicability. If applicable, an authorized firm representative must complete the Disclosure of Offeror's Ownership or Control by a Foreign Government (found in Attachment 2 of the DoD SBIR/STTR Program BAA) and upload as a separate PDF file in Volume 5. Please refer to instructions provided in the Phase I Proposal section of the DoD SBIR/STTR Program BAA.
- **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. Complete certification as detailed under ADDITIONAL SUBMISSION CONSIDERATIONS.

- Additional information:
  - Proposers may include the following administrative materials in Supporting Documents (Volume 5); a template is available at https://navysbir.com/links_forms.htm to provide guidance on optional material the proposer may want to include in Volume 5:
    - Additional Cost Information to support the Cost Volume (Volume 3)
    - SBIR/STTR Funding Agreement Certification
    - Data Rights Assertion
    - 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
  - Do not include documents or information to substantiate the Technical Volume (Volume 2) (e.g., resumes, test data, technical reports, or publications). Such documents or information will not be considered.
  - 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 requires Volume 6 for submission. Please refer to the Phase I Proposal section of the DoD SBIR/STTR Program BAA for details.

PHASE I EVALUATION AND SELECTION

The following section details how the DON SBIR/STTR Programs will evaluate Phase I proposals.

Proposals meeting DoD SBIR/STTR submission requirements will be forwarded to the DON SBIR/STTR Programs. Upon receipt, all proposals will undergo a compliance review to verify compliance with DoD

and DON SBIR/STTR submission requirements. Proposals not meeting submission requirements will be REJECTED and not evaluated.

- **Proposal Cover Sheet (Volume 1).** Not evaluated. The Cover Sheet (Volume 1) will undergo a compliance review to verify the proposer has met eligibility requirements.

- **Technical Volume (Volume 2).** The DON will evaluate and select Phase I proposals using the evaluation criteria specified in the Phase I Proposal Evaluation Criteria section of the DoD SBIR/STTR Program BAA, with technical merit being most important, followed by qualifications of key personnel and commercialization potential of equal importance. "Best value" is defined as approaches containing innovative technology solutions to the Navy's technical challenges for meeting its mission needs as reflected in the SBIR/STTR topics. This is not a FAR Part 15 evaluation and proposals will not be compared to one another. Cost is not an evaluation criteria and will not be considered during the evaluation process. Due to limited funding, the DON reserves the right to limit the number of awards under any topic.

  The Technical Volume (Volume 2) will undergo a compliance review to verify the proposer has met the following requirements or it will be REJECTED:
  - 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, except as permitted in the instructions above.
  - 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.
  - Phase I Base Period of Performance must be exactly six (6) months.
  - Phase I Option Period of Performance must be exactly six (6) months.

- **Cost Volume (Volume 3).** Not evaluated. The Cost Volume (Volume 3) will undergo a compliance review to verify the proposer has complied with not to exceed values for the Base ($140,000) and Option ($100,000). Proposals exceeding either the Base or Option not to exceed values will be REJECTED without further consideration.

- **Company Commercialization Report (Volume 4).** Not evaluated.

- **Supporting Documents (Volume 5).** Not evaluated. Supporting Documents (Volume 5) will undergo a compliance review to ensure the proposer has included items in accordance with the PHASE I SUBMISSION INSTRUCTIONS section above.

- **Fraud, Waste, and Abuse Training Certificate (Volume 6).** Not evaluated.

ADDITIONAL SUBMISSION CONSIDERATIONS

This section details additional items for proposers to consider during proposal preparation and submission process.

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 by the proposer 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. A TABA Report, detailing the results and benefits of the service received, will be required annually by October 30.

Request for TABA funding will be reviewed by the DON SBIR/STTR Program Office.

If the TABA request does not include the following items the TABA request will be denied.

- 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 proposer
- Propose a TABA provider that is the SBIR proposer
- Propose a TABA provider that is an affiliate of the SBIR proposer
- Propose a TABA provider that is an investor of the SBIR proposer
- 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 requests must be included in the proposal as follows:

- Phase I:
  - Online DoD Cost Volume (Volume 3) – the value of the TABA request.
  - Supporting Documents Volume (Volume 5) – a detailed request for TABA (as specified above) specifically identified as “Discretionary Technical and Business Assistance” in the section titled Additional Cost Information.
- Phase II:
  - DON Phase II Cost Volume (provided by the DON SYSCOM) - the value of the TABA request.
  - Supporting Documents (Volume 5) – a detailed request for TABA (as specified above) specifically identified as “Discretionary Technical and Business Assistance” in the section titled Additional Cost Information.

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

VERSION 2

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 Phase II 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.

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 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 (defined by National Security Decision Directive 189). A firm whose proposed work will include fundamental research and requests to eliminate the requirement for prior approval of public disclosure of information must complete the DON Fundamental Research Disclosure and upload it to the Supporting Documents (Volume 5) as part of their proposal submission. The DON Fundamental Research Disclosure is available on https://navysbir.com/links_forms.htm and includes instructions on how to complete and upload the completed Disclosure. Simply identifying fundamental research in the Disclosure does **NOT** constitute acceptance of the exclusion. All exclusions will be reviewed and, if approved by the government Contracting Officer, noted in the contract.

Majority Ownership in Part. 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 as set forth in 13 C.F.R. § 121.702, **are eligible** to submit proposals in response to DON topics advertised within this BAA.

For proposers that are a member of this ownership class the following must be satisfied for proposals to be accepted and evaluated:

a. Prior to submitting a proposal, firms must register with the SBA Company Registry Database.
b. The proposer within its submission must submit the Majority-Owned VCOC, HF, and PEF Certification. A copy of the SBIR VC Certification can be found on https://navysbir.com/links_forms.htm. Include the SBIR VC Certification in the Supporting Documents (Volume 5).
c. Should a proposer become a member of this ownership class after submitting its proposal 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.

System for Award Management (SAM). It is strongly encouraged that proposers register in SAM, https://sam.gov, by the Close date of this BAA, or verify their registrations are still active and will not expire within 60 days of BAA Close. Additionally, proposers should confirm that they are registered to receive contracts (not just grants) and the address in SAM matches the address on the proposal.

Notice of NIST SP 800-171 Assessment Database Requirement. The purpose of the National Institute of

Standards and Technology (NIST) Special Publication (SP) 800-171 is to protect Controlled Unclassified Information (CUI) in Nonfederal Systems and Organizations. As prescribed by DFARS 252.204-7019, in order to be considered for award, a firm is required to implement NIST SP 800-171 and shall have a current assessment uploaded to the Supplier Performance Risk System (SPRS) which provides storage and retrieval capabilities for this assessment. The platform Procurement Integrated Enterprise Environment (PIEE) will be used for secure login and verification to access SPRS. For brief instructions on NIST SP 800-171 assessment, SPRS, and PIEE please visit https://www.sprs.csd.disa.mil/nistsp.htm. For in-depth tutorials on these items please visit https://www.sprs.csd.disa.mil/webtrain.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: https://www.onr.navy.mil/work-with-us/how-to-apply/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 technical merit of 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).

SELECTION, AWARD, AND POST-AWARD INFORMATION

Notifications. Email notifications for proposal receipt (approximately one week after the Phase I BAA Close) and selection are sent based on the information received on the proposal Cover Sheet (Volume 1). Consequently, the e-mail address on the proposal Cover Sheet must be correct.

Debriefs. 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. 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 2. If the protest is to be filed with the GAO, please refer to instructions provided in the Proposal Fundamentals section 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 the Proposal Fundamentals section of the DoD SBIR/STTR Program BAA.

Awards. Due to limited funding, the DON reserves the right to limit the number of awards under any topic. Any notification received from the DON that indicates the proposal has been selected does not ultimately guarantee an award will be made. This notification indicates that the proposal has been selected in accordance with the evaluation criteria and has been sent to the Contracting Officer to conduct cost analysis, confirm eligibility of proposer, and to take other relevant steps necessary prior to making an award.

Contract Types. 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 the section of the DoD SBIR/STTR Program BAA titled Proposal Fundamentals, 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.

Contract Deliverables. Contract deliverables for Phase I are typically a kick-off brief, progress reports, and a final report. Required contract deliverables (as stated in the contract) must be uploaded to https://www.navysbirprogram.com/navydeliverables/.

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

VERSION 2

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.

PHASE II GUIDELINES

Evaluation and Selection. All Phase I awardees may submit an **Initial** Phase II proposal for evaluation and selection. The evaluation criteria for Phase II is the same as Phase I. 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 BAAs prior to FY13 will be conducted in accordance with the procedures specified in those BAAs (for all DON topics, this means by invitation only).

Awards. 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. Consequently, DON will assign SBIR/STTR Data Rights to any noncommercial technical data and noncommercial computer software delivered in Phase III that were developed under SBIR/STTR Phase I/II effort(s). Government prime contractors and 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.

VERSION 2

NAVY SBIR 21.3 Phase I Topic Index

VERSION 2

N213-140 TITLE: Automated Pier Battle Damage Assessment from 3D Scanned Data

OUSD (R&E) MODERNIZATION PRIORITY: Artificial Intelligence (AI)/Machine Learning (ML); Autonomy

TECHNOLOGY AREA(S): Information Systems; Materials / Processes; Sensors

OBJECTIVE: Enable an automated pier repair planning tool with the inputs from remote sensing-captured infrastructure data such as three-dimensional (3D) point-cloud, Simultaneous Localization and Mapping (SLAM) technologies, photogrammetry, and Structure from Motion (SfM), and the outputs being Battle Damage Assessment (BDA) Rough Order of Magnitude (ROM) for repair type, enabling material quantities, and estimated repair times.

DESCRIPTION: Currently, when Port Damage Repair (PDR) efforts are conducted for piers or wharves, geo-referenced 3D point-cloud data for a structure is gathered via LiDAR (for the above water structure) and multi-beam sonar (for the underwater structure). However, presently, all key details of the scanned data are manually entered into a spreadsheet-based tool, known as the Pier Reconnaissance Assessment Tool (PRAT), for facility repair planning and detailed repair instructions. This manual data entry is a laborious human-in-the-loop bottleneck and is an opportunity for significant PDR improvement. Therefore, automating the conversion of structural 3D scan data into actionable tabular gross-defects and BDA are the key focus of this SBIR topic. The methods employed to achieve this end are believed to have commercial value.

This SBIR topic seeks to prototype the automation of gross-defect and battle damage detection (from structure scan 3D point-clouds, SLAM technologies, photogrammetry, and SfM data types), defect identification, defect volume approximation, defect location, and defect tabular summation. This SBIR topic must enable future tabulation of ROM for repair material quantities, and ROM for approximated repair times. All ROM estimates may be nominally approximated from conventional construction, as some military-specific solutions are still in development and such military-specific information is considered out of scope for proposers to this SBIR topic. Common pier construction types to be considered include cast reinforced concrete, pre-stressed concrete, steel, and timber construction (listed in the order of importance, with emphasis on cast reinforced concrete construction). In addition to the concrete, steel, or timber sub-structure or base-structure concerns, the facilities' fender (bumper) system and mooring hardware (cleats and bollards) shall also be addressed.

This SBIR topic does not address generation of repair instruction, plans, specifications, etc., as the actual repair methods may or may not be of a conventional construction method.
Current methods for converting 3D point-cloud data into Building Information Modeling (BIM), or for inventorying of scanned city streets, as applied to waterfront structures fall short since they rely on libraries of standardized pre-modelled mechanical components. However, with the construction of piers and wharves, while there are common construction techniques and configurations per material type, there is notable variability within even a single structure, i.e., piers are not built with uniformity, precision, or accuracy (particularly in regard to pile placement and angle, pile-cap dimensions, cast deck features, etc.). Therefore, innovation is needed to post-process 3D scan data, delivering volumetric construction details and patterns on the existing and missing component(s), while allowing for original structural variability (i.e., variability is not a gross defect or battle damage).

Also, current methods for defect detection/location rely on change-detection between two vintages of data. However, in the subject case, the user is assumed to not have access to pre-event scan data. Therefore, gross-defect and BDA will need to rely on things such as in-situ pattern recognition/missing-pattern detection within a +/- 12 inch grid precision, and +/- 6 inch feature/component (e.g., pile, pile cap,

etc.) dimensional precision (statistical pattern configuration [i.e., change-detection strategy] from undamaged portions of structure), innovations in artificial intelligence (AI)/machine learning (ML), a convenient user interface for identification, or other diverse BDA techniques. Increases in the level of required human interaction for this step will proportionally lower the overall satisfaction in the resulting solutions(s).

It is desired to reduce the time (or labor equivalent) required between obtaining of scan data to the completion of the BDA tabular data entry by a factor of between half (satisfactory) and three quarters (excellent) reduction.

This SBIR topic seeks solutions that will work equally well for structure scan data sets from either (listed in order of preference): 1.) 3D point-clouds, 2.) SLAM technologies, 3.) Photogrammetry, and 4.) SfM technologies. Proposed solutions that do not address all these listed technologies will receive proportionally less consideration. Emphasis for this SBIR topic is currently placed on, however not limited to, 3D point-cloud data.

This SBIR topic seeks solutions which can be executed in the field, without reliable Wi-Fi connectivity; therefore, are not cloud-based or require high computing capability. This topic also seeks solutions that utilize open standard data interfaces and enables interoperability between IT systems.

Once the gross defects and BDA are tabulated, with ROM repair volumes and times summarized, the requirements of this topic will be satisfied.

PHASE I: Determine the technical feasibility of automating the conversion of structural 3D scan data into actionable tabular-based gross-defects and BDA. Within this requirement, separately determine the technical feasibility of:

a) Post-processing 3D scan data, delivering volumetric detail and construction patterns on the existing and potentially missing component(s), while allowing for constructed variability.

b) Determining BDA from in-situ pattern recognition, missing pattern detection (i.e., 3D statistically-based pattern-detection/change-detection based on undamaged portions of a variably-constructed structure), innovations in AI/ML, a field user interface for identification, or other diverse BDA techniques.

c) Reducing by half or three quarters the time (or labor equivalent) between obtaining scan data through to the completion of the BDA tabular data entry. For proposal purposes, assume a concrete-constructed pier approximately 100 ft. wide x 1,000 ft. long x 5 ft. of average under-deck clearance, with 100 bents and 20 piles per bent (i.e., 20 rows of piles); assume that a three person BDA assessment team will require two days (equivalent to 48 labor hours) to assess.

d) The solution's likelihood to work with 3D point-clouds, SLAM technologies, photogrammetry, and SfM data types, in a communications degraded or communications denied environment (i.e., local connectivity possible, global/networked connectivity not).

Note: Beginning with commercial off-the-shelf (COTS) options is acceptable in Phase I. Limited proof of concept for custom integration is also acceptable in Phase I, but is not required.

PHASE II: Develop a prototype of custom solutions or integration that enables post-processing of 3D scan data of an idealized structure(s) and idealized damage scenario(s). Deliver a tabular summary of volumetric detail, location, and affected structural components (down to NAVFAC Design-Build RFP Structure [UNIFORMAT-II] component level) for gross-defects and for BDA.

While not required at this point, possible steps for the above might include:

VERSION 2

- Determining or establishing situ/constructed pattern recognition (while allowing for constructed variability), either via pattern recognition methods, AI/ML, field user interface for identification, or other diverse defect identification techniques
- Providing volumetric detail of the structure, down to UNIFORMAT-II component level (see references), i.e., delineate the volume of each pile, pile-cap, beam, deck span, etc.
- Determining or establishing construction pattern for the missing component(s), while allowing for constructed variability.
- Providing volumetric detail of the missing structure component(s), down to UNIFORMAT-II component level, i.e., enabling future ROM repairs and times likely driven by the combination of volume and component location.
- Providing tabular output of volumetric detail, location, and affected structural component for gross-defects and for BDA.

Provide the idealized data(s) for structure(s) and damage scenario(s) of typical port/harbor pier(s) and wharf construction types, and include rubble, debris, and other simulated realistic scenario for the solution to overcome. (Note: Single construction type for reinforced concrete is acceptable for Phase II.)

Provide validation of the following:

- Volumes of constructed element(s)
- Constructed structural pattern (i.e., bent/row grid, or similar)
- Volumes of missing/damaged element(s)
- Identification of missing element(s) from pattern or convenient graphical user interface
- Reductions by half to three quarters for the time (or labor equivalent) between obtaining scan data through to the completion of the BDA tabular data generation
- The solution's likelihood to work with 3D point-clouds, SLAM technologies, photogrammetry, and SfM data types
- Capability to operate in a communications degraded or communications denied environment (i.e., local connectivity possible, global/networked connectivity not)

PHASE III DUAL USE APPLICATIONS: Transition the product within the Government to include field demonstration of the Phase III solution for two actual concrete-constructed piers, where actual gross defects may or may not exist, and where the actual data is edited to simulate battle damage with simulated debris, rubble, and other realistic anomalies.

Revise the tabular formatting of the Phase II solution to fully satisfy employment by the Pier Reconnaissance Assessment Tool (PRAT) process.

Potential dual-use applications include:

1) Government off-the-shelf (GOTS) to U.S. Army Corps of Engineers (USACE), Engineer Research and Development Center (ERDC) for use with the PRAT; whereby Navy Expeditionary Combat Command (NECC) and the Underwater Construction Team (UCT) will employ the solution from within the PRAT.
2) A non-military tool for licensing or selling to major vendor(s) of related computer aided design and modelling tools and software.

REFERENCES:

1. Navy Tactics, Techniques and Procedures NTTP 4-04.2.9 Expedient Underwater Construction and Repair Techniques.
https://www.amazon.com/Reference-Publication-Expedient-Underwater-Construct/dp/1543118259
https://www.goodreads.com/author/show/17316991.United_States_Government_US_Navy

VERSION 2

2. Unified Facilities Criteria (UFC); UFC 4-150-07; MAINTENANCE AND OPERATION: MAINTENANCE OF WATERFRONT FACILITIES.
https://www.cioimpact.com/www/FFC/DOD/UFC/ufc_4_150_07_2001_c1.pdf
3. UFC 4-150-08; INSPECTION OF MOORING HARDWARE.
https://standards.globalspec.com/std/565254/ufc-4-150-08
4. NAVFAC Design-Build RFP Uniformat Structure; UNIFORMAT II / WORK BREAKDOWN STRUCTURE; Section H – Waterfront; see all H1010 through H1040 codes.
https://www.wbdg.org/ffc/navy-navfac/design-build-request-proposal/uniformat-structure
5. ASCE Manuals and Reports on Engineering Practice No. 130; Waterfront Facilities Inspection and Assessment.
https://sp360.asce.org/PersonifyEbusiness/Merchandise/Product-Details/productId/233127082

KEYWORDS: Battle Damage Assessment; BDA; Engineering Survey; Expeditionary Pier Repair; Repair Planning Tool; 3D; Point Cloud Data; Point Cloud Conversion; Simultaneous Localization and Mapping; (SLAM); Photogrammetry; Structure From Motion; Building Information Modeling; BIM

VERSION 2

N213-141 TITLE: Positioning Using Magnetic Anomalies Correlation of Earth (PUMACE)

OUSD (R&E) MODERNIZATION PRIORITY: Networked C3

TECHNOLOGY AREA(S): Sensors

OBJECTIVE: Develop Global Positioning System (GPS)-independent positioning sensors for accurate surface and subsurface vessel positioning that utilizes Earth's magnetic anomalies with an accuracy threshold of at least 30 meters and 15 meters (Objective) and has a Size, Weight and Power (SWaP) of 500 cm3 for the target volume, <5W for power and weight of <15 lbs.

DESCRIPTION: GPS is a highly accurate all-weather source of positioning, velocity, and timing and is invaluable in bounding a ship's inertial navigation system's (INS) error. However, GPS utilizes weak radio frequency (RF) signals from distant satellites and are subjected to intentional and unintentional interference. Navigation based on the Earth's magnetic field promises a more robust all-weather passive navigation with no dependence on new infrastructure.
Magnetic anomaly navigation has been extensively explored and researched, most notably by the Air Force Institute of Technology; however, challenges remain in the availability of precise maps of the Earth's crustal magnetic field. The presence of larger core fields, as well as temporal variations, can further limit the precision of position accuracy. Additionally, locally induced magnetic fields of the ship itself must also be considered in the determination of position. Furthermore, there are limitations to current Geomagnetic Mapping that requires advanced modeling techniques. For example, the International Geomagnetic Reference Field (IGRF) model only accounts for the core field. Crustal field variation sensing could result in accurate positioning; however, because the crustal field is so weak in comparison to core fields, it also requires advanced vector sensors. Current-generation sensors are limited because they are scalar sensors and, therefore, not capable of sensing minute variations of the Earth's crustal field.

Advanced magnetic anomaly sensors can provide reliable and accurate INS aiding. These sensors can also work effectively to bound inertial error by providing re-sets to the INS. Additionally, they can provide a precise, all-weather robust vertical reference to bound INS errors over time. This family of sensors can promise robust positioning using integrated systems that are capable of blending alternate positioning sensor data as a re-set of the INS for continued accurate platform navigation holdover without GPS dependency. In addition to INS aiding, the data can be used as another sensor source for integrity evaluation within the Position, Navigation, and Timing (PNT) suite.

PHASE I: Determine the technical feasibility of using measurements of anomalies in the Earth's magnetic field for accurate Geomagnetic Mapping, as well as the identification of sensors necessary to detect magnetic field anomalies for accurate positioning.

Describe the technical solution based on the investigation and technical trade-offs performed earlier in this phase. Identify the means to incorporate the technical solution into the PNT suite, such as the GPS-based Positioning Navigation and Timing Service (GPNTS).
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 Positioning Using Magnetic Anomalies Correlation of Earth (PUMACE) sensor with positioning solution system for GPNTS and conduct a System Requirements Review (SRR).

VERSION 2

Engage with the Program Office in its introduction and collaboration with Naval Information Warfare Center (NIWC) Pacific engineers. Establish a working relationship with PMW/A 170 and NIWC Pacific engineers to perform integration studies to include the identification of any necessary engineering changes to the GPNTS system. Additionally, establish a working relationship with the engineering team(s) of other potential transition PNT suite target(s).

Develop the prototype PUMACE sensor with positioning solution system for GPNTS for demonstration and validation in the GPNTS or equivalent development environment. Conduct a Preliminary Design Review (PDR) 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 system.

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 GPNTS and other potential transition PNT suite target(s).

PHASE III DUAL USE APPLICATIONS: Refine and fully develop the Phase II EDM to produce a Production Representative Article (PRA) of the PUMACE sensor.

Perform Formal Qualification Tests (FQT) (e.g., field testing, operational assessments) of the PRA PUMACE sensor with the GPNTS system and other potential transition PNT suite target(s).
Provide life-cycle support strategies and concepts for the PUMACE sensor with the GPNTS and other potential transition PNT suite contractor(s) by developing a Life-Cycle Sustainment Plan (LCSP).

Investigate the dual use of the developed technologies for commercial applications, including but not limited to, commercial and privately owned vessels and aircrafts. These sensors can provide an additional method of positioning that is independent of GPS and is available at all times, world-wide.

REFERENCES:

1. “Magnetic-Field Navigation as an 'Alternative' GPS?” Evaluation Engineering, 27 October 2020. https://www.evaluationengineering.com/applications/article/21160035/magneticfield-navigation-as-an-alternative-gps
2. “Magnetic Anomaly.” Wikipedia, the Free Encyclopedia. https://en.wikipedia.org/wiki/Magnetic_anomaly
3. Mount, Lauren A. "Navigation using Vector and Tensor Measurements of the Earth's Magnetic Anomaly Field." (2018). AFIT Scholar Theses and Dissertations. 1817. https://scholar.afit.edu/etd/1817
4. Canciani, Aaron J. "Absolute Positioning using the Earth’s Magnetic Anomaly Field." (2016). AFIT Scholar Theses and Dissertations. 251. https://scholar.afit.edu/etd/251

KEYWORDS: Earth’s Magnetic Fields; Magnetic Sensors; Magnetic Anomalies; GPS-based Positioning, Navigation, and Timing Service; GPNTS; Position, Navigation, and Timing; PNT; Assured Position, Navigation, and Timing; APNT; Positioning; Navigation; Global Positioning System; GPS; Positioning Using Magnetic Anomalies Correlation of Earth; PUMACE

VERSION 2

N213-142 TITLE: Automated High Frequency Communications Planner

OUSD (R&E) MODERNIZATION PRIORITY: Autonomy; Networked C3

TECHNOLOGY AREA(S): Human Systems; Information Systems

OBJECTIVE: Develop a fully automated communications planning tool that will cover the military High Frequency (HF) operational frequencies (2 MHz to 30 MHz) and will support, at a minimum, HF sounding information (e.g., ionospheric analysis and modeling, real-time and forecast ionospheric and propagation conditions) to create frequency plans; monitor and control local and distant radio assets; and utilize open standards for management and control planes.

DESCRIPTION: As various threats to the communications world continue to grow, the Navy must remain vigilant and properly equipped to respond to changes to the threat environment. While Satellite Communications (SATCOM) is the preferred method of communications, if degraded or denied, High Frequency (HF) communications provide a means for the continuity of communications. HF communications via ionospheric reflection is a commonly used technique; unfortunately, HF communications are complex due to the constantly changing ionosphere.
Ionospheric sounding is a technique used to provide real-time ionospheric data that is vital for HF communications. With the addition of forecasted data, it can effectively predict the optimal channels for communications.

The solution, expected to be fully automated, will ingest ionospheric and propagation information to actively and dynamically provide frequency plans; and will provide resilient and reliable communications in the tactical environment, which is key to the successful completion of missions of the U.S. Navy, Joint, and Coalition forces.

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 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: Define the automated HF communications planning tool architecture that will optimize HF channel selection based on real-time ionospheric and propagation information, as well as prediction data; and enable monitoring and control of local and distant radios. Determine the feasibility of the tool architecture.

Develop the SBIR Phase II Project Plan to include a detailed schedule (in Gantt format), spend plan, performance objectives, and transition plan for Battle Force Tactical Network (BFTN) Resilient Command and Control (RC2) System Enhancement (BRSE).

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

Engage with the Program Office in its introduction and collaboration with Naval Information Warfare Center (NIWC) Pacific and Office of Naval Research (ONR) Engineers. Establish a working relationship

with PMW/A 170 and NIWC Pacific engineers to perform initial integration activities and identification/development of any necessary engineering changes to BRSE.

Develop the prototype system for demonstration and validation in BRSE or an equivalent development environment. Conduct a Preliminary Design Review (PDR). Conduct a Critical Design Review (CDR) prior to building the EDM. Commence development of an Engineering Development Model (EDM) system.

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

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 BRSE.

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

PHASE III DUAL USE APPLICATIONS: Refine and fully develop the Phase II EMD to produce a Production Representative Article (PRA) of the system.

Perform Formal Qualification Tests (FQT) (e.g., field testing, operational assessments) of the PRA with BRSE.

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

Investigate the dual use of the developed technologies for commercial applications such as Global Maritime Distress and Safety System (GMDSS) communications or other users that employ maritime sea-to-shore and ship-to-ship services.

REFERENCES:

1. “High Frequency.” Wikipedia, the Free Encyclopedia. https://en.wikipedia.org/wiki/High_frequency
2. “Ionosphere.” Wikipedia, the Free Encyclopedia. https://en.wikipedia.org/wiki/Ionosphere
3. Hervás, Marcos, et al. “Ionospheric Narrowband and Wideband HF Soundings for Communications Purposes: A Review.” PubMed Central (PMC), 28 Apr. 2020. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7273218

KEYWORDS: Battle Force Tactical Network; BFTN; Resilient Command and Control; RC2, BFTN RC2 System Enhancements; BRSE,; High Frequency: HF; Ionosphere; Propagation; Automation

VERSION 2

CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM
FY21.3 Small Business Innovation Research (SBIR)
Proposal Submission Instructions

The approved FY21.3 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.

Please read the entire DoD Announcement and these CBD SBIR instructions carefully prior to submitting your proposal. Also go to https://www.sbir.gov/about/about-sbir#sbir-policy-directive to read the SBIR/STTR Policy Directive issued by the U. S. Small Business Administration (SBA).

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 overall impact of chemical and biological threats. 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 to include wearable technologies.

VERSION 2

Proposals not conforming to the terms of this Announcement will not be considered. CBD SBIR reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality as determined by CBD SBIR will be funded. CBD SBIR reserves the right to withdraw from negotiations at any time prior to contract award. The Government may withdraw from negotiations at any time for any reason to include matters of national security (foreign persons, foreign influence or ownership, or other related issues).

Use of Foreign Nationals (also known as Foreign Persons), Green Card Holders, and Dual Citizens

See the "Foreign Nationals" section of the DoD SBIR Program Announcement for the definition of a Foreign National (also known as Foreign Persons).

ALL offerors proposing to use foreign nationals, green-card holders, or dual citizens, MUST disclose this information regardless of whether the topic is subject to export control restrictions. Identify any foreign nationals 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 the project. You may be asked to provide additional information during contract 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)).

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.

Any questions pertaining to the DoD SBIR/STTR submission system should be directed to the DoD SBIR/STTR Help Desk: DoDSBIRSupport@reisystems.com

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 Company Commercialization Report (CCR) must be uploaded as Volume 4, in accordance with the instructions provided in the DoD Program BAA. Information contained in the CCR will not be considered during proposal evaluations.

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.

The Phase II proposal must include a concise summary of the Phase I project including the specific technical problem or opportunity addressed and its importance, the objective of the Phase I project, the type of research conducted, findings or results of this research, and technical feasibility of the proposed technology. Due to limited funding, the CBD SBIR program reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

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.

VERSION 2

It is recommended that Phase II awardees have a Defense Contract Audit Agency (DCAA) approved accounting system. If you do not have a DCAA approved accounting system, this could delay/prevent a Phase II contract award. Visit https://www.dcaa.mil/Customers/Small-Business for more information on DCAA approved accounting systems.

Technical Assistance

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

Fraud, Waste and Abuse

All offerors must complete the fraud, waste, and abuse training (Volume 6) that is located on the Defense SBIR/STTR Innovation Portal (DSIP) (https://www.dodsbirsttr.mil). Please follow guidance provided on DSIP to complete the required training prior to submitting proposals.

To Report Fraud, Waste, or Abuse, Please Contact:
DoD Inspector General (IG) Fraud, Waste & Abuse
Hotline: (800) 424-9098
hotline@dodig.mil

Additional information on Fraud, Waste and Abuse may be found in the DoD Instructions of this Announcement.

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.

Notification of Selection or Non-selection

Proposing firms will be notified of Selection or Non-selection status for a Phase I award within 90 days of the closing date of the BAA. The individual named as the Corporate Official in addition to the Principal Investigator will be notified using the email addresses provided on the Proposal Cover Sheet. These individuals will receive an email for each proposal submitted with official notification of proposal Selection or Non-selection. The email will originate from: notification@dtrasubmission.net and will be provided by the CBD SBIR Program Manager.

VERSION 2

CBD SBIR 21.3 Phase I Topic Index

CBD213-001	Surface-Enhanced Raman Scattering Substrate Development
CBD213-002	Millimeter Wave Imaging with Metamaterials

VERSION 2

TOPIC: CBD213-001

TITLE: Surface-Enhanced Raman Scattering Substrate Development

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

OBJECTIVE: To develop a metallic surface-enhanced Raman scattering (SERS) substrate to be utilized for augmentation of current/future Raman spectroscopic portable instrumentation for the detection of trace and residual chemical materials. The substrates should consist of nanostructured metals, preferably gold or silver, on a porous or non-porous material backing (such as filter paper, silicon, gallium nitride, etc.), with no less than 3 mm x 3 mm and no larger than 4 x 4 mm active SERS area providing the SERS enhancement, and be useable with minimally 633 nanometer (nm) or 785 nm excitation.

DESCRIPTION: Raman spectroscopy has proven to be a reliable field deployable detection technique for assessing chemical threats, including chemical warfare agents, energetic materials, and illicit narcotics. Military and Homeland Security agencies commonly utilize various portable Raman systems in sensitive site exploitation, checkpoint scenarios, and to determine hazardous content on surfaces or containers. Enhanced Raman techniques, such as surface-enhanced Raman scattering (SERS) have been demonstrated to be a vibrant field of research that is growing significantly in scope and applicability while pushing at the ultimate limits of sensitivity. SERS occurs when nanometallic substrates locally amplify electromagnetic fields at or near particle surfaces providing enhancements over 'normal' Raman spectroscopy, typically over a million-fold. Along with other advantages such as reduction of interfering fluorescence, decreased detection times, and reduction of laser power required for analysis, SERS has been positioned to be an ideal technique for low-level, low-consumable detection schemes, while aiming towards miniaturization of instrumentation.

The problem to date, however, is the lack of commercially available robust SERS active substrates that have an inherent low background signature which ultimately interferes with obtaining clean SERS spectra from low-level concentrations of threat analytes, while still having at least 10^4 SERS enhancement. The goal of this topic and the resulting research is to develop miniature metal-based surface-enhanced Raman spectroscopy substrates which could be manufactured at a large scale, while retaining both low-level baseline signatures (native background peaks are minimal) and low contaminant levels, to be utilized in various chemical and biological detection scenarios for augmentation of portable Raman technologies.

PHASE I: Develop a conceptual design for the surface-enhanced Raman substrate detailing the technical feasibility of the proposed design and production of the substrate. Technical feasibility shall be demonstrated through modelling, production capability infrastructure, proposed optimal (633 nm or 785 nm) and non-optimal wavelength (< 400 nm or >800 nm) use, and theoretical shelf-life. This demonstration will elucidate the minimal SERS background spectral features when exposed to clean de-ionized water for a minimum of 10 minutes. The demonstration will also provide an estimated SERS enhancement value to be equal to or greater than 10^4. Use of 1,2-bis(4-pyridyl)-ethylene to determine the SERS enhancement value is encouraged. Of importance is a clean substrate with minimal production/manufacturing contamination present, so that the maximum potential exists for the binding of typically weakly bound analytes.

VERSION 2

Demonstration of technical feasibility in Phase I is required for consideration of a Phase II project award.

PHASE II: Following technical feasibility demonstration of the Phase I requirements, the small business shall develop manufacturing protocols for the design and delivery of 500 substrates after 10 months, and 1000 SERS substrates after 24 months, meeting the goals of a 10^4 or better enhancement with native surface background Raman features (with no analyte present) not exceeding 3 times the background noise level with the same laser power and integration time with which a SERS Raman spectrum is obtained. The purposes of a low native surface background are both to reduce spectral interference and to maintain the maximum number of possible available binding sites for user introduced analytes. Also, spectral reproducibility characteristics of the substrates need to be within 30% for a measured analyte over 50 individual substrate measurements (analyte to be determined) obtained by comparison of peak areas across the measurements. The substrates will be tested by U.S. Army DEVCOM-CBC for requirement compliance.

PHASE III: Following successful delivery of 1000 SERS substrates meeting the performance characteristics in Phase II, protocols for scale-up manufacturing will be developed in order to deliver thousands of substrates which can be utilized in various chemical and biological detection applications for the augmentation of field portable Raman spectroscopy systems. Methods for QA/QC will be developed to ensure standardization during mass production. In addition, packaging for shipment will be developed with the goal of protecting the substrates and minimizing additional contamination.

PHASE III DUAL USE APPLICATIONS: In addition to use for the Department of Defense (DoD) low-level chemical detection scenarios, the designed SERS surfaces have commercialization activity for low-level explosive detection and biological detection for civilian uses by first responders and law enforcement personnel. DoD uses could include sensitive site exploitation, explosives detection, post decontamination survey and verification, and may serve as a technology upgrade for current and future portable Raman spectroscopic technologies. Civilian uses could include identification of illicit drugs and inspection of food products and/or hazardous waste containers.

REFERENCES:

1. Emmons, E. D., Guicheteau, J. A., Fountain III, A. W., Tripathi, A. “Effect of Substituents on Surface Equilibria of Thiophenols and Isoquinolines on Gold Substrates Studied Using Surface-Enhanced Raman Spectroscopy”. Phys. Chem. Chem. Phys. 2020, 22, 15953-15965.

2. Tripathi, A., Emmons, E. D., Kline, N. D., Christesen, S. D., Fountain III, A. W., and Guicheteau, J. “Molecular Structure and Solvent Factors Influencing SERS on Planar Gold Substrates”, J. Phys. Chem. C. 2018, 122 (18), 10205–1021.

3. Guicheteau, J. A., Tripathi, A., Emmons, E. D., Christesen, S. D., Fountain III, A. W. “Reassessing SERS enhancement factors: using thermodynamics to drive substrate design”. Faraday Discuss. 2017, 205, 547-560.

4. Guicheteau, J. A, Farell, M. E., Christesen, S. D., Fountain III, A. W., Pelligrino, P. M., Emmons, E. D., Tripathi, A., Wilcox, P., Emge, D. “Surface-enhanced Raman Scattering (SERS) Evaluation Protocol for Nanometallic Surfaces”. Appl. Spec. 2013, 67, 4, 396-403.

KEYWORDS: Surface-enhanced Raman Spectroscopy; SERS; Metallic Nanostructures; Chemical Detection

VERSION 2

TOPIC: CBD213-002

TITLE: Millimeter Wave Imaging with Metamaterials

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

OBJECTIVE: To develop a low-cost millimeter wave imager based on pyroelectric metamaterial absorbers. The goal is to develop an advanced composite detector fashioned from metamaterials that can be assembled into compact arrays for low cost hyperspectral and high sensitivity W-band imaging applications.

DESCRIPTION: Millimeter wave imaging has been shown to be a useful tool in the detection of potential threats to military personnel. Examples include the use of millimeter wave imaging for chemical/biological detection, person-borne improvised explosive device detection, land-mine detection, and unmanned aerial system (UAS) detection. W-band (75 to 110 GHz) imagers have proven to be particularly useful to the military for the detection of threats. A low-cost solution to imaging in the millimeter wave region has the potential to provide significant benefits to numerous applications within the Department of Defense (DoD) Science & Technology programs.

Electromagnetic metamaterials have demonstrated the ability to provide frequency dependent high absorptivity at millimeter wavelengths, and a W-band detector with optical read-out has been demonstrated. A common metamaterial absorber design uses a metal ground plane, dielectric layer, and a top layer of patterned metal. The metamaterial detectors use thin film pyroelectric materials as the dielectric spacer, thus enabling high absorptivity, and direct read-out of the detected signal. Metamaterial enhanced bimaterial cantilever pixels have been demonstrated for far-infrared detection.

At least two types of metamaterial detector structures may be considered for millimeter wave imaging applications: (1) symmetric metamaterial absorbers (SMA) for coherent amplitude and phase detection, and (2) asymmetric or ground plane metamaterial absorbers (GPA), for intensity-only detection. While both SMA and GPA structures can be used for hyperspectral sensing, the coherent SMA structure provides phase sensitive, vector mode, sensing capabilities that are especially important in millimeter wave imaging applications.

A W-Band imager should be able to detect objects at a distance of at least 10 meters and possess a noise equivalent temperature difference (NETD) of 5 degrees Kelvin (K) or less. The imager should be able to detect targets with a resolution of 10 cm or better at a distance of 10 meters.

PHASE I: Develop and test a single pixel detector operating at 95 GHz. Demonstrate that the system can detect a NEDT of 5 degrees or less. Explore the use of a coherent structure that provides phase sensitive, vector mode, sensing capabilities. Develop a design of an imager operating in the W-Band that can detect objects to at least a distance of 10 meters with a resolution of 10 cm or better with a NEDT of 5 degrees K or less.

PHASE II: Construct and demonstrate a working prototype W-Band imaging system using the design developed in Phase I. Demonstrate the imager using targets and black bodies at a distance of 10 meters or more. Demonstrate that the system can detect objects to at least a distance of 10

meters with a resolution of 10 cm or better with a NETD of 5 degrees K or less. Deliver the working prototype to the Government for further testing.

PHASE III: Further research and development during Phase III efforts will be directed toward refining the final deployable equipment and procedures. Design modifications based on results from tests conducted using the Phase II deliverable will be incorporated into the system. Manufacturability specific to U.S. Army Concepts of Operation (CONOPS) and Chemical and Biological Defense Program end-user requirements will be examined.

PHASE III DUAL USE APPLICATIONS: The development of a low-cost solution to imaging in the millimeter wave region has the potential to provide significant benefits to numerous programs within the DoD as well as other Government Agencies.

REFERENCES:

1. P.K. Singh, K.A. Korolev, M.N. Afsar, S. Sonkusale, "Single and dual band 77/95/110 GHz metamaterial absorbers on flexible polyimide substrate," Appl. Phys. Lett. 99, 264101 (2011).

2. H. Tao, E.A. Kadlec, A.C. Strikwerda, K. Fan, W.J. Padilla, R.D. Averitt, E.A. Shaner, X. Zhang, "Microwave and Terahertz wave sensing with metamaterials," Opt. Exp. 19, 21620 (2011).

3. J.Y. Suen, K. Fan, J. Montoya, C. Bingham, V. Stenger, S. Sriram, W.J. Padilla, "Multifunctional metamaterial pyroelectric infrared detectors," Optica 4, 276-279 (2017).

4. M.R. Webb, "A millimeterwave pyroelectric detector," International Journal of Infrared and Millimeter Waves 12, 1225–1231 (1991).

5. T.W. Du Bosq, J.M. Lopez-Alonso, G.D. Boreman, D. Muh, J. Grantham, D. Dillery, "Millimeter wave imaging system for the detection of non-metallic objects," Proc. of SPIE Vol. 6217 621723-10 (2006).

6. T.W. Du Bosq, J.M. Lopez-Alonso, G.D. Boreman, "Millimeter wave imaging system for land mine detection," Applied Optics 45, 5686-5692 (2006).

7. J.P. Samluk, C.A. Schuetz, R.D. Martin; E.L. Stein Jr., D.G. Mackrides, C. Chen, P. Yao, R. Shireen, J. Macario, D.W. Prather, "94 GHz millimetre-wave imaging system implementing optical upconversion,", Proc. SPIE 7117, Millimetre Wave and Terahertz Sensors and Technology, 71170T (2 October 2008).

8. J.P Samluk, D.W. Prather, et al., "Demonstration of Passive W-Band Millimeter Wave Imaging Using Optical Upconversion Detection Methodology with Applications," J. of Infrared, Millimeter, and Terahertz Waves, vol. 33, no. 11, pp.1076-1084, (2012).

9. S.A. Mousavi, E. Plum, J. Shi, N.I. Zheludev, "Coherent control of optical polarization effects in metamaterials," Scientific Reports, Mar 10, 2015.

10. J. Chen, H. Zhao, L. Yan, Y. Dai, “A new type of coherent electromagnetic radiation source based on interference effect between forward and backward waves in an active metamaterial slab,” Applied Physics A, (2019) 125:255.

11. Q. Yang, B. Li, Z. Lan, Y. Li, Z. Zhu, J. Shi, “Coherent absorption in optical metamaterials,” SPIE Proceedings, vol. 10824, Plasmonics III; 1082408 (2018).

12. H. Tao, W. J. Padilla, X. Zhang, and R. D. Averitt, “Recent progress in electromagnetic metamaterial devices for terahertz applications,” IEEE J. Sel. Top. Quantum Electron. 17(1), 92–101 (2011).

KEY WORDS: millimeter wave imaging; metamaterials; hyperspectral; W-Band

VERSION 4

DEFENSE HEALTH AGENCY
21.3 Small Business Innovation Research (SBIR) Program
Proposal Submission Instructions

The Defense Health Agency (DHA) SBIR Program seeks small businesses with strong research and development capabilities to pursue and commercialize medical 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/login

Specific questions pertaining to the DHA SBIR Program should be submitted to the DHA SBIR Program Management Office (PMO) at:

Email - usarmy.detrick.medcom-usamrmc.mbx.dhpsbir@mail.mil
Phone - (301) 619-7296

The DHA Program participates in up to three DoD SBIR BAAs each year. Proposals not conforming to the terms of this BAA will not be considered. Only Government personnel will evaluate proposals with the exception of technical personnel from Irving Burton Associates who will provide technical analysis in the evaluation of proposals submitted against DHA topic number:

- DHA213-008 Digital Human Model for Use in Simulation Environments for Tactile Human/Robot Interaction

PHASE I PROPOSAL SUBMISSION

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

DHA SBIR Phase I Proposals have six Volumes: Proposal Cover Sheet, Technical Volume, Cost Volume, Company Commercialization Report (CCR), Supporting Documents, and Fraud, Waste, and Abuse training. Please refer to the DoD SBIR Program BAA for full details on the requirements of each proposal volume.

The Technical Volume has a 20-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 20-page limit.

The electronically-generated Cover Sheets, Cost Volume, CCR, and Supporting Documents are excluded from the 20-page limit. Technical Volumes that exceed the 20-page limit will be reviewed only to the last word on the 20th page. Information beyond the 20th 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 20 pages of the proposal, the evaluator may deem the proposal as non-responsive and score it accordingly.

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 $250,000 over a period of up to six months.

The Company Commercialization Report (CCR), Volume 4, allows companies to report funding outcomes resulting from prior SBIR and STTR awards. Information contained in the CCR will be considered during proposal evaluations. Please refer to the DoD SBIR Program BAA for full details.

The DHA SBIR Program will evaluate and select Phase I proposals using the evaluation criteria in the DoD SBIR Program BAA. Due to limited funding, the DHA SBIR Program reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

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.

RESEARCH INVOLVING HUMAN SUBJECTS, HUMAN SPECIMENS/DATA, OR ANIMAL RESEARCH

The DHA SBIR Program highly discourages offerors from proposing to conduct Human Subjects, Human Specimens/Data, or Animal Research during Phase I due to the significant lead time required to prepare regulatory documentation and secure approval, which will significantly delay the performance of the Phase I award. For example, the ability to obtain Institutional Review Board (IRB) and Human Research Protection Official (HRPO) approval for proposals that involve human subjects can take 3-6 months, and that lengthy process can be at odds with the Phase I goal for time-to-award. Before DHA 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 subjects, human specimens/date or research with animals. It will not impact DHA'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.

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 US 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 for this award will be issued 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 this award involving the use of human subjects, to include the use of human anatomical substances or human data, shall not begin until the USAMRDC's Office of Research Protections (ORP) provides authorization that the research protocol may proceed. Written approval to begin research protocol will be issued from the USAMRDC ORP, under separate notification to the recipient. Written approval from the USAMRDC ORP is also required for any sub-recipient that will use funds from this award to conduct research involving human subjects.

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

CYBERSECURITY CONSIDERATIONS

VERSION 4

Appropriate cybersecurity considerations should be implemented at Phase III (or earlier if specified) for the potential transition of software and connected devices to be considered for future fielding. For initial information, please see the below reference to the *DoD Cybersecurity Reference and Resource Guide*.

DoD Cybersecurity Reference and Resource Guide
https://dodcio.defense.gov/Portals/0/Documents/Cyber/2019%20Cybersecurity%20Resource%20and%20Reference%20Guide_DoD-CIO_Final_2020FEB07.pdf

PHASE II PROPOSAL SUBMISSION

Phase II is the demonstration of the technology found feasible in Phase I. All DHA SBIR Phase I awardees from this BAA will be allowed to submit a Phase II proposal for evaluation and possible selection. The details on the due date, content, and submission requirements of the Phase II proposal will be provided by the DHA SBIR PMO. Submission instructions are typically sent toward the end of month five of the phase I contract. The awardees will receive a Phase II window notification via email with details on when, how and where to submit their Phase II proposal.

Small businesses submitting a Phase II Proposal must use the DoD SBIR electronic proposal submission system (https://www.dodsbirsttr.mil/submissions/login). 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 email at DoDSBIRSupport@reisystems.com.

The DHA SBIR Program will evaluate and select Phase II proposals using the evaluation criteria in the DoD SBIR Program BAA. Due to limited funding, the DHA SBIR Program reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

Small businesses submitting a proposal are required to develop and submit a Commercialization Strategy (please refer to the DoD SBIR Program BAA) describing feasible approaches for transitioning and/or commercializing the developed technology in their Phase II proposal. This plan should be included in the Technical Volume.

The Cost Volume must contain a budget for the entire 24-month Phase II period not to exceed the maximum dollar amount of $1,100,000. These costs must be submitted using the Cost Volume format (accessible electronically on the DoD submission site), and may be presented side-by-side on a single Cost Volume Sheet.

DHA SBIR Phase II Proposals have six Volumes: Proposal Cover Sheets, Technical Volume, Cost Volume, Company Commercialization Report, Supporting Documents, and Fraud, Waste, and Abuse. The Company Commercialization Report may only be submitted if available at time of submission. 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.

VERSION 4

The Company Commercialization Report (CCR), Volume 4, allows companies to report funding outcomes resulting from prior SBIR and STTR awards. Information contained in the CCR will be considered during proposal evaluations. Please refer to the DoD SBIR Program BAA for full details.

PHASE II ENHANCEMENTS

The DHA SBIR Program has a Phase II Enhancement Program which provides matching SBIR funds to expand an existing Phase II contract that attracts investment funds from a DoD Acquisition Program, a non-SBIR government program or eligible private sector investments. Phase II Enhancements allow for an existing DHA SBIR Phase II contract to be extended for up to one year per Phase II Enhancement application, and perform additional research and development. Phase II Enhancement matching funds will be provided on a dollar-for-dollar basis up to a maximum $550,000 of SBIR funds. All Phase II Enhancement awards are subject to acceptance, review, and selection of candidate projects, are subject to availability of funding, and successful negotiation and award of a Phase II Enhancement contract modification.

TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The DHA 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.

The DHA SBIR Program has a Technical Assistance Advocate (TAA) who provides technical and commercialization assistance to small businesses that have Phase I and Phase II projects.

WAIVERS

In certain situations, the DHA SBIR Program allows for waivers to be incorporated per program regulations for cases of federal facility usage for testing/evaluation when it has been determined that another facility does not have the ability or expertise to complete the work. In those cases, the DHA SBIR Program has the right of refusal and will work to establish the waiver for Program Manager approval. The proposer will subcontract directly with the federal facility and not a third party representative.

PROTEST PROCEDURES

Please refer to the DoD Program Announcement for procedures to protest an Announcement. As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to:

Ms. Micaela Bowers
SBIR/STTR Contracting Officer
U.S. Army Medical Research Acquisition Activity
Phone: (301)-619-2173
Email: micaela.l.bowers.civ@mail.mil

NOTIFICATION OF SELECTION AND NON-SELECTION

Proposing firms will be notified of selection or non-selection status for a Phase I award within 90 days of the closing date of the BAA. The individual named as the Corporate Official on the Proposal Cover Sheet

will receive an email for each proposal submitted from the DHA SBIR Office with their official notification of proposal selection or non-selection.

VERSION 4

DHA SBIR 21.3 Phase I Topic Index

VERSION 4

DHA213-001 TITLE: Head and Neck Protection System for Acute and Chronic Injury Mitigation

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Bio Medical

OBJECTIVE: Develop prototype systems to mitigate acute head and neck injuries due to high G loading in the ejection environment and mitigate chronic neck fatigue and pain associated with prolonged low G use of Helmet Mounted Display Systems.

DESCRIPTION: Advancements in combat aircraft performance and flight equipment design, particularly the widespread use of helmet-mounted display systems (HMDS), have led to an increase in reported neck pain and injury due to G loading among aircrew across all services. While neck pain and injury has long been an established risk with fixed-wing and rotary-wing combat flight, increased use of head/helmet supported masses – from night vision goggles, to Joint Helmet Mounted Cueing System (JHMCS) and Helmet Mounted Inertial Tracker (HMIT) systems deployed in thousands of legacy aircraft, to advanced systems deployed in the HMDS of 4th and 5th Generation Fighter Aircraft – has exacerbated the issue. These helmet-supported masses shift the center of gravity (CG) more forward and superior to the normal CG of the current helmet system. Under rapid high G loading or over prolonged usage in the low G environment, this added weight and adverse CG location both increases the stresses placed the neck and spine at all times during flight operations and increases the risk of cervical spinal injury during ejection. Recent surveys show that over 80% of USAF pilots using such systems report neck fatigue associated chronic neck pain. These issues have the potential to jeopardize mission success and increase potential mishaps as pilots reportedly avoid flying to the aircraft's full potential in order to lessen their pain. Furthermore, these issues have reduced USAF force readiness, and in some instances, led to pilots seeking medical treatment from providers outside the Department of Defense.

The development of an assistive technology to augment the pilot's ability to manage additional head-mounted mass and adverse CG during both normal maneuvers and ejection scenarios would greatly decrease pilot injury risk, improve force readiness, restore mission performance, and reduce medical treatment costs. Potential solutions should minimally impede a pilot's head motion and operational Range of Motion (ROM) while inside the aircraft and ideally would be virtually imperceptible to the user, yet provide assistive force when required. Failure to give attention to these concerns has caused previous attempts at a solution to be rejected by the user community. Potential solutions should also give consideration to size, weight, and power (SWaP) constraints present in fixed-wing and rotary-wing aircraft cockpits. The aircrew gender and size demographic is wide ranging, including the 5th percentile female (103 lbs) to 95th percentile male (245 lbs). Proposed solutions should accommodate this wide demographic and be interoperable with aircrew flight equipment (AFE) worn by all sizes of aircrew.

PHASE I: For the Phase I effort, contractors shall develop and execute a plan for establishing end user requirements and develop a proof of concept (TRL 2-3) for their proposed system to determine its technical feasibility. Establishing design requirements via engagement with end users is highly recommended for successful user integration. Early coordination with USAF Agile Combat Support Directorate Human Systems Division (AFLCMC/WNU) and other DoD PEOs interested in incorporating this technology into their systems is also recommended. Proofs of concept should demonstrate technical feasibility by delivering a report containing results of benchtop experiments, models and simulations, or calculations that show successful implementation of actuation schemes, control algorithms, developed hardware, and any other vital components of the system. Technical data, including AFE specifications, dangerous/safe neck loading conditions, aircraft information, etc. will be provided to Phase 1 awardees.

VERSION 4

PHASE II: Contractors awarded a Phase II shall mature their proof-of-concept into a prototype that simulates integration with aircrew flight equipment (AFE) or aircraft system integration (i.e., a reasonable surrogate of AFE or existing aircraft systems such as an ejection seat), and is testable in simulated flight environments with anthropometrically represented manikins (centrifuge, drop towers, and horizontal acceleration sleds). The system should demonstrate a capability for attenuating neck loads by at least 25% compared to an unaided helmet-supported mass in high +Gz testing on AFRL impact facilities with both 5th percentile female Lightest Occupant in Service (LOIS) and 95th percentile male Large Anthropomorphic Research Dummy (LARD) manikins. The system must demonstrate scalable attenuation up to a +12 Gz impulse (simulated ejection scenario) in order to ensure the system can provide adequate neck load protection, without introducing additional injury modes to the user. Prototype systems should also demonstrate they allow users to perform all necessary duty activities with minimal ROM loss and minimal additional effort of motion required. Finally, awardees shall deliver a detailed plan for integrating the system with existing aircraft systems and (AFE).

PHASE III DUAL USE APPLICATIONS: Phase III awardees shall build upon their Phase II prototype, such that it furthers the attenuation neck forces and head accelerations to safe levels under operationally relevant test conditions, without introducing additional modes of injury, reducing user ROM, or requiring additional effort of motion in order to complete duty tasks. The Phase III prototype must also demonstrate reasonable success at satisfying critical requirements for adoption, including those required to integrate with aircraft systems and AFE. The conclusion of the Phase III shall deliver a prototype system that demonstrates attenuation of a pilot's head and neck loads during routine High +Gz exposure, as well as ejection cases, to a Multi-axial Neck Injury Criteria (MANIC) rating of less than 5% injury risk in all three (X, Y, Z) axes (Parr, 2014). The prototype must be shown to be effective while also requiring little, if any, additional effort of motion on part of the user and not restrict user ROM in any way that would preclude them from accomplishing mission-critical tasks. This system would provide tremendous benefit to fixed-wing fighter squadrons that employ helmets equipped with HMDs or similar helmet-supported masses by reducing neck injury risks and will increase force readiness, while decreasing the need for medical rehabilitation. Potential transitions include the relevant fighter, attack and trainer aircraft program management offices of the USAF Life Cycle Management Center and NAVAIR. The system could also similarly benefit the Future Vertical Lift program (minus any components specifically needed for ejection) with similar helmet mounted systems. Additionally, this system could provide a therapeutic rehabilitation tool to medical professionals treating cervical spine injuries or neuromuscular conditions that affect the ability of a person to keep their head upright.

REFERENCES:

1. Harrison, M.F., Coffey, B., Albert, W.J., and Fischer, S.L. (2015). "Night vision goggleinduced neck pain in military helicopter aircrew: A literature review." Aerospace Medicine and Human Performance, 86(1), 46-55.
2. Philip S.E. Farrell et al. (2016) "Aircrew Neck Pain Prevention and Management". Human Factors & Medicine Panel NATO Research Task Group 252 STO Technical Report.
3. Turner, Anthony M. (2018) "Pilot Questionnaire to Characterize Neck Pain Related to Forward Helmet Center of Gravity (U.S. Air National Guard)". 711th Human Performance Wing USAF School of Aerospace Medicine.
4. LaFiandra, M. et. al. (July 2007) "The Effects of Personal Armor System for Ground Troops (PASGT) and the Advanced Combat Helmet (ACH) With and Without PVS-14 Night Vision Goggles (NVG) on Neck Biomechanics During Dismounted Soldier Movements". US Army Medical Research and Materiel Command report.
5. Parr, Jeffrey C., Michael E. Miller, Joseph a. Pellettiere, and Roger a. Erich. 2013. "Neck Injury Criteria Formulation and Injury Risk Curves for the Ejection Environment: A Pilot Study." Aviation Space and Environmental Medicine 84(12): 1240–48.

6. Parr, J. (2014). "A Method To Develop Neck Injury Criteria To Aid Design And Test Of Escape Systems Incorporating Helmet Mounted Displays." Doctoral Dissertation, Air Force Institute of Technology. Dayton, OH

KEYWORDS: neck pain, neck injury, chronic pain, helmet mounted display, aircraft ejection, head injury, head supported mass, ejection injury

VERSION 4

DHA213-002 REMOVED

VERSION 4

DHA213-003 TITLE: Advanced Nasopharyngeal Airway

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Bio Medical

OBJECTIVE: Design and produce an advanced nasopharyngeal airway (NPA) that provides more effective and reliable upper airway patency in unconscious patients than existing NPAs, which can be easily inserted and removed by medics/first responders such as combat life savers with varying skill levels.

DESCRIPTION: Airway compromise continues to account for approximately one in ten preventable battlefield deaths. Combat medics often provide care in no or low-light conditions, surrounded by the chaos of combat, and with the limited dexterity that accompanies bulky body armor, gloves, and heavy equipment. Therefore, a critical procedure such as airway management requires very simple tools that are highly effective. The purpose of this research and development effort is to revolutionize one of the most basic lifesaving airway management tools, the NPA. The NPA is a 140-year-old technology that was designed to open an obstructed airway in a patient who is unconscious or deeply sedated, and still factors prominently within Tactical Combat Casualty Care (TCCC) guidelines and civilian acute care. Although NPAs are easy to insert by medics, they are not universally effective in relieving airway obstruction, they are underutilized in the TCCC environment, and they are in need of an innovative overhaul.

A review of the Department of Defense Trauma Registry (DODTR) showed that only 2% of non-head and neck-injured in-theater trauma patients who had a prehospital airway intervention had a prehospital NPA placed by combat medics, yet 6% had a cricothyroidotomy (a hole cut in their neck to allow breathing). Similarly, the Prehospital Trauma Registry (PHTR) which is module of the DODTR capturing data during the Role 1 phase of care, found that only 19.5% of casualties requiring airway interventions had NPAs placed, which was closely followed by a 12% cricothyroidotomy rate, suggesting that NPAs are underutilized. This is further supported by observations that combat medics have been performing surgical airways on a number of occasions for casualties who were unconscious from hemorrhagic shock or traumatic brain injury (TBI) but who had no direct maxillofacial injuries or documented airway problems. This is troubling, because the failure rate for combat medic-performed cricothyroidotomy is as high as 33%. Recently, the TCCC Airway Working Group raised concerns about the effectiveness of current NPAs especially in battlefield applications. Despite the presence of a traditional NPA, airway obstruction can still occur in up to 42% of heavily sedated patients.

The pathophysiology of upper airway obstruction during depressed levels of consciousness is highly complex and is not fully addressed by the traditional NPA. Contemporary sleep apnea science has provided substantial insight regarding the locations, mechanisms, and forces associated with upper airway collapse. A novel NPA founded upon this new knowledge will potentially be more effective in relieving upper airway obstruction resulting in lives saved, greater operator confidence, and the avoidance of unnecessary and risky medic-performed surgical airways. A novel NPA technology should 1) be easy to insert and removed by low-skilled operators, 2) be no more traumatic than traditional NPAs, 3) demonstrate greater efficacy than traditional NPAs, and 4) have a relatively low cost of manufacturing to enhance dual-purpose utilization.

PHASE I: The main goal of Phase I is to design an innovative concept for a novel NPA and to exhibit its feasibility by conducting a demonstration of a prototype to Department of Defense (DoD) end users. A first deliverable is a concept paper that describes how the new technology will function and why it will theoretically perform better than existing NPAs in relieving airway obstruction associated with depressed levels of consciousness. A physical description of the device along with its features should be included, as

well as a description of the proposed manufacturing process. Contractors are encouraged to develop innovate designs to address the stated problem. The technology should be able to be inserted through the nasopharynx with the no greater force or mucosal trauma than traditional NPAs. Once inserted into the airway, the NPA should provide relief of obstruction at multiple pharyngeal levels. Ideally, the technology should be a one-size-fits-all solution in order to minimize operator equipment burden. The device should allow for nasal as well as oral ventilation and should facilitate effective spontaneous breathing as well as positive pressure ventilation via face mask. The physical design must have an anthropometric form factor and material characteristics that will accommodate ease of insertion. Weight should be minimized. The device should be approximately the same size of the standard NPA and should be able to withstand the crushing forces within medic backpacks. The device should be designed to be entirely disposable. Innovation is strongly encouraged in each design aspect in order to prompt intuitive ease of use. A second deliverable is a computer-aided design (CAD) model of the concept NPA. A third and final deliverable is an in-person demonstration of a low fidelity prototype (e.g., 3D printed model) to end users in order to demonstrate the principle of operation. The exhibit should demonstrate that the conceptual design will be capable of achieving the long-term goals.

PHASE II: The overall objective of Phase II is to produce an operational advanced NPA that aligns with the specified goals, form factor, and functional characteristics outlined in Phase I. The first goal of Phase II is to produce an intermediate-fidelity prototype. The emphasis should be on form, function, and subcomponent interaction. Performers are encouraged to initiate a failure mode and effects analysis (FMEA) at this stage as a means to analyze the risk factors associated with a device. A first deliverable is a description of the prototype and a report detailing a small, interim formative user study of the intermediate-fidelity prototype performed by users in manikin and/or cadaver models. One example of a manikin model is the Advanced Modular Manikin (AMM) for healthcare simulation which is open source platform (see reference 6 below). Testing of improvements and changes is then encouraged in order to take advantage of data obtained from user feedback. The next goal is to produce a higher-fidelity prototype based upon usability study findings, additional user requirements, and other observations. Focus areas for this stage include material selections (e.g., biocompatibility, hardness and flexibility, frictional interactions), design for manufacturing, and minimizing cost of goods. The aim of this stage is to produce a second deliverable that is a modified form of the first prototype, except more closely functioning and performing as the final intended device. Design innovations resulting in an intuitive ease of use are strongly encouraged. A second deliverable is a description of the updated prototype and a report detailing modifications made based upon prior user testing and risk analysis. A third deliverable will be the report of another interim formative user study. This assessment should also evaluate labels and the comprehension of instructions for use (IFU). The last stage of development serves to finalize and validate component system design and interaction and to fabricate a final prototype. Here again, testing of improvements and changes are encouraged in order to take advantage of data obtained from usability studies and risk analysis. The presentation and demonstration of a fully functional device to DoD end-users will constitute the fourth and final deliverable, accompanied by a Food and Drug Administration (FDA) regulatory plan to illustrate the pathway to clearance, and any other relevant reports and designs.

PHASE III DUAL USE APPLICATIONS: A novel NPA should be designed with dual-use purpose. In addition to meeting DoD needs, the technology should also appeal to the broader civilian healthcare market including prehospital EMS, critical care transport, the hospital emergency department, intensive care units, and anesthesiology. The small business concern is encouraged to obtain funding from non-SBIR/STTR government sources and/or the private sector to develop or transition their device into viable product or service for sale to the DoD or private sector markets. Contractors are also encouraged to adapt aspects of their research or technology into other related technologies that could be potentially inserted into defense systems as a result of this particular SBIR project. Utility may be enhanced if the technology served the additional purpose of serving as an airway adjunct during procedural deep sedation. The contractor should refine and implement their regulatory strategy for obtaining FDA approval of their

technology for use as an airway device based on their initial FDA feedback. Phase III funding should also aim towards the development of training software and other training tools. This phase should culminate in a clear path to FDA approval. In conjunction with FDA submission, the contractor should develop scaled up manufacturing of the technology that follows FDA quality regulations. In addition, the work may result in technology transition to a DoD Acquisition Program likely through USAMMDA or a SOCOM/AFSOC unit with planned expansion to the military at large after initial entry into the government purchase pathways. The ability to provide a simple to use novel NPA that reliably prevents upper airway obstruction will result in lives saved and the avoidance of unnecessary emergency surgical airways.

REFERENCES:

1. Blackburn MB, April MD, Brown DJ, et al. Prehospital airway procedures performed in trauma patients by ground forces in Afghanistan. J Trauma Acute Care Surg. 2018;85(1S Suppl 2) 2. Schauer SG, Naylor JF, Maddry JK, Kobylarz FC, April MD. Outcomes of Casualties Without Airway Trauma Undergoing Prehospital Airway Interventions: A Department of Defense Trauma Registry Study. Mil Med. 2020;185(3-4)
2. Otten EJ, Montgomery HR, Butler FK Jr. Extraglottic Airways in Tactical Combat Casualty Care: TCCC Guidelines Change 17-01 28 August 2017. J Spec Oper Med. 2017 Winter;17(4):19-28. PMID: 29256190.
3. Mabry RL. An analysis of battlefield cricothyrotomy in Iraq and Afghanistan. J Spec Oper Med. 2012;12(1):17-23.
4. Stoneham MD. The nasopharyngeal airway. Assessment of position by fibreoptic laryngoscopy. Anaesthesia. 1993 Jul;48(7):575-80.
5. David Hananel, BSEE, BACS, Dan Silverglate, BAFA, BSCS, Dan Burke, A.S, Benjamin Riggs, Jack Norfleet, PhD, Robert M Sweet, MD, FACS, The Advanced Modular Manikin Open Source Platform for Healthcare Simulation, Military Medicine, Volume 186, Issue Supplement_1, January-February 2021, Pages 49–57, https://doi.org/10.1093/milmed/usaa420

KEYWORDS: Nasopharyngeal, nasal, airway, obstruction, cricothyroidotomy

VERSION 4

DHA213-004 TITLE: Bougie-Integrated Endotracheal Intubation Stylet

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Bio Medical

OBJECTIVE: Design and build a bougie-integrated endotracheal intubation (ETI) stylet that improves operator first pass success rates by resolving anatomic challenges associated with indirect and direct laryngoscopy. The technology should provide enhanced ETI performance and autonomy for providers of varying skill levels operating in austere and remote environments.

DESCRIPTION: Each year millions of patients will have a breathing tube, known as an endotracheal tube (ETT) inserted into their windpipe in order to assist with ventilation or to protect their airway. The procedure is called endotracheal intubation (ETI), and thousands who undergo ETI will experience serious complications as a result of operator difficulty during the process. ETI is a complex procedure that requires considerable skill. An improperly placed tube can deprive a patient of oxygen and can rapidly lead to death. Emergency circumstances, such as trauma and austere conditions make ETI riskier and more difficult. In the combat prehospital environment where airway loss and ventilatory compromise represents one of the leading causes of death, ETI encompasses over 80% of airway securement. It is also in this setting where airway interventions, specifically ETI, is one of the most common incorrectly performed life-saving interventions. A significant number of casualties arrive at Combat Support Hospitals in need of an immediate ETT, suggesting that many prehospital operators lack either the technology or skill to confidently provide definitive airway management.

Although anatomic, skill, and circumstantial issues all contribute this capability gap, there also exists an ETI technology gap. Rapid, first-pass ETI success is critical in order to save lives, decrease complications and minimize downstream casualty acuity. ETI needs to be more accessible to a broader range of operators, particularly those with lower skill and experience levels. This is particularly relevant in the context of future Multi Domain Operational (MDO) environments where small, widely dispersed units will require levels of self- sufficiency that are higher than what is currently demanded. In the MDO, endotracheal intubation will become more necessary due to evacuation constraints and prolonged transit times. The MDO environment is also where resource-consuming complications must be avoided. These challenges effectively widen the current ETI capability gap.

ETI is a three-step process that involves: 1) viewing the vocal cords with a device called a laryngoscope (visualization), 2) delivering the tip of the ETT to the vocal cords (insertion), and 3) advancing the tube into the trachea (cannulation). For over 120 years the visualization step with direct laryngoscopy (DL) has been the main procedural pain-point. With this in mind, video-assisted laryngoscopy (VL) was introduced into clinical practice relatively recently. Despite VL's ability to provide easier views, it has not resulted in a consistent improvement in airway management success. Therefore, a stylet technology that could resolve the anatomic and technical ETI challenges associated with both contemporary DL and traditional VL could be disruptive in terms of closing the deadly skill gap. Such a stylet technology would ideally incorporate 1) an intubating "bougie" that can be easily and atraumatically guided into the trachea, 2) a minimal gap between the bougie and the ETT, 3) a feature that allows advancement of the ETT into the airway to enhance operator autonomy, and 4) a feature that allows adjustments for ETT's of different lengths.

PHASE I: The main goal of Phase I is to develop an innovative design for an advanced bougie-integrated ETI stylet and to exhibit its feasibility by conducting a demonstration of a prototype in a manikin model by end users. One example of a manikin model is the Advanced Modular Manikin (AMM) for healthcare simulation which is open source platform (see reference 6 below). The technology should provide a

leveraging advantage over existing devices in overcoming operator skill-level issues and the anatomic impediments that vex operators during DL and VL. A first deliverable should be a detailed description of the proposed trechnology for sponsoring end-users including its principle of operation.The technology should be able to deploy a flexible bougie into the trachea that will serve as guide for the ETT, thereby easing glottic insertion and preventing ETT hang-up on glottic and subglottic structures during ETT cannulation. The outer diameter of the bougie should be as close as possible to the inner diameter of the ETT, which may necessitate different size ranges in terms of length and diameter. The amount of collision between the tip of the bougie during advancement and the anterior trachea should be minimized. The tip of the bougie should be atraumatic. The bougie should be able to be retracted and redirected if necessary. The resting position of the ETT on the device should be adjustable. There should be a feature that allows the operator to advance the ETT off of the device and into the airway in order to provide more autonomous operation. The physical design must have an anthropometric form factor that will accommodate a wide range of hand sizes. The device should be designed to be entirely or partly disposable for space saving purposes. It should not require any electrical power. Innovation is encouraged in each design aspect to prompt intuitive ease of use. A second deliverable is a computer-aided design (CAD) model of the stylet. A third deliverable is the demonstration of low fidelity protype in a manikin model performed by sponsoring end-users at San Antonio Military Medical Center. The exhibit should validate that the conceptual design will be capable of achieving longer-term goals.

PHASE II: The overall objective of Phase II is to produce a fully operational bougie-integrated ETI stylet that aligns with the specified goals, form factor, and functional characteristics outlined in Phase I. The first goal of Phase II is to produce an intermediate-fidelity prototype. The emphasis should be on form, function, and component interaction. Contractors are encouraged to perform a failure mode and effects analysis (FMEA) at this stage as a means to analyze the risk factors associated with a device. A first deliverable is a description of the prototype and a report detailing an interim formative user study of the intermediate-fidelity prototype performed by ETI operators on manikin and/or cadaver models. Testing of improvements and changes is then encouraged in order to take advantage of data obtained from user feedback. The next goal is to produce a higher fidelity prototype based upon usability study findings, additional user requirements, and other observations. Focus areas for this stage include material selections for the final product (e.g., biocompatibility, frictional interactions, bougie characteristics), design for manufacturing, and minimizing cost of goods. The aim of this stage is to produce a second deliverable that is a modified form of the first prototype, except more closely functioning and performing as the final intended device. Design innovations resulting in an intuitive ease of use are strongly encouraged. A second deliverable is a description of the updated prototype and a report detailing modifications made based upon prior user testing and risk analysis. A third deliverable will be the report of another interim formative user study. This assessment should also evaluate labels and the comprehension of instructions for use (IFU). The final stage of development serves to finalize and validate component system design and interaction and to fabricate a completed device. Here again, testing of improvements and changes are encouraged in order to take advantage of data obtained from usability studies and risk analysis. The presentation and demonstration of a fully functional device to sponsoring end-users at San Antonio Military Medical Center will constitute the fourth and final deliverable, accompanied by a Food and Drug Administration (FDA) regulatory plan to illustrate the pathway to clearance, and any other relevant reports and designs.

PHASE III DUAL USE APPLICATIONS: A novel tracheal intubation stylet should be designed for dual-use purpose. In addition to meeting DoD needs, the technology should also appeal to the broader civilian healthcare market including prehospital EMS, critical care transport, the hospital emergency department, intensive care units, and anesthesiology. The small business concern is encouraged to obtain funding from non-SBIR/STTR government sources and/or the private sector to develop or transition their device into viable product or service for sale to the DoD or private sector markets. Phase III funding should aim towards the adaptation of a bougie-integrated stylet technology for DoD field use, which should include

formative usability testing by DoD end -users. Weight should be minimized and the device should be suitable for storage and transport in medical field packs. Contractors are also encouraged to adapt aspects of their research or technology into other related technologies that could be potentially inserted into defense systems as a result of this particular SBIR project. Utility may be enhanced if the technology incorporated optional visualization technology. The contractor should refine and implement their regulatory strategy for obtaining FDA approval of their technology for use as an airway device based on their initial FDA feedback. Phase III funding should also aim towards the development of training software and other training tools. This phase should culminate in a clear path to FDA approval. In conjunction with FDA submission, the contractor should develop scaled up manufacturing of the technology that follows FDA quality regulations. In addition, the work may result in technology transition to a DoD Acquisition Program likely through USAMMDA or a SOCOM/AFSOC unit with planned expansion to the military at large after initial entry into the government purchase pathways. The ability to provide a simple to use ETI stylet system that decreases required skill levels and improves ETI success rates will result in lives saved and enhanced casualty flow in MDO environments.

REFERENCES:

1. Schauer SG, Naylor JF, Maddry JK, Beaumont DM, Cunningham CW, Blackburn MB, April MD. Prehospital Airway Management in Iraq and Afghanistan: A Descriptive Analysis. South Med J. 2018 Dec;111(12):707- 713
2. Adams BD, Cuniowski PA, Muck A, De Lorenzo RA. Registry of emergency airways arriving at combat hospitals. Journal of Trauma and Acute Care Surgery. 2008;64(6):1548-1554.
3. Levitan RM, Heitz JW, Sweeney M, Cooper RM. The complexities of tracheal intubation with direct laryngoscopy and alternative intubation devices. Ann Emerg Med. 2011 Mar;57(3):240-7.
4. Lascarrou JB, Boisrame-Helms J, Bailly A, Le Thuaut A, Kamel T, et al. Video Laryngoscopy vs Direct Laryngoscopy on Successful First-Pass Orotracheal Intubation Among ICU Patients: A Randomized Clinical Trial. JAMA. 2017 Feb 7;317(5):483-493
5. Maples, SL. Sustainment Considerations for the Multi-Domain Battle. School of Advanced Military Studies US Army Command and General Staff College, Fort Leavenworth, KS 2018 https://apps.dtic.mil/sti/pdfs/AD1071756.pdf (accessed 31 May, 2021)
6. David Hananel, BSEE, BACS, Dan Silverglate, BAFA, BSCS, Dan Burke, A.S, Benjamin Riggs, Jack Norfleet, PhD, Robert M Sweet, MD, FACS, The Advanced Modular Manikin Open Source Platform for Healthcare Simulation, Military Medicine, Volume 186, Issue Supplement_1, January-February 2021, Pages 49–57, https://doi.org/10.1093/milmed/usaa420

KEYWORDS: Intubation, endotracheal, airway, stylet, bougie, laryngoscopy, video, direct

VERSION 4

DHA213-005 TITLE: Chemical Sterilant for Far Forward, Austere Environments

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Bio Medical

OBJECTIVE: Develop and validate a chemical sterilant solution that can sterilize surgical instruments and other materiel through immersion. Product could be a powder or concentrated liquid that when mixed with potable water, creates the requisite solution capable of the desired sterilization.

DESCRIPTION: In the future, the Armed Forces will utilize multi-domain operations in order to fight and win against peer and near-peer adversaries. Armed conflict will likely occur via large-scale combat, resulting in high numbers of casualties over short time periods where degraded air superiority and ease of maneuver will make evacuation extremely difficult. These circumstances will force units to hold casualties at earlier roles of care for longer periods of time, where lifesaving surgical interventions will need to take place in order to preserve life. This creates significant challenges to safely operating on casualties with sterile equipment.

For example, the Army sterilizers that exist at the Role 3 Field Hospital, with smaller sterilizers present with the Forward Resuscitative Surgical Detachments at some Role 2s. However, heat/steam sterilization cycles can take close to an hour to complete and some items (e.g. retractors) can't fit into the sterilizers that are present at the Role 2. The inability to adequately sterilize some of these items is an issue in and of itself, but the mass casualty situations that will be prevalent during large-scale combat operations will compound this issue. In addition, medical units likely won't be able to sterilize surgical equipment quickly enough to meet surgical demand, and/or surgery will need to take place in settings without the space and infrastructure to support heat and steam sterilizers. As such, the desired chemical sterilant solution would not only address shortcomings at the Role 2, but it would also augment existing sterilization capabilities to help mitigate bottlenecks during mass casualty situations.

According to the Centers for Disease Control and Prevention (CDC) Guideline for Disinfection and Sterilization in Healthcare Facilities (2008), sterilization "destroys or eliminates all forms of microbial life" (page 9)1. This capability is looking for a chemical solution that is capable of sterilization according to these CDC guidelines. Because of the unique circumstances of performing surgery in austere conditions, the solution would need to have additional attributes beyond its ability to sufficiently sterilize surgical equipment. The solution would need to effectively sterilize instruments in 10 minutes or less (perhaps through immersion) at ambient temperatures (i.e. wouldn't require being warmed or cooled to be effective), and once activated (e.g. when a powder is mixed with water to create a sterilization liquid), should remain effective for at least 36 hours. The solution also needs to be safe enough to not require disposal as a hazardous chemical nor cause irritation if it comes into contact with bare skin. Additionally, because military logistics entail products being shipped in non-climate-controlled containers, the 1 https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html product will need to be stable enough to withstand extreme temperatures (high and low) and a variety of humidity conditions without impacting its performance.

PHASE I: The Phase I effort should focus on designing and/or developing an innovative solution that could sterilize surgical equipment as described above. Testing of the solution should demonstrate its ability to sterilize per the CDC Guidelines. Additional testing/assessments should demonstrate the proposed solution's ability to adhere (or potential to adhere) to sterilization time and shelf stability once activated. Disposal considerations should also be assessed, as the product will need to eventually comply with Environmental Protection Agency (EPA) regulations as well as FDA regulations before being fielded. The product cannot be considered hazardous material, and should be safe enough to dispose of

down a drain and ideally, safe to dispose of on the ground. Additionally, the product should not cause irritation if it comes into contact with bare skin.

The concept of use in the field should also be developed, outlining the process to activate, use and dispose of the product. This should attempt to be as comprehensive as possible, e.g. how the product will be shipped and stored (e.g. environmental conditions, acceptable containers), including after activation, through to disposal. Safety precautions that personnel will have to take with the product (before, during, and after use) should also be addressed.

Required Phase I deliverables will include the results of all testing and assessments done on the product to support its ability to meet the parameters outlined in the Details section, along with a demonstration of how the product is used (can be a video). Additional key information about the product should be summarized in a report. The report should also address the solutions' ability or potential to meet all of the parameters.

PHASE II: Using the results from Phase I, further develop, demonstrate and validate the solution identified and tested in Phase I. The performer should produce enough material to fully validate whether the solution can meet the CDC Guidelines for sterilization of surgical equipment, as well as begin to validate the solution's ability to meet the other parameters. Through this testing and validation process, the performer should make iterative refinements to the proposed solution to enable it to meet all of the parameters. The Phase II effort should also include verification of how well the solution can be integrated into the intended field environment.

The Phase II effort could include finalizing the proposed solution, as well as conducting environmental studies and preclinical or clinical studies to support regulatory submissions to the Environmental Protection Agency and Food and Drug Administration (respectively). Stability and shelf life studies could also be included during Phase II. Additional testing on the product to evaluate its compatibility with the intended fielding environment could also be included. This may entail demonstrating how the product can be utilized in different scenarios given the materials available at the Role 2 aid station and Role 3 field hospital. These demonstrations could also include user testing.

Required Phase II deliverables will include results that demonstrate all the parameters that the solution can meet, along with any data/information that support its potential to meet any parameters that aren't already met. Demonstrations of how the proposed solution can be integrated into the Role 2 and 3 environment (video submission is acceptable) and/or results of user testing could also be a Phase II deliverable. Additional required deliverables would be any regulatory submissions and communications with the EPA and FDA. The status of the effort and all deliverables should be captured in a report that captures the detailed outcomes of the work completed during Phase II, the status of regulatory submissions, and the degree to which the proposed solution(s) meets the additional performance parameters.

PHASE III DUAL USE APPLICATIONS: Using the results and progress made during Phase II, a Phase III effort would complete any remaining work necessary to have the proposed solution meet the performance parameters described in this topic, obtain regulatory clearance from both the EPA and FDA, establish appropriate stability and shelf life of the product, demonstrate its performance in a military-relevant environment, become production ready, and become commercially available. Based on the progress made in Phase II, the product would be considered as the solution to be fielded under the Chemical Sterilant program managed by the Warfighter Expeditionary Medicine and Treatment Project Management Office (WEMT PMO). Phase III would include any remaining product development to progress it towards being ready for commercialization and fielding, such as packaging, manufacturing, regulatory clearances, and military testing. Beyond this, the U.S. Army would procure the finalized

product in quantities sufficient to satisfy its fielding requirements. Other services would also be able to procure the finalized product for their capability needs as well. Units would then purchase resupply of this product to maintain this specific sterilization capability.

In the civilian market, this solution may provide a new, innovative option for rural clinics to sterilize critical tools and instruments (e.g. forceps, scalpels, scalpel handles) where they don't have the capacity for large sterilization equipment, but would also work well for emergency response situations where field hospitals are set up by the American Red Cross, the Federal Emergency Management Agency, or other non-profits. Additionally, international development and non-profit organizations focused on improving healthcare in resource-poor settings outside of the U.S. may also find this product a useful way to push a sterilization capability into areas where surgery is difficult or dangerous, such as isolated village clinics in under-developed countries.

REFERENCES:

1. Association for the Advancement of Medical Instrumentation. ANSI/AAMI ST79:2017. (2017). Comprehensive Guide to Steam Sterilization and Sterility Assurance in Health Care Facilities. Arlington, VA: AAMI. https://my.aami.org/aamiresources/previewfiles/1709_ST79Preview.pdf
2. Centers for Disease Control and Infection. Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008 (updated May 2019). https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html
3. TRADOC Pamphlet 525-3-1 "The U.S. Army in Multi-Domain Operations 2028". 6 December 2018. https://adminpubs.tradoc.army.mil/pamphlets/TP525-3-1.pdf
4. Emergency War Surgery, 5th Edition. Chapter 2 "Roles of Medical Care (United States)". https://ckapfwstor001.blob.core.usgovcloudapi.net/pfw-images/dbimages/Ch%202.pdf

KEYWORDS: chemical sterilant, sterilant, sterilization, surgery, surgical instruments, austere environment, mass casualty event, field surgery, secondary infection, infection prevention

VERSION 4

DHA213-006 TITLE: Sterilizer, Field, Special Materiel for Far Forward, Austere Environments

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Bio Medical

OBJECTIVE: Develop and validate a sterilization cabinet that can sterilize heat-sensitive surgical instruments and other materiel.

DESCRIPTION: In the future, the Army will utilize multi-domain operations in order to fight and win against peer and near-peer adversaries. Armed conflict will likely occur via large-scale combat, resulting in high numbers of casualties in short periods of time where degraded air superiority and ease of maneuver will make evacuation extremely difficult. These circumstances will force units to hold casualties at earlier roles of care for longer periods of time, where lifesaving surgical interventions will need to take place in order to preserve life. This creates significant challenges to safely operating on casualties with sterile equipment.

Sterilizers that utilize heat and steam exist at the Role 3 Field Hospital, with smaller sterilizers present at the Role 2-level Forward Resuscitative Surgical Detachment (FRSD). However, some specialized equipment (e.g. surgical scopes) cannot undergo heat/steam sterilization. High-level disinfection of these scopes is often not sufficient to mitigate the risk of infection in surgical patients due to crevices and hard-to-reach areas on the instrument. Even when traditional sterilization is possible, these methods often result in retained moisture that allows for bacterial growth. Unfortunately, many of these instruments include highly sensitive components that cannot be exposed to the high pressure, temperature, and moisture of heat/steam sterilization. Therefore, a sterilization method that sterilize the unique form factor of surgical scopes is needed.

According to the Centers for Disease Control and Prevention (CDC) Guideline for Disinfection and Sterilization in Healthcare Facilities (2008), sterilization “destroys or eliminates all forms of microbial life, including bacterial spores” (page 9).1 The desired solution would provide a solution capable of sterilizing sensitive surgical scopes according to these CDC guidelines. While there may be some solutions in the marketplace, manufacturers of commercially-available products have not built to their systems for frequent transport and lack the rugged structure required for field use.

PHASE I: The main goal of Phase I is to design a concept for a rugged benchtop sterilization cabinet. The physical design of the cabinet should put the centerline of the cabinet door no less than 48 inches from the floor and weigh no more than 182 pounds, with preference towards a lighter build. The internal compartment should be capable of holding two or more midsize sterilization baskets (17” x 11” x 4”) and large enough to house one or more standard-sized surgical scopes. The sterilization cabinet should operate by 110/20 VAC, 50/60 Hz power supply, and run times for optical equipment (i.e. surgical scopes) should last no longer than 75 1 https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html minutes. The system display should be simple to navigate, allow for manual interruption of cycles, and the system should follow industry standards for data logging and recall of cycle data. Innovation is encouraged in each design aspect to create a lighter and more rugged cabinet.

Required Phase I deliverables include a mock-up or early prototype of the desired sterilization cabinet. A report should also describe the cabinet design and features, the proposed sterilization process, progress made towards meeting the various parameters, and the results of any preliminary testing.

PHASE II: The overall objective of Phase II is to produce a fully operational prototype sterilization cabinet that can sterilize sensitive surgical scopes based on the Phase I design. Phase II work can include

building and testing of the prototype, iterative design improvements, manufacturing assessments, generating data necessary for regulatory submissions, building out multiple/additional sterilization cycles and testing them, and other related work. At the conclusion of Phase II, the performer should have achieved design lock of the system, developed a finalized prototype and be ready to move into more manufacturing-focused development.

Required Phase II deliverables include a report describing the work accomplished under Phase II, with the latest design of the sterilization cabinet including specifications, a description of the final sterilization process for any/all cycles and options, a description of the user interface, and identification of all intellectual property and proprietary information. The ruggedization of the sterilization cabinet must also be addressed in the system design and performance documentation. Other deliverables include all regulatory submissions for the sterilization cabinet and subsequent communications with the Food and Drug Administration (FDA). Additional deliverables could include any manufacturing development that has been done.

PHASE III DUAL USE APPLICATIONS: Building on the work completed under Phase II, a Phase III effort would complete any remaining work to test and validate performance of the sterilization cabinet, including its ability to withstand military rugged conditions. Phase III could also include completing work to successfully obtain regulatory clearance from the FDA, begin production prototyping and/or early manufacturing runs, and to bring the product to the commercial market.

Based on the progress made in Phase II, the product would be considered as the solution to be fielded under the Sterilizer, Field, Special Materiel program managed by the Warfighter Expeditionary Medicine and Treatment Project Management Office. Phase III would include any remaining product development to progress the cabinet towards being ready for commercialization and fielding, such as packaging, manufacturing, regulatory clearances, and military testing. Beyond this, the U.S. Army would procure the finalized product in quantities sufficient to satisfy its fielding requirements. Other services would also be able to procure the finalized product for their capability needs as well. Units would then purchase resupply of this product to maintain this specific sterilization capability.

In the civilian market, this solution is applicable to an ongoing problem in civilian healthcare facilities, as evidenced by the 2015 CDC “Call to Action” and the 2015 Joint Commission on high-level disinfection (see references). Despite the dates of these documents, this problem still persistents. If a sterilization cabinet that can fully and adequately sterilize these sensitive, hard-to-clean instruments becomes commercially available, it would greatly reduce the current burden
on hospitals and outpatient clinics to sufficiently clean these instruments. As such, the commercial market for a technology of this nature would provide ample demand for the product.

REFERENCES:

1. Association for the Advancement of Medical Instrumentation. ANSI/AAMI ST79:2017. (2017). Comprehensive Guide to Steam Sterilization and Sterility Assurance in Health Care Facilities. Arlington, VA: AAMI. https://my.aami.org/aamiresources/previewfiles/1709_ST79Preview.pdf
2. CDC. (2015a). Immediate need for healthcare facilities to review procedures for cleaning, disinfecting, and sterilizing reusable medical devices. https://emergency.cdc.gov/han/han00382.asp
3. The Joint Commission. (2015). High--level disinfection (HLD) and sterilization boosterpak. http://www.jointcommission.org/assets/1/6/TJC_HLD_BoosterPak.pdf
4. 2015 CDC “Call to Action” to evaluate high-level disinfection across the nation. https://emergency.cdc.gov/han/han00383.asp
5. TRADOC Pamphlet 525-3-1 “The U.S. Army in Multi-Domain Operations 2028”. 6 December 2018. https://adminpubs.tradoc.army.mil/pamphlets/TP525-3-1.pdf

VERSION 4

6. Emergency War Surgery, 5th Edition. Chapter 2 “Roles of Medical Care (United States)”. https://ckapfwstor001.blob.core.usgovcloudapi.net/pfw-images/dbimages/Ch%202.pdf

KEYWORDS: sterilization, surgical scopes, austere environment, surgery, field surgery, high-level disinfection, sensitive surgical equipment, secondary infection, infection prevention

VERSION 4

DHA213-007 TITLE: Anionic Nanoparticle Carriers for Neuron-targeting of Synthetic and Protein Drugs

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Bio Medical

OBJECTIVE: Construct a population of uniformly sized anionic nanoparticles (NPs) with consistent size, composition, and charge that can be loaded with traditional water-soluble synthetic drugs and, alternatively, protein therapeutics in the lumen and on the surface of the vesicles.

DESCRIPTION: Current medical treatments for casualties are heavily reliant upon diffusion of water-soluble synthetic drugs to reach their site of action to protect critical cells and tissues. Typically, synthetic drugs need to be administered at levels such that non-target sites can saturate prior to reaching physiologically relevant concentrations. To minimize drug dosage and maximize the time to effective dose, nanoparticle carriers can be tailored to focus drug delivery to those critical cells and tissues and shift the time tables towards better protection and, ultimately, faster recovery for patients.

NPs are increasingly used in applications for drug delivery and other biomedical technologies. Their small size range (1-100 nm diameter) affords them unique properties that can be significantly leveraged to improve systemic delivery and cell-mediated absorption. Their high surface-to-volume ratios enable them to carry significant quantities of synthetic small molecule drugs, as well as protein drugs. The intrinsic properties of the NP's constituents can also be exploited to intricately specify which cells are targeted by the NPs and their payload.

Most somatic cells in the human body have an anionic (negative) membrane potential, including neurons. The membrane potential is consistently maintained by gated ion channels, assisting the separation of cytoplasm from extracellular fluids. Neurons have the unique characteristic of switching their membrane potential from negative to positive, albeit transiently, during action potentials. It has been shown that negatively charged NPs are attracted to electrically active neurons, regardless of their size, shape, or composition (Dante et al., 2017).This complimentary charge-charge attraction between NPs and neurons is the cornerstone for this SBIR initiative.

PHASE I: The main goal of Phase I is to formulate and construct non-toxic NP constituents which will consistently produce uniformly sized NPs with a negative surface charge. The NPs must have the capacity to be easily loaded with water-soluble synthetic drugs. The NPs must also have the capacity to lumen load protein drugs with encapsulation efficiencies greater than 25% with no decrement to enzyme activity. Developing an efficient NP loading strategy will be paramount to completing Phase I. As a separate milestone, protein drugs must also be functionalized to adhere to the surface of the NPs by any means, as long as there is no interference with enzyme catalytic efficiency.

The NPs must be capable of retaining these drugs in a closed vesicle of any shape. NPs can take various shapes during production, including spherical vesicles or rod-shaped hexasomes (Angelova et al., 2017; Eygeris et al., 2020). NP size distributions will be measured using quasi-electric light scattering (QELS) or a similar method. Diffusion coefficients are used to develop population characteristics in terms of hydrodynamic radius (Rh) by quantifying dynamic fluctuations in scattered light. After extrusion, NPs should have a narrow Rh histogram. Some variation in NP sizes will exist within any singular population, which should be captured using QELS and monitored across three (3) distinct production batches. Stability of the nanoparticles can be evaluated by incubating NP samples at elevated temperatures (e.g., 37 °C) in buffer and measuring population shifts in Rh.

VERSION 4

PHASE II: The main goal of Phase II is to evaluate cytotoxicity of the primary NP product from Phase I. A colorimetric thiazolyl blue tetrazolium bromide (MTT) assay for assessing cell metabolic activity or a similar assay measuring cytotoxicity effects may be used. Cytotoxicity can also be assessed in cultured neurons using fluorescent dyes (SYTO 13 and Hoechst 33342) to monitor membrane fluidity and neuron viability (Hubbard et al., 2012). Attraction to neurons in vitro may also assist in developing confidence in the NP net charge (e.g., anionic). Primary neuronal cell cultures can potentially be used to assist in determining cytotoxicity and neuronal attraction simultaneously.

A stability study of loaded NPs spiked into animal plasma will need to be completed at room temperature and at 37 °C. This will help evaluate the stability of the NP in an ex vivo milieu. NP size and size distribution changes can be monitored using QELS to determine if osmotic shifts will impact loading buffer ionic strength or command the use of loading adjuvants.

PHASE III DUAL USE APPLICATIONS: The main goal of Phase III is to show stability and efficacy of the engineered NP with full payloads of both synthetic small molecule drugs and protein drugs in either the lumen or adorned to the surface in a small animal study comparing safety and efficacy results to a non-NP approach using the same drugs. Stability will be measure by injecting loaded NPs into an animal and evaluating their ability to be cleared from the bloodstream by following protein drug pharmacokinetics. This will be a “follow on” experiment to the study in Phase II where loaded NPs are spiked into animal plasma to evaluate stability ex vivo. Ultimately, this phase of the SBIR will involve direct contact between key DoD laboratories involved in neurological and surgical research, allowing for collaborative assessment using advanced injury models.

To evaluate the ability of the NPs to confer neuroprotective capabilities, animals shall be challenged with paraoxon, an organophosphorous compound that is known to inhibit acetylcholinesterase, a key enzyme involved in the transmission of nerve signals at the neuromuscular junction. The proposed animal study will incorporate two therapeutic approaches by examining protective efficacies against 2 x LD50 challenges of paraoxon using conventional chemotherapeutics (atropine and 2-PAM) compared to anionic NPs loaded with these drugs or with a protein-based drug designed to hydrolyze organophosphorus threat agents or loaded with a combination of small molecule and protein drugs. Mice would be an ideal choice because they maintain a body temperature similar to humans at 37° C, putting the experimental NPs under conditions that they will encounter when transitioned to clinical trials. These animals also have a small blood volume which will minimize the use of the experimental NP drugs.

As an advanced application of the NPs, they may be transitioned to the administration of pain relieving drugs for both kinetic and thermal traumatic wounds. The neurons responsible for transmitting pain from the source undergo excessive depolarization to send the pain signal back to the central nervous system. Time is the most critical factor in treating any traumatic wound of any kind. In drug development, drug onset of action is critical to success of the product. The short-term effect of these new therapeutic vesicles is that they will provide an improvement in targeting neurons and delivering drugs faster once administered. These NPs will also help extend limited supplies of pharmacological drugs needed in a crisis by using a smaller drug quantity per person, thereby helping more people.

Additionally, as a transition product that could also have additional use in the Chemical-Biological Defense Program, a future direction that would be beneficial is in the area of kinetic or thermal traumatic wounds that are exacerbated by the presence of chemical agents. This area is lacking because, currently, a patient’s skin can be decontaminated, but there is not a decontamination product appropriate for use in wounds. Without proper decontamination of wounds, the chemical warfare agent continues to be absorbed into the patient’s bloodstream. As an adjunct to conventional wound treatment, the anionic nanoparticles could be applied, potentially in the form of a bandage-based treatment solution, to detoxify chemical agents sustainably, immediately, and locally, while traditional administration of therapeutics

would attempt to treat the whole body. Ultimately, this new drug design will open the possibility to reformulate the way we present therapeutic drugs to patients, with an emphasis on treating combined injuries involving traumatic wounds contaminated with chemical warfare agents.

REFERENCES:

1. Angelova, A., Garamus, V., Angelova, B., Tian, Z., Li, Y., and Zou, A. Advances in structural design of lipid-based nanoparticle carriers for delivery of macromolecular drugs, phytochemicals and anti-tumor agents. 2017. Advances in Colloidal and Interface Science 249: 331-345.
2. Dante, S., Petrelli, A., Petrini, E., Marotte, R., Maccione, A., Alabastri, A., Quarta, A., DeDenato, F., Ravasenga, T., Sathya, A., Cingolani, R., Zaccaria, R., Berdondini, L., Barberis, A., and Pellegrino, T. Selective targeting of neurons with inorganic nanoparticles: revealing the crucial role of nanoparticle surface charge. 2017. ACS Nano 11: 6630-6640.
3. Eygeris, Y., Patel, S. Jozic, A., and Sahay, G. Deconvoluting lipid nanoparticle structure for messenger RNA delivery. 2020. NANO Letters 20: 4543-4549.
4. Hubbard, K., Gut, I., Scheeler, S., Lyman, M. and McNutt, P. Compatibility of SYTO 13 and Hoechst 33342 for longitudinal imaging of neuron viability and cell death. 2012. BMC Research Notes 5: 437-442.

KEYWORDS: neurons, nanoparticles, anionic, drug delivery, pain management, and chemical agents

VERSION 4

DHA213-008 TITLE: Digital Human Model for Use in Simulation Environments for Tactile Human/Robot Interaction

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR); Autonomy

TECHNOLOGY AREA(S): Bio Medical

OBJECTIVE: The objective for this topic is to develop a biomechanically correct human parametric model to be used in digital simulation environments, capable of interacting with robotic manipulators in computer simulation and express stress metrics in the form of contact forces on the body and force-torques at the body joints.

DESCRIPTION: The use of Robotic and Autonomous Systems (RAS) at the tactical edge will increase as technology matures, providing multi-functional utility while minimizing risks to Soldiers during future operations[1]. The Army's RAS Strategy, approved in 2017, describes the use of RAS to penetrate high-risk areas and to provide support in future contested environments to increase reach, capacity, and protection. Faced with the operational challenges emphasized by the Multi-Domain Operations (MDO) concept, medical forces would benefit by using forward-deployed RAS as force multipliers. Medics could employ RAS in ways that augment their capacity to provide care or reduce their exposure to particularly dangerous tasks. One such high-risk task that Soldiers are faced with is the need to locate the wounded and extract them to a place of relative safety so that Medics are able to perform life-saving Tactical Combat Casualty Care. As illustrated in the Army RAS Strategy, many of the required technologies and programs to enable this application of RAS are well underway by the larger RAS research and development community.

However, there are specific technical challenges that are unique to medical applications of RAS as described in the U.S. Army Medical Department's Position for the Employment of Robotic and Autonomous Systems. Medical applications, such as autonomous extraction of casualties and RAS-assisted diagnostics/interventions, will require robots to safely and precisely make physical contact, grasp, and/or apply forces to humans. Developing methods and technologies for safe physical interaction between emerging robot platforms and humans is a key technical challenge that is yet to be addressed. This topic calls for the development of a biomechanically correct human parametric model to express relevant body stress metrics in order to design, develop, and test methods of safe physical human-robot interaction in a simulation environment. This human parametric model will fill a key technology gap by providing information such as joint torques at the limbs or contact forces on the skin. This data will in turn ensure safe operation and motion planning throughout the research and development process of many medical RAS technologies.

For all of the advancements in robotic technology driven by new techniques in computer vision, precise path planning and acute control systems, little development has been made for refining safe and effective grasping and manipulation of the human body by a robotic manipulator. In order for RAS to be used for casualty extraction, the actual moments of robotic grasping on the casualty need to be accurately modelled during Research and Development (R&D) in simulation environments to allow for safe and rapid iterations to be made to refine controls and develop motion planning algorithms. A major feature missing from existing robotic simulation environments is anatomically correct and physically accurate digital human models. Existing human models for open-source robotic simulation environments are rudimentary[2], lacking both accurate collision physics as well as force metrics on the model. Some open source models, however are very advanced, such as those focused on musculoskeletal modeling for mapping out both the dynamics of the body but also the forces acting upon the joints during motion[3]. Those musculoskeletal models do not however focus on outside forces acting on the body such as a robotic manipulator. The goal of this topic will be to develop a biometrically accurate human parametric

model able to be inserted into simulation environments allowing for the advancement of robotic grasping and manipulating techniques. In order for the digital manikin model to further robotic grasping development, the model must provide stress and strain metrics to quantify the safety and efficacy of a grasping technique. Metrics include, but are not limited to, contact force at the spot of the robotic grasp, and force metrics of strain on the muscles, and stress at the joints. As a robotic end effector grasps a human limb and begins to manipulate it into a new position, the digital model will need to supply the forces generated at each joint. The model must be able to calculate real-time and accurate reaction force during manipulation. The model must represent accurate musculoskeletal dynamics as manipulation is taking place. In order to achieve this, it must represent accurate density and mass along the entire anatomy. The model developed needs to be able to be imported into commonly used simulation environments for robotic motion planning development. The intended use case is to simulate an unconscious soldier, therefore the model is only required to be reactionary in nature.

PHASE I: Develop a proof of concept demonstration capability to conduct a feasibility study describing approaches to meet the technical challenges in developing a digital biometric human model as described above. The feasibility study should take into account all of the different forces that can be applied on the body from contact with a robotic system, both from grasping of a limb and manipulation to non-prehensile manipulation. Design a proof of concept digital model that outputs preliminary stress metrics during interaction with a robotic manipulator in simulation. The proof of concept design should include a human model with accurate biometric form and the required architecture for measuring reaction forces at the joints, contact forces, and distributed loads on the surface of the body. Design should take into account maximizing the ability for the digital model to be integrated into common robotic simulation environments. Work done in Phase I should focus on demonstrating feasibility of the elements of the overall technical solution that present the highest technical risk and will inform the design and development plan for Phase II.

PHASE II: From Phase I work, develop and demonstrate the functionality of the human model capable of quantifying stress and strain metrics as it is manipulated by a robotic system in a simulation environment. The technical solution shall be based on research conducted into the accurate application of biomechanics and musculoskeletal dynamics inside simulation environments. Similarly, research must be conducted to accurately translate collision of objects (manipulator, human limb) into point and distributed force metrics at the point of the joints and the surface contact of the skin in a simulation environment. The model should be biometrically correct demonstrating accurate musculoskeletal dynamics in all of its movements. All motions of the body should represent anatomically realistic limitations of the range of motion of joints. This also means accurate forces applied to a part of the body reflect down the kinematic chain. The Phase II development work will target an application consisting of a robotic system grasping and lifting different limbs of the human model and manipulating them to new positions, using both prehensile and non-prehensile manipulation. The interactions between a 7 degree of freedom (DoF) robot and the human digital model in a simulation environment should include:

1) A robot gripping a wrist and lifting the arm.
2) A robot gripping the ankle and lifting the leg
3) A robot rolling the body from prone to supine pose
4) A robot dragging the body from a grasping point on the arm
5) A robot dragging the body from a grasping points on the leg
6) A series of palpations from the robot across the surface of the body.

These interactions will be pre-determined and online planning is not required. Net forces at key anatomical joints such as the shoulder, elbow, wrist, neck, hip knee and ankle must be calculated and expressed. Contact forces along the surface of the body where interaction occurs from the robot must also be measured. The distributed forces applied to the human model at the contact locations and at the joints as the limbs are manipulated must be able to be logged and saved (to eventually be used to refine robotic

motion planning algorithms). To demonstrate grasping and manipulation it is recommended that readily available grippers be used for simulation, as the development of new types of robotic grippers are outside the scope of this topic. The goal of the Phase II demonstration is to verify the performance of the human model when interacting with any surrogate/notional robotic system in simulation.

PHASE III DUAL USE APPLICATIONS: In Phase III, the technical solution will be matured to TRL 7 or 8 and dual-use applications will be explored. A refined Phase III end state would focus on interoperability, as the model should be in a plug and play state for commonly used simulation environments. Phase III provides an opportunity to apply the Phase II development work to specific needs identified by laboratories and program offices across the DoD. For example, the Telemedicine and Advance Technology Research Laboratory, a subordinate USAMRDC science and technology laboratory, is currently engaged in a variety of research initiatives related to the medical applications of RAS. Phase III efforts should focus on technology transition to product development/program management offices within USAMRDC, and DoD mission programs. For example, the U.S. Army Medical Materiel Development Activity's (USAMMDA) Warfighter Health, Performance and Evacuation (WHPE) Project Management Office, could benefit from technology solutions under this topic in their mission to develop, rapidly prototype and procure medical support products, combat casualty care support systems, and ground and aeromedical evacuation vehicles. Phase III efforts have the ability to expand the functionality of the digital model, for example, including internal injury modeling in additional to external force mapping. These advancements could provide injury mitigation solutions, as well as enhance Soldier lethality in multi-domain battlefield environments, which would be of benefit to DoD operational medicine research programs.

While the primary intended use for this digital model is to support the development and testing of medical RAS technologies that require physical interaction between robots and humans, alternate use cases should be explored in Phase III such as emergency response robotics, human collaborative industrial robotics, and injury prevention health hazard assessment tools. Companies that produce robotic systems requiring close human-robot interaction should be targeted for potential dual-use commercialization opportunities. Phase III works includes the refinement and execution of the commercialization plan included in the Phase II proposal, potentially through collaborative relationships with partners identified in Phase II. The resulting technical solution, which provides an advanced biometric human model designed for simulation and development environments, has the potentially to accelerate progress in the field of human-robot interaction.

REFERENCES:

1. U.S Army, "Robotic and Autonomous Systems Strategy", March 2017.
2. Howard, Andrew, and Nate Koenig. "Robot Simulation Made Easy." Gazebo, www.gazebosim.org
3. OpenSim, National Center for Simulation in Rehabilitation Research, 2010, https://opensim.stanford.edu
4. "Powering the World's Robots." ROS.org, www.ros.org
5. Joint Chiefs of Staff. "Joint Concept for Robotic and Autonomous Systems". 2016.

KEYWORDS: Robot, Simulation, Manikin, Manipulation, Biometric, Human-Robot Interaction, Simulation Environments, Robotics, Casualty Extraction, Autonomous Systems, Combat Casualty Care, Medical Robotics, Musculoskeletal Dynamics, Digital Human Model

VERSION 4

DHA213-009 TITLE: Prolonged Care: To Demonstrate a Wearable Wound Infection Treatment Delivery Device

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Bio Medical

OBJECTIVE: To reimagine the combat wound medication packet (CWMP) in a wearable format capable of delivering treatment for the prevention of infection in a prolonged care (PC) setting. The technology shall be in an easy-to-use format, durable instrumentation, lightweight, and compatible with PC. The approach should enable treatment administration for 72 hours near the wound bed. The end goal for this effort is to assemble a system of systems to prevent the development of infection in an austere environment when the provision of surgical intervention is delayed.

DESCRIPTION: Multi-domain operations (MDO) of the future anticipate division-on-division combat operations with casualty volumes and medical intervention times that mirror what was observed in World War I and II. In MDO, the deployment of anti-access and area denial (A2AD) technologies will not only limit evacuation to degrade the Golden Hour timeline for medical support but also constrain medical resupply, which will leave wounded Warfighters and first line medical support providers stranded in PC scenarios for unknown duration. Furthermore, repeated events of mass casualty and greater dependency on PC (i.e. limited resources) will increase the number of deaths from wounds as the infection rate will rise in these wounds within 72 hours and beyond as was observed in previous conflicts. Here, the amount of wound dressings and antibiotics needed to prevent infection from polytraumatic wounds based on current US military medical doctrine designed for “Golden Hour” doctrine are untenable in PC scenarios. As a result, the need for innovative solutions that are massively scalable and distributive (i.e. affordable and for all combatants) focused on amplifying self/buddy care (i.e. fire and forget solutions that enable less supply to be carried for longer duration or the ability of one medical provider to provide care for a high number of wounded casualties) is urgent. Furthermore, adding materials to the improved first aid kit (IFAK) or combat lifesaver (CLS) bag presents significant challenges. The critical need for wound infections and sepsis mitigation at point-of-care and Role1 is to design alternative and/or adjunctive solutions that prevent infection for the first 72 hours following injury. One approach is to reimagine components of IFAK as a system of systems to prevent the development of infection in polytraumatic wounds by extending treatment over 72 hours and buying time for surgical intervention. This topic explores the current CWMP (Combat pill pack, NSN 6505-01-548-5129) as a drug delivery device to specifically meet the need for fire and forget treatment of infection for at least 72 hours in prolonged care settings without the need to carry more pill packs and track of treatment administration.

In MDO (TRADOC PAM 525-3-1), especially those involving large scale combat operations, the deployment of Golden Hour medical doctrine from OEF and OIF is not tenable and new weapon systems by near-peer adversaries to deprive superiority on land, sea, and air anticipates accumulation of large volumes of casualties with complex wounds of wide variety without medical evacuation for surgical intervention for unknown duration. In this scenario, the ability to treat penetrating combat wounds for longer duration becomes paramount to limit mortality and morbidity. Operationally, the ability to treat even minor breaks in the skin and prevent infection underpins the instruments of maintaining combat power. Here, numerous studies have demonstrated that the timing of antibiotic treatment significantly correlated with the infection development process. Animal studies of open fractures revealed that early antibiotic treatment and surgical debridement within 2 hours prevented infection, but delayed administration of antibiotics and surgery after 2 hours significantly increased the development of infections. These observations were further validated in retrospective clinical studies in civilian trauma involving open fractures and further studies have revealed that administering antibiotics immediately after traumatic injury reduced infection rates significantly (i.e. 7% of infection if treated within one hour to

28% if treated after 1.5 hours). According to the Tactical Combat Casualty Care (TCCC) guidelines (available online), the initial response to injury recommends administration of moxifloxacin (400 mg, PO once a day) from the CWMP. The current CWMP also contains two slow-release bilayer Tylenol caplets (650 mg, PO every 8 hours) and meloxicam (15 mg, PO once a day). Unfortunately, adherence to CWMP intervention for injury patterns meeting indications set by TCCC guidelines is very low for a variety of reasons including hierarchy of life-saving interventions and lack of oral administration tolerance by casualties. The conceivable lack of a reasonable timeframe for medical evacuation in large scale combat operations and issues of compliance with CWMP intervention for the prevention of infections requires the adaption of PC to the new operational environment to meet the balanced need for ease-of-use, scalability, longevity treatment, and efficiency of treatment delivery focused on point-of-injury and Role 1 care.
The ultimate goal of the technology in this request is, but not limited to, to automate treatment delivery in a wearable format as a convergent technology to increase treatment delivery at the earliest time possible after injury for an extended duration without additional attention from a medical provider with respect to treatment administration for relevant injuries. In doing so, this convergent technology should prevent infection development, enable dose adjustment based on weight of warfighter, customize treatment, overcome compliance with the combat wound medication packet (CWMP) usage, and extend treatment duration all in one single step at point-of-injury and Role 1. The aim of this SBIR/STTR is to develop and commercialize a technology that addresses the unmet need of delayed definitive care and to accelerate the next generation of medical innovations that increase, but not limited to, the efficiency treatment delivery at point-of-injury and Role 1 care. Offerors are encouraged to familiarize themselves with the TCCC handbook, TCCC pharmacology, and field medicine literature.

When proposing a wearable technology, it is paramount, but not limited to, to consider the factors below:
1) The starting technology must plan to have or already has Food and Drug Administration (FDA) or equivalent clearance as a wearable device
2) The packing dimensions should not exceed CWMP generations (i.e. LxWxH- 2x2x0.5 in)
3) The system design should accommodate suitable formulations for the TCCC pharmacology and the route of administration for multiple days of application
4) Modular designs with a library of medications incorporating exchangeable cartridges, microneedles, micropumps, catheters, gels… etc. are welcomed, but should describe a ruggedization plan and durability of design
5) Designs must have a manual fail-safe backup option for motorized or automated designs. Use of adhesives must consider human skin safe products.
6) Treatment for prevention of infection shall start with TCCC pharmacology, but not limited to, other small molecule-based antibiotics, metal ions, lantibiotics, natural products, bacteriophages, antibodies, polymers, nano-fibers/sponges, antimicrobial peptides, and or any pathogen agnostic treatment. Stable formulations with long shelf-life should be considered.
7) Other treatments such as analgesics for pain management are optional but preferred
8) Dose customization features are optional
9) Built in sensors are optional
10) Ease of application, ability to withstand water, high positive and negative pressures, hot and cold temperatures and minimal storage conditions will be factored in the nomination process

PHASE I: Given the short duration of Phase I and the high order of technology integration required for Phase II, Phase I should focus on system design and development of proof-of-concept prototypes that address the treatment delivery requirement. Starting material may include off the shelf commercially available wearable technologies with proper agreements. Proposals may include different formulations of treatments. Prototypes may combine “classes” of applications into different “sets” of designs. At the end of this phase, fabricated prototypes should demonstrate feasibility, ease-of-use, proof-of-concept and establish “release profile”, using relevant test beds for the proposed technology. This phase should down-select designs as well as identify a pre-clinical animal model, such as, but not limited to, open fracture or

soft tissue wounds with and without infection for use in Phase II.

PHASE II: During this phase, the lead integrated system should be further refined from proof-of-concept into a viable product. Further optimization of technology for deep penetration of treatments and prevention of infection should be demonstrated during this phase. Evaluation of the product's efficacy both antimicrobial activity must include data for the first 6, 24, 48, and 72 hours at a minimum, if not longer. Qualitative and quantitative outcomes of product with regards to prevention of infection, and/or decolonization by invading organisms must be demonstrated as specific performance characteristics of the product. This testing should be controlled, and rigorous.. Testing and evaluation of the prototype to demonstrate operational effectiveness in simulated environments shall be demonstrated. Here, the selected offeror/contractor may choose but not required to coordinate or consult with WRAIR/NMRC for control of infection as testing site and models if needed. Contract research organizations (CROs) and Universities are suitable partners at the phase. Stability of product in an austere environment should be evaluated to include extreme conditions (i.e. extreme heat, cold, wet environment). This phase should also demonstrate evidence of commercial viability of the product. Accompanying application instructions, simplified procedures and training materials should be drafted in a multimedia format for use and integration of the product into market. The offeror may define and document the regulatory strategy and provide a clear plan on how FDA clearance will be obtained at the end of this phase. Offeror should also consider a pre-pre-submission communication with the FDA.

PHASE III DUAL USE APPLICATIONS: This phase should encompass both large animal models and randomized clinical trials that would require formal IRB approval as well as shelf-life optimization of at least 120 days to 2 years in austere environments. The ultimate goal of this phase is work closely with USAMMDA and the Warfighter Expeditionary Medicine and Treatment (WEMT) office to secure funds to develop and demonstrate a technology enabling the prevention of infection in wounded service members from infected traumatic combat wounds under PC with proper regulatory (FDA) clearance or authorization for human or Department of Defense use exemption. If funded, this effort will focus on coordinated activities to seamlessly integrate product into the TCCC paradigm of initial response to trauma. Once developed and demonstrated, the technology can be used both commercially in civilian or military settings to increase efficiency of treatment delivery. For instance, wound infections are projected to account for 27 billion dollars of the market size by 2026 and the post-surgical treatment care over 10 billion dollars. Performer should formulate a plan to penetrate this market. The selected contractor shall make this product available to potential military applications beyond prevention of infection to include analgesic, medical countermeasures for Chemical, Biological, Radiological, and Nuclear (CBRN) Injury, human performance augmentation solutions, and anti-sepsis treatment. Price estimate and comparison analysis for new design relative current fielded equipment shall be provided. The contractor should coordinate with Medical Research and Development Command (MRDC) to establish a National Stock Number (NSN) as the first step towards the potential inclusion into appropriate "Sets, Kits and Outfits" that are used by deployed medical forces in the Defense Acquisition System. If the product is transitioned into Acquisition Programs of Record, the Government may work with performer to harmonize design with other relevant products.

REFERENCES:

1. Saeed O, et al. Infection prevention in combat-related injuries. Mil Med 2018;183: 137–141
2. Benov A, et al. Antibiotic treatment-what can be learned from point of injury experience. Mil Med 2018;183: 466–471
3. Schauer SG, et al. Prehospital combat wound medication pack administration in Iraq and Afghanistan: a Department of Defense Trauma Registry Analysis. J Spec Oper Med 2020; 20(3): 76-80
4. Butler FK, et al. Tactical combat casualty care and wilderness medicine: Advancing trauma care in austere environments. Emerg. Med. Clin North Am 2017; 35(2): 391-407

VERSION 4

KEYWORDS: MDO, drug delivery, wearable, trauma, prolonged care

VERSION 2

Defense Logistics Agency (DLA)
21.3 Small Business Innovation Research (SBIR)
Proposal Submission Instructions

INTRODUCTION

The Defense Logistics Agency's (DLA) mission has four lines of effort the DLA Small Business Innovation Program (SBIP) supports. They include supporting the **NUCLEAR ENTERPRISE** by maintaining nuclear systems readiness, qualifying alternate sources of supply, improving the quality of consumable parts, and increasing materiel availability. **FORCE READINESS & LETHALITY** through Improvements to life cycle performance through technological advancement, innovation, and reengineering, Mitigate single points-of-failure that threaten the readiness of weapons systems used by our Warfighters. **SUPPLY CHAIN INNOVATION** through improved lead times, reduced lifecycle costs, maintaining a secure and resilient supply chain, providing opportunities for the small business industrial base to enhance supply chain operations with technological innovations. Lastly **SUPPLY CHAIN ASSURANCE** securing the microelectronics supply chain, development of a domestic supply chain for rare earth elements, the adoptions of industrial base best practices associated with counterfeit risk reduction.

The DLA Small Business Innovation Research (SBIR) and Small Business Technology Transfer Programs are implemented, administered, and managed by the DLA Small Business Innovation Program (SBIP) Management Office located within the DLA J68 Research and Development Division. Specific questions pertaining to the administration of the DLA SBIR Program and these proposal preparation instructions should be submitted to:

Defense Logistics Agency
Small Business Innovation Program (SBIP) Office
DLA/J68
Email: DLASBIR2@DLA.mil

Proposals not conforming to the terms of this Announcement will not be considered. DLA reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality as determined by DLA will be funded.

DLA reserves the right to withdraw from negotiations at any time prior to contract award.

Post Award, DLA may terminate any award at any time for any reason to include matters of national security (foreign persons, foreign influence or ownership, inability to clear the firm or personnel for security clearances, or other related issues).

Please read the entire DoD Announcement and DLA instructions carefully prior to submitting your proposal. Please go to https://www.sbir.gov/about/about-sbir#sbir-policy-directive to read the SBIR/STTR Policy Directive issued by the Small Business Administration.

Use of Support Contractors in the Evaluation Process
Only Government personnel with active non-disclosure agreements will evaluate proposals.

Non-Government technical consultants (consultants) to the Government may review and provide support in proposal evaluations during source selection.

Consultants may have access to the offeror's proposals, may be utilized to review proposals, and may provide comments and recommendations to the Government's decision makers. Consultants will not

establish final assessments of risk and will not rate or rank offerors' proposals. They are also expressly prohibited from competing for DLA SBIR awards in the SBIR topics they review and/or on which they provide comments to the Government.

All consultants are required to comply with procurement integrity laws. Consultants will not have access to proposals or pages of proposals that are properly labeled by the offerors as "FEDONLY." Pursuant to FAR 9.505-4, DLA contracts with these organizations include a clause which requires them to

(1) Protect the offerors' information from unauthorized use or disclosure for as long as it remains proprietary and

(2) Refrain from using the information for any purpose other than that for which it was furnished. In addition, DLA requires the employees of those support contractors that provide technical analysis to the SBIR/STTR Program to execute non-disclosure agreements. These agreements will remain on file with the DLA SBIP PMO.

Non-Government consultants will be authorized access to only those portions of the proposal data and discussions that are necessary to enable them to perform their respective duties. In accomplishing their duties related to the source selection process, employees of the organizations may require access to proprietary information contained in the offerors' proposals.

OFFEROR SMALL BUSINESS ELIGIBILITY REQUIREMENTS
Each offeror must qualify as a small business at time of award per the Small Business Administration's (SBA) regulations at 13 CFR 121.701-121.705 and certify to this in the Cover Sheet section of the proposal. Small businesses that are selected for award will also be required to submit a Funding Agreement Certification document and be registered with Supplier Performance Risk System https://www.sprs.csd.disa.mil/ prior to award.

SBA Company Registry
Per the SBIR/STTR Policy Directive, all applicants are required to register their firm at SBA's Company Registry prior to submitting a proposal. Upon registering, each firm will receive a unique control ID to be used for submissions at any of the eleven (11) participating agencies in the SBIR or STTR program. For more information, please visit the SBA's Firm Registration Page: http://www.sbir.gov/registration.

Performance Benchmark Requirements for Phase I Eligibility
DLA does not accept proposals from firms that are currently ineligible for Phase I awards caused by failing to meet the SBA benchmark rates at the last assessment. Additional information on Benchmark Requirements can be found in the DoD Instructions of this Announcement.

ORGANIZATIONAL CONFLICTS OF INTEREST (OCI)
The basic OCI rules for Contractors which support development and oversight of SBIR topics are covered in FAR 9.5 as follows (the Offeror is responsible for compliance):

(1) the Contractor's objectivity and judgment are not biased because of its present or planned interests which relate to work under this contract.

(2) the Contractor does not obtain unfair competitive advantage by virtue of its access to non-public information regarding the Government's program plans and actual or anticipated resources; and

(3) the Contractor does not obtain unfair competitive advantage by virtue of its access to proprietary information belonging to others.

All applicable rules under the FAR Section 9.5 apply.

If you, or another employee in your company, developed or assisted in the development of any SBIR requirement or topic, please be advised that your company may have an OCI. Your company could be precluded from an award under this BAA if your proposal contains anything directly relating to the development of the requirement or topic. Before submitting your proposal, please examine any potential OCI issues that may exist with your company to include subcontractors and understand that if any exist, your company may be required to submit an acceptable OCI mitigation plan prior to award.

USE OF FOREIGN NATIONALS (also known as Foreign Persons), GREEN CARD HOLDERS AND DUAL CITIZENS

If proposing to use foreign nationals (also known as foreign persons), they must be green card holders, and/or dual citizens. (No Student or Temporary Visa holders will be approved). The offeror must identify the personnel they expect to be involved on this project, the type of visa or work permit under which they are performing, country of origin and level of involvement.

You will be asked to provide additional information during negotiations 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)).

Proposals submitted to export control-restricted topics and/or those with foreign nationals, dual citizens, or green card holders listed will be subject to security review during the contract negotiation process (if selected for award).

DLA reserves the right to vet all uncleared individuals involved in the project, regardless of citizenship, who will have access to Controlled Unclassified Information (CUI) such as export controlled information. If the security review disqualifies a person from participating in the proposed work, the contractor may propose a suitable replacement.

In the event a proposed person and/or firm is found ineligible by the government to perform proposed work, the contracting officer will advise the offeror of any disqualifications but is not required to disclose the underlying rationale.

V. EXPORT CONTROL RESTRICTIONS

The technology within most DLA topics is restricted under export control regulations including the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR). ITAR controls the export and import of listed defense-related material, technical data and services that provide the United States with a critical military advantage. EAR controls military, dual-use and commercial items not listed on the United States Munitions List or any other export control lists. EAR regulates export-controlled items based on user, country, and purpose. The offeror must ensure that their firm complies with all applicable export control regulations. Please refer to the following URLs for additional information: https://www.pmddtc.state.gov/ and https://www.bis.doc.gov/index.php/regulations/export-administration-regulations-ear.

Most DLA SBIR topics are subject to ITAR and/or EAR. If the topic write-up indicates that the topic is subject to International Traffic in Arms Regulation (ITAR) and/or Export Administration Regulation

(EAR), your company may be required to submit a Technology Control Plan (TCP) during the contracting negotiation process.

CLAUSE H-08 PUBLIC RELEASE OF INFORMATION (Publication Approval)
Clause H-08 pertaining to the public release of information is incorporated into all DLA SBIR contracts and subcontracts without exception. Any information relative to the work performed by the contractor under DLA SBIR contracts must be submitted to DLA for review and approval prior to its release to the public. This mandatory clause also includes the subcontractor who shall provide their submission through the prime contractor for DLA's review for approval.

FLOW-DOWN OF CLAUSES TO SUBCONTRACTORS
The clauses to which the prime contractor and subcontractors are required to comply include but are not limited to the following clauses:

1) DLA clause H-08 (Public Release of Information),
2) DFARS 252.204-7000 (Disclosure of Information),
3) DFARS clause 252.204-7012 (Safeguarding Covered Defense Information and Cyber Incident Reporting), and
4) DFARS clause 252.204-7020 (NIST SP 800-171 DoD Assessment Requirements). Your proposal submission confirms that any proposed subcontract is in accordance with the clauses cited above and any other clauses identified by DLA in any resulting contract.

OWNERSHIP ELIGIBILITY
Prior to award, DLA may request business/corporate documentation to assess ownership eligibility as related to the requirements of SBIR Program Eligibility. These documents include, but may not be limited to, the Business License; Articles of Incorporation or Organization; By-Laws/Operating Agreement; Stock Certificates (Voting Stock); Board Meeting Minutes for the previous year; and a list of all board members and officers.

If requested by DLA, the contractor shall provide all necessary documentation for evaluation prior to SBIR award. Failure to submit the requested documentation in a timely manner as indicated by DLA may result in the offeror's ineligibility for further consideration for award.

FRAUD, WASTE, AND ABUSE
All offerors must complete the fraud, waste, and abuse training (Volume 6) that is located on the Defense SBIR/STTR Innovation Portal (DSIP) (https://www.dodsbirsttr.mil). Please follow guidance provided on DSIP to complete the required training.

To Report Fraud, Waste, or Abuse, Please Contact:

DoD Inspector General (IG) Fraud, Waste & Abuse
Hotline: (800) 424-9098
hotline@dodig.mil

Additional information on Fraud, Waste and Abuse may be found in the DoD Instructions of this Announcement.

PROPOSAL FUNDAMENTALS

Proposal Submission

VERSION 2

All proposals MUST be submitted online using DSIP https://www.dodsbirsttr.mil/submissions/login. Any questions pertaining to the DoD SBIR/STTR submission system should be directed to the DoD SBIR/STTR Help Desk at DoDSBIRSupport@reisystems.com.
It is recommended that potential offerors email topic authors to schedule a time for topic discussion during the pre-release period list in the DoD SBIR Program BAA.

Classified Proposals
Classified proposals **ARE NOT** accepted under the DLA SBIR Program. The inclusion of classified data in an unclassified proposal is grounds for the Agency to determine the proposal as non-responsive and the proposal not to be evaluated.

Contractors currently working under a classified contract must use the security classification guidance provided under that contract to verify new SBIR proposals are unclassified prior to submission.

Phase I contracts are not typically awarded for classified work. However, in some instances, work being performed on DLA SBIR/STTR contracts will require security clearances. If a DLA SBIR/STTR contract develops into or identifies classified work, the offeror must have a facility clearance, appropriate personnel clearances to perform the classified work and coordinate the DD254 with the Contract Officer and the service owning the classified data.

For more information on facility and personnel clearance procedures and requirements, please visit the Defense Counterintelligence and Security Agency Web site at: https://www.dcsa.mil.

Use of Acronyms
Acronyms should be spelled out the first time they are used within the technical volume (Volume 2), the technical abstract, and the anticipated benefits/potential commercial applications of the research or development sections. This will help avoid confusion when proposals are evaluated by technical reviewers.

Communication
All communication from the DLA SBIR/STTR PMO will originate from the DLASBIR2@DLA.mil email address. Please white list this address in your company's spam filters to ensure timely receipt of communications from our office.

Proposal Status
The SBIP PMO will distribute selection and non-selection email notices to all firms who submit a SBIR/STTR proposal to DLA. The email will be distributed to the "Corporate Official" and "Principal Investigator" listed on the proposal coversheet. DLA cannot be responsible for notification to a company that provides incorrect information or changes such information after proposal submission. DLA will distribute the selection and non-selection notifications to all offerors within 90 days of the BAA close date.

Proposal Feedback
DLA will provide written feedback to unsuccessful offerors regarding their proposals on the non-selection notification. Only firms that receive a non-selection notification are eligible for written feedback.

Technical and Business Assistance (TABA)
DLA does not utilize the TABA program.

Protests Procedures
Refer to the DoD Program Announcement for procedures to protest the Announcement.

VERSION 2

As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to: DCSO Small Business Innovation Program SBIP.DCSO@dla.mil. This is the DLA Contracting Team workflow email address.

PHASE I PROPOSAL GUIDELINES

Any pages submitted beyond the 20-page limit within the Technical Volume (Volume 2) will not be evaluated. If including a letter(s) of support, they should be included in Volume 5, and they will not count towards the 20-page Technical Volume (Volume 2) limit. Any technical data/information that should be in the Technical Volume (Volume 2) but is contained in other Volumes will not be considered.

DLA's objective for the Phase I effort is to determine the merit and technical feasibility of the concept. Typically, the contract period of performance for Phase I should be up to nine (9) months and the base award should not exceed $100,000. However, each topic may have a different threshold. A list of topics currently eligible for proposal submission is included in these instructions, followed by full topic descriptions. These are the only topics for which proposals will be accepted at this time.

Phase I Proposal
A complete Phase I proposal consists of six volumes:

- Volume 1 (required): Proposal Cover Sheet *(does not count towards 15-page limit)*
- Volume 2 (required): Technical Volume (maximum of 15 pages)
- Volume 3 (required): Cost Volume *(does not count towards 15-page limit)*
- Volume 4 (required): Company Commercialization Report *(does not count towards 15-page limit)*
- Volume 5:
    - Contractor Certification Regarding Provision of Prohibited Video Surveillance and Telecommunications Services and Equipment (required),
    - Foreign Ownership or Control Disclosure (Proposers must review Attachment 2 in the DoD SBIR BAA: Foreign Ownership or Control Disclosure to determine applicability),
    - Additional Cost information (optional),
    - Letters of Support (optional),
    - Any other supporting documents (optional),
    - No more than 15 Page Power Point Presentation (If Applicable)
    - A qualified letter of support is from a relevant commercial or Government Agency procuring organization(s) working with DLA, articulating their pull for the technology (i.e., what DLA need(s) the technology supports and why it is important to fund it), and possible commitment to provide additional funding and/or insert the technology in their acquisition/sustainment program.
    - Letters of support shall not be contingent upon award of a subcontract.
- Volume 6 (required): Fraud, Waste, and Abuse Training Certification

References to Hardware, Computer Software, or Technical Data
In accordance with the SBIR/STTR Policy Directive, SBIR/STTR contracts are to conduct feasibility-related experimental or theoretical R/R&D related to described agency requirements. The purpose for Phase I is to determine the scientific and technical merit and feasibility of the proposed effort. It is not intended for any formal end-item contract delivery and ownership by the Government of your hardware, computer software, or technical data. As a result, your technical proposal should not contain any reference to the term "Deliverables" when referring to your hardware, computer software, or technical

data. Instead use the term: “Products for Government Testing, Evaluation, Demonstration, and/or possible destructive testing”.

The standard formal deliverables for a Phase I are the:

- 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.
- 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)
- Applicable Patent documentation
- Other Deliverables as defined in the Phase I Proposal
- Phase II Proposal is optional at the Phase I Awardee’s discretion (as Applicable)

FAR 52.203-5 Covenant Against Contingent Fees
As prescribed in FAR 3.404, the following FAR 52.203-5 clause shall be included in all contracts awarded under this Broad Agency Announcement (BAA):

> (a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.
>
> (b) Bona fide agency, as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.
"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

XII. PHASE I PROPOSAL SUBMISSION CHECKLIST

VERSION 2

____1. The following have been submitted electronically through DSIP by the date and time listed on the first page of the DoD Program BAA.

Volume 1: DoD Proposal Cover Sheet
If proposing to use foreign nationals (also known as foreign persons), they must be green card holders, and/or dual citizens. No Student or Temporary Visa holders will be approved. The offeror must identify the personnel they expect to be involved on this project, the type of visa or work permit under which they are performing, country of origin and level of involvement.

Volume 2: Technical Volume (DOES NOT EXCEED 20 PAGES): Any pages submitted beyond this will not be evaluated. Your Proposal Cover Sheet, Cost Volume, and Company Commercialization Report DO NOT count toward your maximum page limit.

Volume 3: Cost Volume. (Online Cost Volume form is REQUIRED by DLA)

Volume 4: Company Commercialization Report. The Company Commercialization Report (CCR) must be uploaded in accordance with the instructions provided in the DoD Program BAA. Information contained in the CCR will be considered as part of the proposal evaluations.

Volume 5: Contractor Certification Regarding Provision of Prohibited Video Surveillance and Telecommunications Services and Equipment (required), Foreign Ownership or Control Disclosure, Letters of Supports (optional), and/or TABA (optional).

Volume 6 (required): Fraud, Waste, and Abuse Training Certification.

____2. Phase I proposal is not to exceed topic limits.

____3. The proposal must be formally submitted on DSIP. Proposals that are not submitted will not be evaluated.

XIII. DLA PHASE I PROPOSAL EVALUATIONS

DLA will evaluate and select Phase I and Phase II proposals using scientific review criteria based upon technical merit and other criteria as discussed in this Announcement document. DLA reserves the right to award none, one, or more than one contract under any topic. DLA is not responsible for any money expended by the offeror before award of any contract. Due to limited funding, DLA reserves the right to limit awards under any topic and only proposals considered to be of superior quality as determined by DLA will be funded.

Phase I proposals will be evaluated based on the criteria outlined below, including potential benefit to the DLA. 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 its commercialization.

Please note that potential benefit to the DLA will be considered throughout all the evaluation criteria and in the best value trade-off analysis. When combined, the stated evaluation criteria are significantly more important than cost or price.

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

Final Selection may require an oral presentation. This may include an in-person meeting or a Zoom.gov meeting.

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 BAA. Once the initial evaluations are complete, all Offerors will be notified as to whether they were selected to present the slide deck portion of their proposal within 45 days of the BAA close date. Only proposals receiving a "Highly Acceptable" rating will receive an invitation to present orally.

Part II: If selected for an oral presentation, Offerors shall submit a slide deck not to exceed 15 PowerPoint slides to DLASBIR@dla.mil.

- There are no set format requirements other than the 15-page maximum page length.
- 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.

Selected Offerors will receive an invitation to present a slide deck (15-minute presentation time / 15-minute question and answer) in a technical question and answer forum to the DLA evaluation team via electronic media. This presentation will be evaluated by a panel against the criteria listed above and your overall presentation. DLA will evaluate the presentation for Business Acumen, and Core Business Capabilities (Customer Engagement / Presentation Skills). The rating of the presentation will be a Go/No-Go rating

Notification of the Go/No-Go rating decision will occur within 5 days of the presentation. Input on technical aspects of the proposals may be solicited by DLA 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. Further, these advisors are expressly prohibited from competing for DLA 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.

VERSION 2

XIV. Phase II Proposal Submission

Per SBA SBIR Phase II Proposal guidance, **all** Phase I awardees are permitted to submit a Phase II proposal for evaluation and potential award selection, without formal invitation. Details on the due date, format, content, and submission requirements of the Phase II proposal will be provided by the DLA SBIP PMO on/around the midway point of the Phase I period of performance. Only firms who receive a Phase I award may submit a Phase II proposal.

DLA will evaluate and select Phase II proposals using the same criteria as Phase I evaluation. Funding decisions are based upon the results of work performed under a Phase I award and the scientific and technical merit, feasibility, and commercial potential of the Phase II proposal; Phase I final reports will not be reviewed as part of the Phase II evaluation process. The Phase II proposal should include a concise summary of the Phase I effort including the specific technical problem or opportunity addressed and its importance, the objective of the Phase I effort, the type of research conducted, findings or results of this research, and technical feasibility of the proposed technology.

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

Phase II Proposals should anticipate a combination of any or all 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.

XV. PHASE III GUIDELINES & INSTRUCTIONS

Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLASBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply. More specific Instructions may be available when a firm submits a Phase III proposal.

VERSION 2

DLA 21.3 SBIR Phase I Topic Index

DLA213-001	Engaging the Manufacturing Industrial Base in Support of DLA's Critical Supply Chains
DLA213-002	Development and Qualification of Domestically Sintered Neodymium Iron Boron (NdFeb) Magnets for Weapons Platforms
DLA213-003	Tungsten 3% Rhenium wire manufacturing

VERSION 2

DLA213-001 TITLE: Engaging the Manufacturing Industrial Base in Support of DLA's Critical Supply Chains

RT&L FOCUS AREA(S): Nuclear; General 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 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: Expand the Small Business Manufacturer (SBM) base to address the Agency's need to develop qualified sources of supply to improve DLA product availability, provide competition for reduced lead time and cost, as well as 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. 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.

PROJECT DURATION and COST:

PHASE I: NTE 12 Months $150K- Base NTE $100K base 6 Months, Option 1 NTE $50K base 6 Months. All work should be planned to be completed during the base period. The phase one period of performance should not to exceed 12 months total.

- The project schedule should plan to complete the TDP and SAR in the first six months.
- The use of options needs to be reserved for lead time for TDP and SAR approval and or representative article manufacturing and qualification only.

Inclusion/approval of Options is not automatic. Approval is solely 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. **Our intent regarding options is to cover unforseen testing requirements or circumstances that arise during the course of base execution.**

PHASE II: NTE 24 Months $1.6M - 24 months,
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.

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 “SBIR213C”. If the data is incomplete, or not available, the effort will require reverse engineering.

PHASE I: The goal of phase I is for the SBM to qualify as a source of supply for the DLA NSN(s) to improve DLA NSN 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 NSN(s). 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. 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: Phase III is any proposal that "Derives From", "Extends" or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

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 "SBIR213C"
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

VERSION 2

DLA213-002 TITLE: Development and Qualification of Domestically Sintered Neodymium Iron Boron (NdFeB) Magnets for Weapons Platforms

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

TECHNOLOGY AREA(S): Materials, Air Platform, Ground/Sea Vehicles, 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: The Defense Logistics Agency (DLA) strives to develop domestic sources for rare earth permanent magnets – a defense-essential technology that supports fielded weapon systems and system component assemblies – to reinforce domestic manufacturing capability and to mitigate risks associated with single, foreign sources. Advanced technology demonstrations for affordability and advanced industrial practices must demonstrate the combination of improved discrete-magnet manufacturing of various grades. Proposed efforts funded under this topic must result in unit cost reduction, improved lifecycle and performance and qualification. Further, proposed efforts must be judged to be at a Technology Readiness Level 6 or higher -- system/subsystem model or prototype demonstration in a relevant environment 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: Many defense technologies contain rare earth permanent magnets including motors, missiles, and other weapons systems platforms; but domestic sources remain scarce, leaving the Defense supply chain vulnerable to foreign sourcing. Developing and qualifying economically viable domestic sources for rare earth magnets could help create a competitive and secure domestic supply chain with improved costs and performance. DLA R&D is looking for domestic production processes that can produce a qualified source of NdFeB magnets for use in defense platforms. The production process should be able to use domesticlally produced virgin or recycled Neodymium-Praesomium(NdPr) powder as feedstock that can be sintered to meet Department of Defense magnet specifications for several different grades. DLA R&D tasks include demonstrating the production process, fabricating samples, and qualifying through an identified DoD Program of Record.

PROJECT DURATION and COST:

PHASE I: NTE 12 Months $250K
PHASE II: NTE 24 Months $1.6M

PHASE I: Phase I

VERSION 2

The objective is to generate a US manufactured source of NdFeB magnets that meets or exceeds the current military specifications using all available historical and updated research and technologies; and design a cost effective manufacturing and qualification process adhering to all regulatory and manufacturing standards which can use domestic NdPr powder as a feedstock to meet the current supply demands to the military.

PHASE II: The Phase II proposal is optional for the Phase I awardee. DLA's expectation in Phase II is to complete the qualification process. Phase II selections are based on Phase I performance, Small Business innovation and engineering capability and the availability of appropriate requirements.

PHASE III DUAL USE APPLICATIONS: Phase III is any proposal that "Derives From", "Extends" or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.
There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

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. https://www.dodmantech.com/
2. 2015 Strategic and Critical Materials Report on Stockpile Requirements
3. National Defense Authorization Act For Fiscal Year 2014

KEYWORDS: NdFeB Magnets

VERSION 2

DLA213-003 TITLE: Tungsten 3% Rhenium wire manufacturing

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

TECHNOLOGY AREA(S): Materials/Processes

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 tungsten 3% rhenium wire manufacturing capability using existing feedstock owned by DLA.

DESCRIPTION: The Defense Logistics Agency (DLA) is looking for a domestic capability to manufacture tungsten 3% rhenium wire. Global Tungsten and Powders (GTP), a subsidiary of the Plansee Group, discontinued the manufacture of its tungsten and rhenium wire products in February 2013. Specifically, tungsten 3% rhenium wire is used in multiple vacuum electronic devices (VEDs) that support Department of Defense requirements. Traveling wave tubes (TWTs) make up the largest population of VEDs that use tungsten 3% rhenium wire. TWTs are used as RF amplifiers in radar, electronic warfare, communications, and other military systems. A Title III program was initiated in late 2013 with the goal of establishing a new US source to replace GTP as a tungsten 3% rhenium wire supplier. As of the end of fiscal year 2021, this program has been unsuccessful achieving the end goal of creating split free tungsten rhenium wire in the sizes required to meet all DoD applications. During the time the program was in operation GTP manufactured tungsten rhenium wire ingots to be used as feedstock for the tungsten rhenium wire manufacturing process. The Defense Logistics Agency owns a significant amount of this feedstock. DLA is looking to execute an SBIR program to attempt to analyze a way forward in supporting the manufacturing of tungsten 3% rhenium wire in the United States.

PROJECT DURATION and COST:

PHASE I: NTE 6 Months $100K
PHASE II: NTE 24 Months $1.6M

PHASE I: The research and development goals of Phase I are to provide eligible Small Business firms the opportunity to successfully demonstrate the viability of manufacturing tungsten 3% rhenium wire from feedstock ingots manufactured by GTP and provided as government furnished material (GFM) once the project is awarded. The vendor will analyze the provided ingot and develop plans and processes to use this ingot as starting material for manufacturing process. The main effort will be to conduct preliminary studies to propose details of manufacture of tungsten 3% wire, showing feasibility and benefit to the Department of Defense. A plan to demonstrate the manufacture of tungsten 3% rhenium wire and address implementation approaches for near term insertion into Department of Defense (DoD) systems, subsystems, components, or parts will be included in the Phase I effort. Relationships with potential

customers and systems integrators will be established to aid in component identification, guide design efforts, and support the impact and insertion analyses. The deliverables for this project will include a final report describing the results from these analyses.

PHASE II: Based on the results of PHASE I, the research and development goals of PHASE II will demonstrate commercial viability by successfully producing multiple diameters of tungsten 3% rhenium wire. Tasks to be accomplished include process design, development of wire drawing schedules to manage the manufacturing process and meet the wire specifications provided by the VED industrial base. These processes will be used to produce the target wire sizes. Sufficient validation trials will be conducted to support analyses of manufacturing at commercial scale, including cost, cycle time and commercial benefit of the innovation. Remaining technical gaps will be identified. Manufactured wire shall be used for eddy current testing. Innovative processes should be developed with the intent to readily transition to production in support of DoD needs. A partnership with a current or potential DoD supplier, OEM, or another suitable partner is highly desirable.

Phase III: Phase III is any proposal that "Derives From", "Extends" or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects. There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Dual Use Applications: Progress documented from PHASE I and PHASE II should result in a vendor's qualification as an approved source for tungsten 3% rhenium wire manufacturing for civil or commercial applications, enabling participation in future procurements.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

COMMERCIALIZATION: The vendor will pursue commercialization of the tungsten 3% rhenium wire developed in prior phases, as well as potential commercial sales of any parts or other items.

REFERENCES:

1. https://www.dodmantech.com/
2. 2015 Strategic and Critical Materials Report on Stockpile Requirements
3. National Defense Authorization Act For Fiscal Year 2014

VERSION 3

Missile Defense Agency
21.3 Small Business Innovation Research
Direct to Phase II Proposal Instructions

I. INTRODUCTION

The Missile Defense Agency's (MDA) mission is to develop and deploy a layered Missile Defense System to defend the United States, its deployed forces, allies, and friends from missile attacks in all phases of flight.

The MDA Small Business Innovation Research (SBIR) Program is implemented, administered, and managed by the MDA SBIR/STTR Program Management Office (PMO), located within the Innovation, Science, & Technology directorate. Specific questions pertaining to the administration of the MDA SBIR/STTR Programs should be submitted to:

Missile Defense Agency
SBIR/STTR Program Management Office
MDA/DVR
Bldg. 5224, Martin Road
Redstone Arsenal, AL 35898
Email: sbirsttr@mda.mil | Phone: 256-955-2020

Proposals not conforming to the terms of this Direct to Phase II (DP2) announcement will not be considered. MDA reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality as determined by MDA will be funded. Due to limited funding, MDA reserves the right to withdraw from negotiations at any time prior to contract award. The Government may withdraw from negotiations at any time for any reason to include matters of national security (foreign persons, foreign influence or ownership, inability to clear the firm or personnel for security clearances, or other related issues).

Please read the following MDA DP2 proposal instructions carefully prior to submitting your proposal.

Federally Funded Research and Development Centers (FFRDCs) and Support Contractors

Only Government personnel with active non-disclosure agreements will evaluate proposals. Non-Government technical consultants (consultants) to the Government may review and provide support in proposal evaluations during source selection. Consultants may have access to the offeror's proposals, may be utilized to review proposals, and may provide comments and recommendations to the Government's decision makers. Consultants will not establish final assessments of risk and will not rate or rank offerors' proposals. They are also expressly prohibited from competing for MDA SBIR/STTR awards in the SBIR/STTR topics they review and/or on which they provide comments to the Government.

All consultants are required to comply with procurement integrity laws. Consultants will not have access to proposals that are labeled by the offerors as "Government Only." Pursuant to FAR 9.505-4, the MDA contracts with these organizations include a clause which requires them to (1) protect the offerors' information from unauthorized use or disclosure for as long as it remains proprietary and (2) refrain from using the information for any purpose other than that for which it was furnished. In addition, MDA requires the employees of those support contractors that provide technical analysis to

the SBIR/STTR Program to execute non-disclosure agreements. These agreements will remain on file with the MDA SBIR/STTR PMO.

Non-Government consultants will be authorized access to only those portions of the proposal data and discussions that are necessary to enable them to perform their respective duties. In accomplishing their duties related to the source selection process, employees of the aforementioned organizations may require access to proprietary information contained in the offerors' proposals.

II. OFFEROR SMALL BUSINESS ELIGIBILITY REQUIREMENTS

Each offeror must qualify as a small business at time of award per the Small Business Administration's (SBA) regulations at 13 CFR 121.701-121.705 and certify to this in the Cover Sheet section of the proposal. Small businesses that are selected for award will also be required to submit a Funding Agreement Certification document prior to award.

SBA Company Registry

Per the SBIR/STTR Policy Directive, all applicants are required to register their firm at SBA's Company Registry prior to submitting an application. Upon registering, each firm will receive a unique control ID to be used for submissions at any of the participating agencies in the SBIR/STTR programs. For more information, please visit the SBA's Firm Registration Page: http://www.sbir.gov/registration.

III. ORGANIZATIONAL CONFLICTS OF INTEREST (OCI)

The basic OCI rules for Contractors which support development and oversight of SBIR topics are covered in FAR Section 9.5 as follows (the Offeror is responsible for compliance):

(1) the Contractor's objectivity and judgment are not biased because of its present or planned interests which relate to work under this contract;

(2) the Contractor does not obtain unfair competitive advantage by virtue of its access to non-public information regarding the Government's program plans and actual or anticipated resources; and

(3) the Contractor does not obtain unfair competitive advantage by virtue of its access to proprietary information belonging to others.

All applicable rules under the FAR Section 9.5 apply.

If you, or another employee in your company, developed or assisted in the development of any SBIR/STTR requirement or topic, please be advised that your company may have an OCI. Your company could be precluded from an award under this announcement if your proposal contains anything directly relating to the development of the requirement or topic. Before submitting your proposal, please examine any potential OCI issues that may exist with your company to include subcontractors and understand that if any exist, your company may be required to submit an acceptable OCI mitigation plan prior to award.

VERSION 3

IV. USE OF FOREIGN NATIONALS (also known as foreign persons)

See the "Foreign Nationals" section of the DoD SBIR Program Announcement for the definition of a Foreign National (also known as Foreign Persons).

ALL offerors proposing to use foreign nationals, green-card holders, or dual citizens, MUST disclose this information regardless of whether the topic is subject to export control restrictions. Identify any foreign nationals 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. You may be asked to provide additional information during negotiations in order to verify the foreign citizen's eligibility to participate on an SBIR/STTR 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)).

Proposals submitted to export control-restricted topics and/or those with foreign nationals, dual citizens, or green card holders listed will be subject to security review during the contract negotiation process (if selected for award). MDA reserves the right to vet all un-cleared individuals involved in the project, regardless of citizenship, who will have access to Controlled Unclassified Information (CUI) such as export controlled information. If the security review disqualifies a person from participating in the proposed work, the contractor may propose a suitable replacement. In the event a proposed person is found ineligible by the government to perform proposed work, the contracting officer will advise the offeror of any disqualifications but may not disclose the underlying rationale. In the event a firm is found ineligible to perform proposed work, the contracting officer will advise the offeror of any disqualifications but may not disclose the underlying rationale.

V. EXPORT CONTROL RESTRICTIONS

The technology within most MDA topics is restricted under export control regulations including the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR). ITAR controls the export and import of listed defense-related material, technical data and services that provide the United States with a critical military advantage. EAR controls military, dual-use and commercial items not listed on the United States Munitions List or any other export control lists. EAR regulates export controlled items based on user, country, and purpose. The offeror must ensure that their firm complies with all applicable export control regulations. Please refer to the following URLs for additional information: https://www.pmddtc.state.gov and http://www.bis.doc.gov/index.php/regulations/export-administration-regulations-ear.

If the topic write-up indicates that the topic is subject to ITAR and/or EAR, your company may be required to submit a Technology Control Plan (TCP) during the contracting negotiation process.

VI. CLAUSE H-08 PUBLIC RELEASE OF INFORMATION (Publication Approval)

Clause H-08 pertaining to the public release of information is incorporated into all MDA SBIR/STTR contracts and subcontracts without exception. Any information relative to the work performed by the contractor under MDA SBIR/STTR contracts must be submitted to MDA for review and approval prior to

its release to the public. This mandatory clause also includes the subcontractor who shall provide their submission through the prime contractor for MDA's review for approval.

VII. FLOW-DOWN OF CLAUSES TO SUBCONTRACTORS

The clauses to which the prime contractor and subcontractors are required to comply include, but are not limited to the following clauses: MDA clause H-08 (Public Release of Information), DFARS 252.204-7000 (Disclosure of Information), and DFARS 252.204-7012 (Safeguarding Covered Defense Information and Cyber Incident Reporting). Your proposal submission confirms that any proposed subcontract is in accordance to the clauses cited above and any other clauses identified by MDA in any resulting contract.

VIII. OWNERSHIP ELIGIBILITY

If selected for award, MDA may request business/corporate documentation to assess ownership eligibility as related to the requirements of the Guide to SBIR Program Eligibility. These documents include, but may not be limited to, the Business License; Articles of Incorporation or Organization; By-Laws/Operating Agreement; Stock Certificates (Voting Stock); Board Meeting Minutes for the previous year; and a list of all board members and officers. If requested by MDA, the contractor shall provide all necessary documentation for evaluation prior to award. Failure to submit the requested documentation in a timely manner as indicated by MDA may result in the offeror's ineligibility for further consideration for award.

IX. FRAUD, WASTE, AND ABUSE

All offerors must complete the fraud, waste, and abuse training (Volume 6) that is located on the Defense SBIR/STTR Innovation Portal (DSIP) (https://www.dodsbirsttr.mil). Please follow guidance provided on DSIP to complete the required training.

To report fraud, waste, or abuse, please contact:

MDA Fraud, Waste & Abuse
Hotline: (256) 313-9699
MDAHotline@mda.mil

DoD Inspector General (IG) Fraud, Waste & Abuse
Hotline: (800) 424-9098
hotline@dodig.mil

X. DP2 PROPOSAL SUBMISSION GUIDELINES AND REQUIREMENTS

Proposal Submission

The MDA SBIR 21.3 DP2 proposal submission instructions are intended to clarify the Department of Defense (DoD) instructions (https://www.dodsbirsttr.mil) as they apply to MDA requirements. This announcement is for MDA SBIR 21.3 DP2 topics only. The offeror is responsible for ensuring that DP2 proposals comply with all requirements. Prior to submitting your proposal, please review the latest version of these instructions as they are subject to change before the submission deadline.

VERSION 3

All proposals MUST be submitted online using DSIP (https://www.dodsbirsttr.mil). Any questions or technical issues pertaining to DSIP should be directed to the DoD SBIR/STTR Help Desk at DoDSBIRSupport@reisystems.com. It is recommended that potential offerors email the topic author(s) to schedule a time for topic discussion during the pre-release period.

Classified Proposals

Classified proposals ARE NOT accepted under the MDA SBIR/STTR Program. The inclusion of classified data in an unclassified proposal MAY BE grounds for the Agency to determine the proposal as non-responsive and the proposal not to be evaluated. Contractors currently working under a classified MDA SBIR/STTR contract must use the security classification guidance provided under that contract to verify new SBIR/STTR proposals are unclassified prior to submission. In some instances work being performed on Phase II contracts will require security clearances. If a Phase II contract will require classified work, the offeror must have a facility clearance and appropriate personnel clearances in order to perform the classified work. For more information on facility and personnel clearance procedures and requirements, please visit the Defense Counterintelligence and Security Agency Web site at: https://www.dcsa.mil.

Use of Acronyms

Acronyms should be spelled out the first time they are used within the technical volume (Volume 2), the technical abstract, the anticipated benefits/potential commercial applications, and the keywords section of the proposal. This will help avoid confusion when proposals are evaluated by technical reviewers.

Communication

All communication from the MDA SBIR/STTR PMO will originate from the "sbirsttr@mda.mil" email address. Please white-list this address in your company's spam filters to ensure timely receipt of communications from our office. In some instances, the MDA SBIR/STTR PMO may utilize the DoD Secure Access File Exchange (SAFE) website (https://safe.apps.mil) to provide information and/or documentation to offerors.

Proposal Status

The MDA SBIR/STTR PMO will distribute selection or non-selection email notices to all firms who submit a proposal. The email will be distributed to the "Corporate Official" and "Principal Investigator" listed on the proposal coversheet. MDA cannot be responsible for notification to a company that provides incorrect information or changes such information after proposal submission.

Proposal Layout

For MDA DP2 proposals, MDA has provided a template that may be used to create the technical volume, Volume 2, of the DP2 proposal. The Volume 2 template can be found here: https://www.mda.mil/global/documents/pdf/MDA%20SBIR%20phase%20II.pdf

All pages within the technical volume (Volume 2) must be numbered consecutively. Proposals may not exceed 25 pages, may not have a font size smaller than 10-point, must use a font type of Times New Roman, and must be submitted 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. The header must be included in the one-inch margin.

VERSION 3

Proposal Feedback

MDA will provide written feedback to unsuccessful offerors regarding their proposals upon request. Requests for feedback must be submitted in writing to the MDA SBIR/STTR PMO within 30 calendar days of non-selection notification. Non-selection notifications will provide guidance for requesting proposal feedback.

Technical and Business Assistance (TABA)

The SBIR/STTR Policy Directive allows agencies to enter into agreements with suppliers to provide technical assistance to SBIR/STTR awardees, which may include access to a network of scientists and engineers engaged in a wide range of technologies or access to technical and business literature available through on-line databases.

All requests for TABA must be completed using the MDA SBIR/STTR Phase II TABA Form (https://www.mda.mil/global/documents/pdf/SBIR_STTR_PHII_TABA_Form.pdf) and must be included as a part of Volume 5 of the proposal package using the "Other" category. MDA WILL NOT accept requests for TABA that do not utilize the MDA SBIR/STTR Phase II TABA Form or are not uploaded using the DSIP "Other" category as part of Volume 5 of the Phase II proposal package.

An SBIR/STTR firm may acquire the technical assistance services described above on its own. Firms must request this authority from MDA and demonstrate in its SBIR/STTR proposal that the individual or entity selected can provide the specific technical services needed. In addition, costs must be included in the cost volume of the offeror's proposal. The TABA provider 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 or research institution).

If the awardee supports the need for this requirement sufficiently as determined by the Government, MDA will permit the awardee to acquire such technical assistance, in an amount up to $10,000. This will be an allowable cost on the SBIR/STTR award. The amount will be in addition to the award and is not subject to any burden, profit or fee by the offeror. The amount is based on the original contract period of performance and does not apply to period of performance extensions and/or enhancements. Requests for TABA funding outside of the base Phase II period of performance (24 months) will not be considered.

The purpose of this technical assistance is to assist SBIR/STTR awardees in:

1. Making better technical decisions on SBIR/STTR projects;
2. Solving technical problems that arise during SBIR/STTR projects;
3. Minimizing technical risks associated with SBIR/STTR projects; and
4. Developing and commercializing new commercial products and processes resulting from such projects including intellectual property protections.

SBIR/STTR Proposal Funding

All MDA SBIR/STTR contracts are funded with 6.2/6.3 funding which is defined as:

1. Applied Research (6.2), Systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

VERSION 3

2. Advanced Technology Development (6.3), Includes all efforts that have moved into the development and integration of hardware for field experiments and tests.

As stated in Section VI "CLAUSE H-08 PUBLIC RELEASE OF INFORMATION", MDA requires prior review and approval before public release of any information arising from STTR-sponsored research. As such, MDA does not consider STTR-sponsored research as fundamental research.

Protests Procedures

Refer to the DoD 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: Tina Barnhill | 256-450-2817 | sbristtr@mda.mil

Proposal Submission Requirements and Proposal Format

Proposals submitted to an MDA SBIR DP2 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 proposal must have been substantially performed by the offeror and/or the principal investigator (PI).

A complete DP2 proposal consists of five volumes (six if including letters of support and/or Technical and Business Assistance (TABA) funding):

- Volume 1: Proposal Cover Sheet
- Volume 2: Technical Volume **(25 page maximum)**
- Volume 3: Cost Volume
- Volume 4: Company Commercialization Report
- Volume 5: Contractor Certification Regarding Provision of Prohibited Video Surveillance and Telecommunications Services and Equipment (required), Foreign Ownership or Control Disclosure (Proposers must review Attachment 2 in the DoD SBIR 21.3 BAA: Foreign Ownership or Control Disclosure to determine applicability), Letters of Supports (optional), and/or Technical and Business Assistance (optional).
- Volume 6: Fraud, Waste, and Abuse Certification

Volume 1 – Proposal Coversheet (Required)

- A coversheet will be automatically generated by DSIP and placed at the beginning of your PDF proposal package document.

Volume 2 – Technical Volume (Required – 25 page maximum)

- Use of the MDA provided DP2 template is recommended. The template can be obtained at the following URL: https://www.mda.mil/global/documents/pdf/MDA%20SBIR%20phase%20II.pdf. The technical volume should include the following 11 sections:

  (1) **Executive Summary.**
  Provide a summary of the key objectives that will be accomplished in the DP2 effort.

(2) **Phase I Proof of Feasibility.**
The offeror must describe work performed that substantiates Phase I feasibility as described in the topic. Feasibility documentation cannot be based upon any ongoing federally funded SBIR or STTR work and DP2 proposals MUST NOT extend from any ongoing federally funded Phase I SBIR or STTR work.

Proposers interested in participating in DP2 must include Phase I feasibility documentation that substantiates the scientific and technical merit and ensure that the Phase I feasibility described in the topic has been met (i.e., the small business must have performed a proof of concept "Phase I"-type research and development related to the topic, but feasibility documentation MUST NOT be solely based on work performed under prior or ongoing federally funded SBIR/STTR Phase I work) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology as stated in Phase I above in previous work or research completed. 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 principal investigator (PI).

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 principal investigator (PI).

(3) **Description of Proposed DP2 Technical Effort and Objectives.**
Define the specific technical problem or opportunity addressed and its importance.

(4) **Phase II Technical Objective and Statement of Work**.
Enumerate the specific objectives of the Phase II work, and describe the technical approach and methods to be used in meeting these objectives. 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.

(5) **Related Work.**
Describe significant activities directly related or similar to the proposed effort, including any conducted by the principal investigator, the proposing firm, consultants, or stakeholders. Describe how these activities interface with the proposed project and discuss any planned coordination with outside sources. The proposal must accentuate its state-of-the-art technology and how it relates to the topic to capture the Government's interest for further development. In addition, please indicate whether

your firm has performed on a classified government contract in the past as either a prime or subcontractor.

(6) **Relationship with Future Research or Research and Development.**
State the anticipated results if the project is successful. Discuss the significance of the Phase II effort in providing a foundation for Phase III research and development or commercialization.

(7) **Key Personnel.**
Identify at least two key personnel who will be involved in the Phase II effort including information on directly related education and experience. A concise resume of the Principal Investigator (PI) that includes a list of relevant publications (if any) authored by the PI, must be submitted. All resumes count toward the page limitation in the technical volume.

a) **Foreign Persons**: ALL offerors proposing to use foreign persons, green-card holders, or dual citizens, MUST disclose this information regardless of whether the topic is subject to export control restrictions. Identify any foreign nationals 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. You may be asked to provide additional information during negotiations in order to verify the foreign citizen's eligibility to participate on an SBIR/STTR 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)).

Proposals submitted to export control-restricted topics and/or those with foreign nationals, dual citizens, or green-card holders listed will be subject to security review during the contract negotiation process (if selected for award). MDA reserves the right to vet all un-cleared individuals involved in the project, regardless of citizenship, who will have access to Controlled Unclassified Information (CUI) such as export controlled information. If the security review disqualifies a person from participating in the proposed work, the contractor may propose a suitable replacement. In the event a proposed person is found ineligible by the government to perform proposed work, the contracting officer will advise the offeror of any disqualifications but may not disclose the underlying rationale. In the event a firm is found ineligible to perform proposed work, the contracting officer will advise the offeror of any disqualifications but may not disclose the underlying rationale.

(8) **Facilities/Equipment**
Describe the equipment 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, certify that the facilities where the proposed work that will be performed meet environmental laws and regulations of federal, state (name), and local governments (name) 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 described in detail and identified in the Cost Volume. A minimum of one-half of the research and/or analytical work in Phase II, as measured by direct and indirect costs, must be carried out by the offeror, unless otherwise approved in writing by the Contracting Officer.

(10) **Prior, Current or Pending Support of Similar Proposals or Awards.**
While it is permissible to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous federal program solicitations or Broad Agency Announcements (BAA), 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.

(11) **Commercialization Strategy.**
The Commercialization Strategy must address the following questions:

a) What is the first product that this technology will go into (identify the components of the Missile defense System (MDS) and areas within the commercial marketplace where you can transition this technology)?
b) Who will be your customers, and what is your estimate of the market size?
c) How much funding will you need to bring the technology to market, how will you acquire the necessary funds, and how do you expect to integrate this technology into the MDS?
d) Does your company have marketing expertise? If yes, please elaborate. If not, how do you intend to bring that expertise into the company?
e) Who are your competitors, and what makes you more competitive with your technology?

The commercialization strategy must also include a schedule showing the 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 at least annually.

Volume 3 – Cost Volume (Required)

Complete the on-line cost proposal in DSIP. Your cost volume may not exceed $1,700,000 (or $1,710,000 if TABA is included – use of the MDA Phase II TABA form is required if applying for TABA). Proposals whose cost volumes exceed $1,700,000 (or $1,710,000 if TABA is included) will not be evaluated or considered for award.

Volume 4 – Company Commercialization Report (CCR) (Required)

. Information contained in the CCR will not be considered during proposal evaluations.

VERSION 3

The Company Commercialization Report (CCR) allows companies to report funding outcomes resulting from prior SBIR and STTR awards. SBIR and STTR awardees are required by SBA to update and maintain their organization's CCR on SBIR.gov. Commercialization information is required upon completion of the last deliverable under the funding agreement. Thereafter, SBIR and STTR awardees are requested to voluntarily update the information in the database annually for a minimum period of 5 years.

If the proposing firm has prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards, regardless of whether the project has any commercialization to date, a PDF of the SBA CCR must be downloaded from SBIR.gov and uploaded to the Firm Forms section of DSIP by the Firm Admin. Firm Forms are completed by the DSIP Firm Admin and are applied across all proposals the firm submits. The DSIP CCR requirement is fulfilled by completing the following:

1. Log into the firm account at https://www.sbir.gov/.
2. Navigate to My Dashboard > My Documents to view or print the information currently contained in the Company Registry Commercialization Report.
3. Create or update the commercialization record, from the company dashboard, by scrolling to the "My Commercialization" section, and clicking the create/update Commercialization tab under "Current Report Version". Please refer to the "Instructions" and "Guide" documents contained in this section of the Dashboard for more detail on completing and updating the CCR. **Ensure the report is certified and submitted.**
4. Click the "Company Commercialization Report" PDF under the My Documents section of the dashboard to download a PDF of the CCR.
5. Upload the PDF of the CCR (downloaded from SBIR.gov in previous step) to the Company Commercialization Report in the Firm Forms section of DSIP. This upload action must be completed by the Firm Admin.

This version of the CCR, uploaded to DSIP from SBIR.gov, is inserted into all proposal submissions as Volume 4.

During proposal submission, the proposer will be prompted with the question: "Do you have a new or revised Company Commercialization Report to upload?". There are three possible courses of action:

a. If the proposing firm has prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards, and **DOES have a new or revised CCR from SBIR.gov to upload to DSIP**, select YES.
   - If the user is the Firm Admin, they can upload the PDF of the CCR from SBIR.gov directly on this page. It will also be updated in the Firm Forms and be associated with all new or in-progress proposals submitted by the firm. If the user is not the Firm Admin, they will receive a message that they do not have access and must contact the Firm Admin to complete this action.
   - **WARNING:** Uploading a new CCR under the Firm Forms section of DSIP or clicking "Save" or "Submit" in Volume 4 of one proposal submission is considered a change for ALL proposals under any open BAAs or CSOs. If a proposing firm has previously certified and submitted any Phase I or Direct to Phase II proposals under ***any*** BAA or CSO ***that is still open***, those proposals will be automatically reopened. Proposing firms will have to recertify and resubmit such proposals. If a proposing firm does not recertify or resubmit such proposals, they will not be considered fully submitted and will not be evaluated.

VERSION 3

b. If the proposing firm has prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards, and **DOES NOT have a new or revised CCR from SBIR.gov to upload to DSIP**, select NO.
   - If a prior CCR was uploaded to the Firm Forms, the proposer will see a file dialog box at the bottom of the page and can view the previously uploaded CCR. This read-only access allows the proposer to confirm that the CCR has been uploaded by the Firm Admin.
   - If no file dialog box is present at the bottom of the page that is indication that **there is no previously uploaded CCR in the DSIP Firm Forms**. To fulfill the DSIP CCR requirement the Firm Admin must follow steps 1-5 listed above to download a PDF of the CCR from SBIR.gov and upload it to the DSIP Firm Forms to be included with all proposal submissions.

c. If the proposing firm has **NO** prior DoD and/or non-DoD Phase I and/or Phase II SBIR/STTR awards, the upload of the CCR from SBIR.gov is not required and firm will select NO. The CCR section of the proposal will be marked complete.

Volume 5 – Supporting Documents

MDA will only accept the following four documents as part of Volume 5:

1. Contractor Certification Regarding Provision of Prohibited Video Surveillance and Telecommunications Services and Equipment (Required).
2. Foreign Ownership or Control Disclosure (Proposers must review Attachment 2 in the DoD SBIR 21.3 BAA: Foreign Ownership or Control Disclosure to determine applicability)
3. Request for TABA using the MDA Phase II TABA form (optional).
4. Letters of support (optional).

If including a request for TABA, the Phase II TABA Form MUST be completed and uploaded using the "Other" category within Volume 5 of DSIP.

If including letters of support, they MUST be uploaded using the "Letters of Support" category within Volume 5 of DSIP. A qualified letter of support is from a relevant commercial or Government Agency procuring organization(s) working with MDA, articulating their pull for the technology (i.e., what MDS need(s) the technology supports and why it is important to fund it), and possible commitment to provide additional funding and/or insert the technology in their acquisition/sustainment program. Letters of support shall not be contingent upon award of a subcontract.

Any documentation other than the prohibited Video Surveillance and Telecommunications Services and Equipment form, Foreign Ownership or Control Disclosure, letter(s) of support, or requests for TABA included as part of Volume 5 WILL NOT be considered.

Volume 6 – Fraud, Waste, and Abuse Certification (Required)

All offerors must complete the fraud, waste, and abuse training that is located on DSIP.

XI. REFERENCES TO HARDWARE, COMPUTER SOFTWARE, OR TECHNICAL DATA

In accordance with the SBIR/STTR Policy Directive, SBIR contracts are to conduct feasibility-related experimental or theoretical Research/Research & Development (R/R&D). Phase II is not for formal end-item contract delivery or ownership by the Government of the contractor's hardware, computer software, or technical data.

VERSION 3

The SBIR/STTR Policy Directive states that Agencies may issue Phase II awards for testing and evaluation of products, services, or technologies for use in technical or weapons systems.

As a result, the technical proposal should not use the term "Deliverables" when referring to your hardware, computer software, or technical data. Instead use the term: "Products for Testing, Evaluation, and/or Demonstration (possibly destruction)."

The standard formal deliverables for a Phase II are the:
(a) Report of Invention and Disclosure
(b) Contract Summary Report: Final Report
(c) Certificate of Compliance: SBIR_STTR Life-Cycle Certification
(d) Status Report: Quarterly Status Reports
(e) Computer Software Product: Product Description (if applicable, for Government Testing, Evaluation, and/or Demonstration ONLY)
(f) Technical Report - Study Services: Prototype Design and Operation Document
(g) Contract Summary Report: Phase III Plan
(h) Final Summary Chart: SBIR/STTR Transition Summary Chart
(i) Government Property Inventory Report: Government Furnished Property (GFP) and Contractor Acquired Property (CAP) Listing

XII. 52.203-5 COVENANT AGAINST CONTINGENT FEES

As prescribed in FAR 3.404, the following FAR 52.203-5 clause shall be included in all contracts awarded under this BAA:

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) Bona fide agency, as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

VERSION 3

XIII. MDA PROPOSAL EVALUATIONS

MDA will evaluate DP2 proposals using scientific review criteria based upon technical merit and other criteria as discussed in this document. MDA reserves the right to award none, one, or more than one contract under any topic. MDA is not responsible for any money expended by the offeror before award of any contract.

DP2 proposals will be evaluated based on the criteria outlined below, including potential benefit to the MDS. Selections will be based on best value to the Government considering the following factors:

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 its commercialization.

Please note that potential benefit to the MDS will be considered throughout all the evaluation criteria and in the best value trade-off analysis. When combined, the stated evaluation criteria are significantly more important than cost or price.

It cannot be assumed that reviewers are acquainted with the firm or key individuals or any referenced experiments. Technical reviewers will base their conclusions on information contained in the proposal. Relevant supporting data such as journal articles, literature, including Government publications, etc., should be contained in Volume 2 and will count toward the applicable page limit. Qualified letters of support and/or requests for TABA, if included, MUST be uploaded as part of Volume 5 and will not count towards the Volume 2 page limit. Letters of support shall not be contingent upon award of a subcontract.

All Phase II awardees must have a Defense Contract Audit Agency (DCAA) approved accounting system. It is strongly urged that an approved accounting system be in place prior to the MDA Phase II award timeframe. If you do not have a DCAA approved accounting system, this will delay/prevent Phase II contract award. Please reference www.dcaa.mil/small_business/Accounting_System.pdf for more information on obtaining a DCAA approved accounting system.

Approved for Public Release
21-MDA-10737 (15 Mar 21)

VERSION 3

MDA SBIR 21.3 Direct to Phase II Topic Index

VERSION 3

MDA21-D001 TITLE: Secure Collaboration Environment

OUSD (R&E) MODERNIZATION PRIORITY: Artificial Intelligence/ Machine Learning, Cybersecurity

TECHNOLOGY AREA(S): 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: Create a secure environment for collaboration between small businesses and government personnel and provide a central location for Small Business Innovation Research (SBIR) / Small Business Technology Transfer (STTR) knowledge management.

DESCRIPTION: Industry and government organizations require access to collaborative data repositories that are tightly controlled with cyber secure protocols, Risk Management Framework (RMF) compliance, and role-based access controls, resulting in the implementation of DFARS Clause 252.204-7012, Safeguarding Covered Defense Information and Cyber Incident Reporting. This regulation can be costly to small businesses with limited resources, hindering their ability to exchange innovative ideas and research with government entities. Another challenge facing most small business employees is the inability to send encrypted emails due to the lack of a Common Access Card (CAC) or the required certificates, making secure collaboration difficult. Current processes for collaboration are not only an issue for small businesses lacking the necessary tools for security, but create an environment for the unnecessary duplication of data and a cumbersome data management environment. For example, MDA has various requirements for multiple organizational entities to manage and store data, resulting in the accumulation of storage costs and version tracking issues. There are also a number of deadlines for each group or organization that must be tracked independently by both the companies and multiple government staff. This topic seeks a mature concept for the development of a collaborative repository that:

[1] Leverages advanced techniques (i.e., Artificial Intelligence/Machine Learning (AI/ML)) techniques to ensure the security of transferring data
[2] Leverages advanced techniques (i.e., AI/ML) to organically address the data management issue to appropriately distribute and track data, including deliverables, to all relevant project participants and archival repositories
[3] Provides architectural flexibility to seamlessly integrate future plug-ins and supplemental tools (e.g., advance search engines, source code repositories, etc.)
[4] Employs two-factor authentication methods that do not restrict small businesses to the use of a CAC and/or a username/complex password combination
[5] Encrypts communication while also preserving the integrity and non-repudiation of the message
[6] Implements the Least Privilege principle
[7] Monitors and audits user activity and data movement
[8] Provides authorized users with reminders of upcoming deadlines as established in the CDRLs

VERSION 3

[9] Contains intrinsic virus scanning as part of the transfer process
[10] Capable of being deployed on a DoD unclassified network

PHASE I: This is a Direct to Phase 2 (D2P2) topic. "Phase I"-like proposals will not be evaluated and will be rejected as nonresponsive. For this topic, the Government expects that the small business would have accomplished the following in a Phase I-like effort via some other means, e.g., independent research and development (IRAD) or other source, a concept for a workable prototype or design to address, at a minimum, the basic capabilities of the stated objective above. Proposals must show, as appropriate, a demonstrated technical feasibility or nascent capability of virtual reality and/or telepresence and techniques compatible with low latency communications and/or data transfer. Proposal may provide example cases of this new capability on a specific application. The documentation provided must substantiate the proposer's development of a preliminary understanding of the technology to be applied in their Phase II proposal in meeting topic objectives. Documentation should comprise all relevant information including, but not limited to, technical reports, test data, prototype designs/models, and performance goals/results.

Feasibility documentation: Proposers interested in participating in Direct to Phase II must include in their responses to this topic Phase I feasibility documentation that substantiates the scientific and technical merit and Phase I feasibility described in Phase I above has been met (i.e., the small business must have performed a proof of concept "Phase I"-type research and development related to the topic, but feasibility documentation MUST NOT be solely based on work performed under prior or ongoing federally funded SBIR/STTR Phase I work) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of the technology as stated in Phase I above in previous work or research completed. 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 principal investigator (PI).

PHASE II: Develop and demonstrate an innovative solution satisfying, or being capable of satisfying, requirements (1) through (10) outlined in this topic's "Description" section. Conduct software scans and develop detailed documentation sufficient for the software Cybersecurity Maturity Model Certification (CMMC) process (per requirement (10)) to enable the software to be placed into a government provided test environment. Demonstrate the solution's capabilities in the government test environment and with either external or simulated external users.

PHASE III DUAL USE APPLICATIONS: Deploy the collaborative environment within the government unclassified network and relevant external non-CAC using organizations. Upgrade the solution's capabilities to fully satisfy requirements (1) through (10) and improvements based upon feedback from Phase II demonstration and initial users emphasizing security, usability, accessibility, and reliability.

REFERENCES:

1. https://www.nist.gov/system/files/documents/2018/10/18/cui18oct2018-104501145-dod_dfars-michetti-thomas.pdf
2. https://www.acq.osd.mil/dpap/policy/policyvault/USA002829-17-DPAP.pdf
3. https://csrc.nist.gov/publications/detail/sp/800-171/rev-2/final

KEYWORDS: Cybersecurity, Collaboration, Information Management, Task Management, Machine Learning, Artificial Intelligence

VERSION 3

MDA21-D002 TITLE: Algorithms for Radar Clutter Mitigation

OUSD (R&E) MODERNIZATION PRIORITY: Autonomy; Artificial Intelligence/ Machine Learning

TECHNOLOGY AREA(S): Ground Sea, Sensors

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 Artificial Intelligence/Machine Learning enhanced clutter mitigation algorithms for radars to identify targets in cluttered backgrounds.

DESCRIPTION: Viewing targets in complex radar scenes with many clutter objects, such as thrust termination or separation debris, chuff, chaff, and post intercept debris presents a challenging discrimination scene to the radar. Proposed algorithms should mitigate these issues. Desire ability to maximize lethal object discrimination in complex radar scenes using training data sets spanning a range of threats, objects, energies, and aspect angles. Proposed efforts should focus on ship based radars.

PHASE I: This is a Direct to Phase 2 (D2P2) topic. “Phase I”-like proposals will not be evaluated and will be rejected as nonresponsive. For this topic, the Government expects the small business would have accomplished the following in a Phase I-like effort via some other means, e.g., independent research and development (IRAD) or other source, a concept for a workable prototype or design to address, at a minimum, the basic capabilities of the stated objective above. Proposals must show, as appropriate, a demonstrated technical feasibility or nascent capability of virtual reality and/or telepresence and techniques compatible with low latency communications and/or data transfer. Proposals may provide example cases of this new capability on a specific application. The documentation provided must substantiate the proposer’s development of a preliminary understanding of the technology to be applied in their Phase II proposal in meeting topic objectives. Documentation should comprise all relevant information including, but not limited to, technical reports, test data, prototype designs/models, and performance goals/results.

Feasibility documentation: Proposers interested in participating in Direct to Phase II must include in their responses to this topic Phase I feasibility documentation that substantiates the scientific and technical merit and Phase I feasibility described in Phase I above has been met (i.e., the small business must have performed proof of concept “Phase I”-type research and development related to the topic, but feasibility documentation MUST NOT be solely based on work performed under prior or ongoing federally funded SBIR/STTR Phase I work) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of the technology as stated in Phase I above in previous work or research completed. 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 principal investigator (PI).

VERSION 3

PHASE II: Develop and demonstrate an innovative solution satisfying, or being capable of satisfying, project goals. Demonstrate the solution's capabilities in the government test environment and with test and validation data sets. Delivered software must be sufficiently cyber resilient and accompanied with cyber documentation to get approvals for loading on government networks that will be used for its testing.

PHASE III DUAL USE APPLICATIONS: Dual use applications might include radars for weather, navigation, air traffic control, and similar civil uses.

REFERENCES:

1. M. Liu, R. Wang and C. Hu, "Identification and suppression of clutter using machine learning method," 2019 IEEE International Conference on Signal, Information and Data Processing (ICSIDP), 2019, pp. 1-4, doi: 10.1109/ICSIDP47821.2019.9173283.
2. D. Callaghan, J. Burger and A. K. Mishra, "A machine learning approach to radar sea clutter suppression," 2017 IEEE Radar Conference (RadarConf), 2017, pp. 1222-1227, doi: 10.1109/RADAR.2017.7944391.

KEYWORDS: Artificial Intelligence, Machine Learning, radar, signal processing

VERSION 2

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY
21.3 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 http://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, DoD BAA Preface.
For general inquiries or problems with electronic submission, contact DoD SBIR Help Desk at DoDSBIRSupport@reisystems.com.

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 21.3 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**

VERSION 2

Phase II is 24 months. While NGA participates in the majority of SBIR program options, NGA does not participate in the 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/submissions/login 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.

VERSION 2

- (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) Section 508 Compliance: The contractor shall ensure that all systems, hardware, software, software engineering, and information technology associated with this effort is made in a manner that is accessible for people with the standards for people with disabilities as directed in the NGA Instruction 8400.4 and Section 508 of the Rehabilitation Act of 1973 as amended in 1998 (Section 508). Specifically, all Information and Communications Technology (ICT) associated with this contract, may use the Web Content Accessibility Guidelines (WCAG) 2.1 to comply with the Section 508 or use alternative designs or technologies which result in substantially equivalent or greater access to and use of the product for people with disabilities. Furthermore, the contractor shall pursue human centered design and usability guidelines in order to ensure that all services associated with this Topic Area are accessible by as many users as possible and as a means to drive modernization, innovation, and enhance mission support. **As part of the vendor's proposal, the vendor should include an outline specifically how Section 508 compliance will be achieved in the design of the ICT product. The proposal for Phase 2 should provide an explicit, detailed description of the approach, indicate what is planned, how and where the work will be carried out, a schedule of major events, how the solution will be Section 508 Compliant, and the final product to be delivered. The methods planned to achieve each objective or task should be discussed explicitly and in detail. If a determination is made that a Section 508 exception request is justified, the rationale for the exception request must be made and submitted as a part of the proposal.**
- (5) 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.
- (6) 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.
- (7) 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.

- (8) Foreign Citizens. Identify any foreign nationals you expect to be involved on this project.
- (9) 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
- (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. Please refer to section 4.2 of this BAA for detailed eligibility requirements as it pertains to the use of subcontractors/consultants.
- (11) 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."
- (12) 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):** See DoD SBIR Instructions on Company Commercialization Report. This material WILL NOT be reviewed by the evaluation team as part of the proposal evaluation.
- **Supporting Documents (Volume 5):** The vendor may submit supporting documents (Volume 5) but that material WILL NOT be reviewed 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 SF326, advocacy letters, etc.
- **Fraud, Waste and Abuse Training (Volume 6):** See DoD SBIR Instructions on Fraud, Waste and Abuse Training. This material WILL NOT be reviewed by the evaluation team as part of the proposal evaluation.

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.

Due to limited funding, 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.

Proposing firms will be notified of selection or non- selection status for a Phase I award within 90 days of the closing date of the BAA. The individual named as the Corporate Official on the Proposal Cover Sheet will receive an email for each proposal submitted from 21.3 BAA with their official notification of proposal selection or non-selection. 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 level of effort 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 a requirement to produce one-page monthly status reports and a more detailed interim report not later than 7½ months after award. These reports shall include the following sections:

- A monthly summary of the results of the Phase I research to date
- A monthly 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.
- 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.

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 the NGA SBIR Contracting Officer, Bernie Williams. Her email address is Bernie.C.Williams@nga.mil.

USE OF FOREIGN NATIONALS

Due to the nature of our business, only US Nationals are permitted to work on NGA topics, unless the vendor proposes the work as Fundamental Research and indicates it as such in the proposal. The use of non-US National on a NGA contract is PROHIBITTED, unless the work is scoped as Fundamental Research. If the effort is Fundamental Research, the PI must be a US National. ALL

offerors proposing to use non-US Nationals (which has not been determined as Fundamental Research) on the effort will be ineligible for award. This includes the use at universities or any other subcontractor. In the event it is determined to be Fundamental Research, non-US Nationals will be ineligible to receive controlled unclassified information as described below.

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).

CERTICATE 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.

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 and will result in the clause being pushed down to all subcontracts. Non-performance could result in cancelation of contract.**

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.

VERSION 2

NGA SBIR 21.3 Direct to Phase II Topic Index

NGA-213-1	Land Use from Nontraditional Analytics

VERSION 2

NGA-213-1 TITLE: Land Use from Nontraditional Analytics

OUSD (R&E) MODERNIZATION PRIORITY: Artificial Intelligence and Machine Learning

TECHNOLOGY AREA(S): Information Systems Technology

OBJECTIVE: This announcement seeks proposals to develop a flexible and adaptable artificial intelligence (AI) system capable of classifying fine-grained subcategories of urban land use via the fusion of imagery, remote sensing, and non-imagery geospatial data layers.

DESCRIPTION: For decades, geographers have used land use maps to quantify and depict spatial heterogeneities in land use and land cover (LULC) for purposes of land management and urban planning. These efforts have traditionally relied upon satellite imagery and remote sensing techniques to categorize LULC across a landscape1. Machine learning methods have enabled the classification of broad LULC categories in urban environments (e.g., commercial versus industrial2)], but finer grained features of urban landscapes — such as the industry of a manufacturing plant or the business sector of an office complex — can be optically cryptic and difficult to distinguish using satellite imagery and remote sensing techniques alone. A wide range of non-imagery sources of geospatial information (e.g., measures of transportation flow and connectivity; pedestrian pattern-of-life analytics; bike tracks; census data; OpenStreetMap data; etc.) offer complementary sources of information that can be fused with imagery to classify finer grained subcategories of urban land use3. However, the heterogeneous nature of these non-traditional datasets presents challenges that complicate analytic development (e.g., spatiotemporal variability in data density and coverage). The purpose of this effort is to develop and validate an adaptable AI system that can process and integrate multivariate, heterogeneous non-imagery data sources with satellite imagery to classify fine-grained subcategories of urban land use with greater accuracy than that which would be afforded by imagery and remote sensing methods alone. NGA will ONLY be accepting DIRECT to Phase II proposals for this topic.

PHASE I: Provide documentation to substantiate that the scientific and technical merit and feasibility described in the Phase II 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.

PHASE II: Develop a prototype that fuses satellite imagery and remote sensing data layers with other non-traditional non-imagery sources of geospatial information to classify land use at the neighborhood scale in three distinct areas of interest outside of the continental United States. This effort strives to integrate geospatial datasets derived from imagery and non-imagery sources to derive land use signatures that surpass those derived from imagery alone. Although the offeror may select the land use classes germane to the particular use case under investigation, the offeror is encouraged to include the following in the analysis: medical, education, government, military, commercial, industrial, residential, recreational, and undeveloped. In the proposal, the offeror should include a description of the proposed methodology, experimental plan, and validation strategy. Although deep learning approaches are encouraged, these techniques are not required to meet the objectives of this effort. Nevertheless, it is important that the methodology be scalable and adaptable to alternative use cases and inputs. The offeror should also clearly identify any proposed non-imagery data layers that will be included in the analysis, the ground truth that will be used to validate the proposed approach, and the proposed spatial areas to be investigated.

PHASE III DUAL USE APPLICATIONS: Follow-on activities are expected to be aggressively pursued by the offeror. Follow-on work is intended to transition to a secure compartmented information facility for further development in Phase III.

VERSION 2

REFERENCES:

1. Liverman D, Moran EF, Rindfuss RR, Stern PC, eds. People and Pixels: Linking Remote Sensing and Social Science (1998). Natl Acad Press, Washington, DC.
2. Huang, Bo, Bei Zhao, and Yimeng Song. “Urban Land-Use Mapping Using a Deep Convolutional Neural Network with High Spatial Resolution Multispectral Remote Sensing Imagery." Remote Sensing of Environment 214 (2018): 73–86.
3. Grippa T, Georganos S, Zarougui S, Bognounou P, Diboulo E, Forget Y, Lennert M, Vanhuysse S, Mboga N, Wolff E. “Mapping Urban Land Use at Street Block Level Using OpenStreetMap, Remote Sensing Data, and Spatial Metrics.” ISPRS International Journal of Geo-Information, 2018; 7(7): 246. https://doi.org/10.3390/ijgi7070246.

KEYWORDS: land use; land cover; artificial intelligence; machine learning; deep learning; convolutional neural network; geospatial information; pattern-of-life; transportation; social network analysis; network theory; network embedding

VERSION 2

Joint Service Small Arms Program (JSSAP)
Office of the Secretary of Defense (OSD)
21.3 Small Business Innovation Research (SBIR)
Direct to Phase II
Proposal Submission Instructions

INTRODUCTION

The Joint Service Small Arms Program (JSSAP) is participating under the OSD SBIR Program on this SBIR 21.3 Broad Agency Announcement (BAA).

Proposers responding to the JSSAP topic listed in this Announcement must follow all instructions provided in the DoD SBIR 21.3 Broad Agency Announcement (BAA) posted on the DoD SBIR/STTR website at: https://www.dodsbirsttr.mil/submissions, EXCEPT for the specific deviations listed below.

Specific questions pertaining to these instructions should be submitted to: corey.d.hall10.civ@mail.mil

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)	Award Amount	Technical Duration
OSD213-001	Not to exceed 30 pages	Base Period: $1,700,000 Option Period: **Not to exceed total award amount: $1,700,000**	Base Period: 28 months Option Period: **Total Duration: 28 months**

VERSION 2

OSD213-002	Not to exceed 30 pages	Base Period: $1,700,000 Option Period: **Not to exceed total award amount: $1,700,000**	Base Period: 24 months Option Period: **Total Duration: 24 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 21.3 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.

VERSION 2

Full proposal packages must be submitted by the date and time listed in the DoD Program BAA.

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):

- The Technical Volume must include two parts, PART ONE: Feasibility Documentation and PART TWO: Technical Proposal.
- 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.
- 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.

VERSION 2

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) must be uploaded in accordance with the instructions provided in the DoD Program BAA. Information contained in the CCR will not be considered during proposal evaluations.

METHOD OF SELECTION AND EVALUATION CRITERIA

Phase II proposals will be evaluated based on the criteria outlined in the DoD SBIR Program BAA.

NOTIFICATION OF SELECTION OR NON-SELECTION

Proposing firms will be notified of selection or non- selection status for a Phase I award within 90 days of the closing date of the BAA. The individual named as the Corporate Official on the Proposal Cover Sheet will receive an email for each proposal submitted from Corey D. Hall, Joint Services Small Arms Program, with their official notification of proposal selection or non-selection.

PROTEST PROCEDURES

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

VERSION 2

As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to:

VERSION 2

JSSAP SBIR 21.3 Topic Index

VERSION 2

OSD213-001 TITLE: Aim Augmentation for Small Caliber Weapons Systems

OUSD (R&E) MODERNIZATION PRIORITY: Artificial Intelligence / Machine Learning

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 and demonstrate a small caliber weapon system that increases the probability of hit while allowing variability in point of aim.

DESCRIPTION: There is a need for small caliber weapons systems to augment advanced weapon-mounted fire control to adjust for user point of aim. User point of aim accounts for a significant portion of the precision of a weapon system this formulates a need for a novel approach to this technical problem. The Aim Augmentation technology should allow for the shooter point of aim to be off of the intended target by as much as 30 in @ 100m and allow for the weapon to still hit its intended target. The technology should be well suited for the weapon-mounted environment: shock, power consumption and size must be appropriate for this intended use. The accuracy/drift should be sufficient that infrequent recalibration is required. The technology should be ready to integrate into prototype fire control solutions on a 7.62x51mm NATO chambered semiautomatic (threshold) or fully automatic suppressed (objective) weapon, sized appropriately for this integration, and should use currently fielded ammunition.

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 warhead is sufficiently mature to be funded at a Phase II level. Documentation showing aim augmentation systems and/or components or a related field is required. A report detailing the Phase I equivalent efforts should be included.

The Offeror is encouraged to provide any other relevant information to substantiate that the proposed technology is at an acceptable stage to be funded at the DP2 level.

PHASE II: The primary deliverables for Phase II shall be:

- A comprehensive report highlighting actual test results in operational environments. The report should address any barriers to full-rate production, potential manufacturing partners for full-rate production and design deficiencies w/ possible fixes to address any performance shortcomings
- Up to three (3) aim augmentation systems capable of being integrated by the USG into prototype fire control devices. The intended host weapon is to be chambered in 7.62x51mm NATO and capable of semiautomatic (threshold) and fully automatic (objective) fire. The system should be capable of integration of a weapon suppressor.
- A detailed Interface Control Document for the aim augmentation system that will assist the USG and/or a contractor in integrating the system into fire control devices.

VERSION 2

PHASE III DUAL USE APPLICATIONS: Virtually all small caliber weapon systems, commercial and military, would benefit from aim augmentation technology. There is a large commercial market for small arms, and much money is spent by individuals to upgrade the capability of personal firearms.

From the DoD/military side, again the technology would apply to virtually all small arms systems, but primarily to advanced next generation systems or legacy belt fed systems that generate large amounts of heat, chemical erosion, and mechanical wear from the projectile. For newly acquired systems, Program Management offices could include this technology as part of the TDP. For legacy systems, the technology could be added to TDPs as Engineering Change Proposals (ECP), and could be included in weapon system overhauls and rebuilds.

REFERENCES:

1. Fresconi, Frank., and Ilmars Celmins. "Experimental Flight Characterization of Spin-Stabilized Projectiles at High Angle of Attack" *Weapons and Materials Research Directorate, ARL*. August 2017
2. Fansler, Kevin S. and Edward M. Schmidt. “MUZZLE-BLAST-INDUCED TRAJECTORY PERTURBATION OF NONCONICAL AND CONICAL BOATTAIL PROJECTILES” *US Army Ballistic Research Laboratory*. January 1979

KEYWORDS: Barrel, probability of hit, accuracy, small caliber, small arms, fire control

VERSION 2

OSD213-002 TITLE: Versatile Warhead for Low-velocity 40mm Wall-penetrating Munition

OUSD (R&E) MODERNIZATION PRIORITY: 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 a lethal payload for the low-velocity 40mm wall-penetrating round that will be effective both against targets in defilade behind free-standing walls and against targets within enclosed concrete structures. A secondary objective of this effort will be to evaluate and optimize the versatility of the munition's jet against 8” concrete walls.

DESCRIPTION: This effort seeks to maximize lethal effects with a warhead that is effective both against targets concealed in concrete structures and those in defilade behind a free-standing wall. The warhead design must not impede the wall-penetrating efficacy of the round. Likewise, the form factor of the round must remain compatible with the M203 and M320.

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 warhead is sufficiently mature to be funded at a Phase II level. Documentation showing 40mm warhead systems and/or components or a related field is required. A report detailing the Phase I equivalent efforts should be included.

The Offeror is encouraged to provide any other relevant information to substantiate that the proposed technology is at an acceptable stage to be funded at the DP2 level.

PHASE II: The primary deliverables for Phase II shall be:

- Produce and demonstrate a preliminary prototype of the selected warhead design, measuring lethal effects beyond a free-standing wall and within a structure.
- Optimize the jet design for versatility against 8” concrete walls.
- Optimize the warhead design, and integrate the warhead in a prototype wall-penetrating munition
- Demonstrate both wall penetration and lethal effects of the prototype cartridge on a free-standing wall and on an enclosed structure. Measure accuracy of the round from an M320 launcher.
- Optimize the warhead design and prepare a prototype for delivery to Armaments Center.

PHASE III DUAL USE APPLICATIONS: From the DoD/military side, again the technology would apply to 40mm low velocity small arms systems. For newly acquired systems, Program Management offices could include this technology as part of the TDP. For legacy systems, the technology could be added to TDPs as Engineering Change Proposals (ECP), and could be included in weapon system overhauls and rebuilds.

REFERENCES:

1. Trzcinski, Waldemar A., and Lotfi Maiz. "Thermobaric and enhanced blast explosives–properties and testing methods." Propellants, explosives, pyrotechnics 40, no. 5 (2015): 632-644.

2. Olasin, Keith. "Innovative Wall Penetration Munition." PowerPoint presentation, NDIA Joint Services Small Arms Systems Annual Symposium, Exhibition, & Firing Demonstration, Virginia, VA, May 7-10, 2007. Accessed June 10, 2020. https://ndiastorage.blob.core.usgovcloudapi.net/ndia/2007/smallarms/5_10_07/Olasin_940am.pdf

KEYWORDS: counter-defilade, warheads, energetics, projectiles, thermobarics, fragmentation, submunitions.

VERSION 2

Strategic Capabilities Office (SCO)
21.3 Small Business Innovation Research (SBIR)
Proposal Submission Instructions

INTRODUCTION

The Strategic Capabilities Office (SCO) is participating under the OSD SBIR Program on this SBIR 21.3 Broad Agency Announcement (BAA).

Proposers responding to SCO topics listed in this Announcement must follow all instructions provided in the DoD SBIR 21.3 Broad Agency Announcement (BAA) posted on the DoD SBIR/STTR website at: https://rt.cto.mil/rtl-small-business-resources/sbir-sttr/.

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 SCO 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 SCO 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 solicitation 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.

DESCRIPTION OF THE SBIR THREE-PHASE PROGRAM

Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas submitted under the SBIR Program. The SCO contract period of performance for Phase I will be six (6) months, and the award will not exceed $250,000.

Proposals are evaluated using the Phase I evaluation criteria, in accordance with the DoD 21.3 SBIR Program Announcement. Proposals should concentrate on research and development which will significantly contribute to proving the scientific and technical feasibility of the proposed effort, the successful completion of which is a prerequisite for further DoD support in Phase II. The measure of Phase I success includes technical performance toward the topic objectives and evaluations of the extent to which Phase II results would have the potential to yield a product or process of continuing importance to DoD and the private sector.

Subsequent Phase II awards will be made to firms on the basis of results from the Phase I effort and the scientific and technical merit of the Phase II proposal in addressing the goals and objectives described in the topic. Phase II awards will typically cover two to five person-years of effort over a period generally not to exceed 24 months (subject to negotiation), with a dollar value up to $1.5 million. Phase II is the principal research and development effort and is expected to produce a well-defined deliverable prototype or process. A more comprehensive proposal will be required for Phase II. In order for a small business to be considered for a Phase II award, the firm must be a recipient of a Phase I award under this topic.

VERSION 2

All Phase I awardees will be allowed to submit a Phase II proposal for evaluation and selection. The details on the due date, content, and submission requirements of the Phase II proposal will be provided by the awarding technical point of contact and/or the contracting officer by subsequent notification. If executed, Phase II and III may require access to classified information.

DoD is not obligated to make any awards under Phase I, II, or III. For specifics regarding the evaluation and award of Phase I or II contracts, please read the DoD Solicitation Instructions very carefully. Phase II proposals will be reviewed for overall merit based upon the criteria in the DoD 21.3 SBIR Program Announcement.

These instructions are for Phase I proposals only. Any proposal submitted under prior SBIR solicitations will not be considered under this solicitation; however, offerors who were not awarded a contract in response to a particular topic under prior SBIR solicitations are free to update or modify and submit the same or modified proposal if it is responsive to any of the topics listed in this section.

TECHNICAL INQUIRIES

During the Pre-release Period of the DoD 21.3 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 sbir@sco.mil, or posted in the online DSIP Topic Q&A – 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 DSIP Topic Q&A.

PROPOSAL SUBMISSION

In order to participate in the SCO 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 atDoDSBIRSupport@reisystems.com (9:00 a.m. to 5:00 p.m. ET).

SCO will only accept proposals that are submitted through the on-line submission site. The submission site does not limit the overall file size for each electronic proposal; however, there is a 10-page limit for the Technical Volume. File uploads may take a great deal of time depending on your file size and your internet server connection speed. If you wish to upload a large file, it is highly recommended that you submit your proposal early and prior to the deadline submittal date, as the last day is heavily trafficked. You are responsible for performing a virus check on each Technical Volume file to be uploaded electronically. The detection of a virus on any submission may be cause for the rejection of the proposal.

Proposals shall be submitted in response to a specific topic identified in the topic description section following these instructions. The topics listed are the only topics for which proposals will be accepted.

A complete proposal consists of the following proposal volumes:

Volume 1: Proposal Cover Sheet

Volume 2: Technical Volume 10 Pages

Volume 3: Cost Volume (up to $250,000 for a 6-month period of performance)

Volume 4: Company Commercialization Report (CCR). The CCR allows companies to report funding outcomes resulting from prior SBIR and STTR awards. Information contained in the CCR will not be considered during proposal evaluations.

Volume 5: Supporting Documents

a. Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Attachment 1) (REQUIRED)
b. Foreign Ownership or Control Disclosure (Proposers must review Attachment 2: Foreign Ownership or Control Disclosure to determine applicability.)

Volume 6: Fraud, Waste and Abuse Training (REQUIRED)

Refer to the DoD SBIR Program BAA for full details on proposal requirements and preparation.

SCO SBIR PROGRAM POINT OF CONTACT:
Inquiries concerning the SCO SBIR Program should be addressed to sbir@sco.mil.

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: sbir@sco.mil

NOTIFICATION OF SELECTION OR NON-SELECTION:
Proposing firms will be notified of selection or non- selection status for a Phase I award within 90 days of the closing date of the BAA. The individual named as the Corporate Official on the Proposal Cover Sheet will receive an email for each proposal submitted from sbir@sco.mil with their official notification of proposal selection or non-selection.

VERSION 2

SCO SBIR 21.3 Phase I Topic Index

SCO213-001 Novel Spacecraft Power Supply

VERSION 2

SCO 213-001 TITLE: Novel Spacecraft Power Supply

OUSD (R&E) MODERNIZATION PRIORITY: Space

TECHNOLOGY AREA(S): Space Platform

OBJECTIVE: Develop alternative power sources for spacecraft to provide operational or design improvements over traditional solar power systems.

DESCRIPTION: The DoD is seeking functional alternative power source options to enable novel spacecraft designs and payload operations. The power source must be scalable to support ESPA-class spacecraft variants (1/4, 1/2, full ESPA, ESPA-Grande) and must be either mass-efficient compared to traditional power systems, enable a significantly unique design, distinct application, or both. Power source concepts must be capable of operating for at least 1 year in common orbits and in space environment conditions (low earth orbit, geosynchronous earth orbit, transfer orbit, in vacuum, in dynamic thermal conditions, etc.). Power systems may be fully standalone or auxiliary in expected function (e.g., intended to meet all spacecraft power needs for the entirety of the satellite's operational life, act as an auxiliary power source to a traditional system, provide power to a particular payload only and not an entire spacecraft, etc.).

Proposals must describe in detail how the proposed solution will provide power to a notional spacecraft, what unique applications are enabled by the proposed technology (if any) and/or how this technology would support more standard applications, and what notable challenges (radiation hardening, form factor, technical nascence, etc.) will be addressed during this SBIR program. As necessary for lower technical readiness level technologies, proposals should provide academic or similar reference materials to verify the viability of the foundational mechanics involved with the power source.

PHASE I: This phase will develop the preliminary power source design for space qualification, model scalable power performance, and investigate unique spacecraft design considerations necessary to utilize the power source. At the close of this SBIR phase, awardees will deliver to the government:

1. Study report detailing power system conceptual design, expected and scaled (ie, cubesat, ½ ESPA, ESPA Grande classes, etc.) power system performance, (if any) refined enabled application concepts based on design maturation, and preliminary spacecraft design considerations and recommendations that address issues identified within the proposal and/or during the study itself. This report will be delivered electronically and results will be summarized during a study outbrief.
2. Schedule and Cost Estimation for development, manufacture, and delivery of 3 prototype power source test units to inform Phase 2 planning and determinations

PHASE II: Should a Phase 2 follow-on effort be awarded, Phase II is expected to develop a preliminary spacecraft prototype design that incorporates the power source design developed in Phase 1, will deliver power source prototype test units, and then, as required, support and/or execute a series of ground space-environment testing to verify space environment functionality of the power source. Phase 1 work should be accomplished with this goal in mind.

PHASE III DUAL USE APPLICATIONS: Developed alternative power sources could enable both commercial and military applications that are not suited for or would be otherwise limited by solar power systems. Applicable dual use applications could include emergency or on-demand spacecraft power supply, more mass-efficient spacecraft design and manufacture, and novel payload support.

REFERENCES:

VERSION 2

1. ESPA user guide (ref for sizing/scaling in SBIR): https://elibrary.gsfc.nasa.gov/_assets/doclibBidder/tech_docs/Moog_ESPA_UsersGuide%20-%20Copy.pdf;
2. NASA power supply roadmap: https://www.nasa.gov/sites/default/files/atoms/files/2015_nasa_technology_roadmaps_ta_3_space_power_energy_storage.pdf

KEYWORDS: Electric Power System, Satellite, Spacecraft, Power, Power Source, Solar Power, Solar Array, Battery

VERSION 2

STRATEGIC CAPABILITIES OFFICE (SCO)
21.3 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 2021.3 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 2021.3 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 PROCESS	SCO D2P2
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:

VERSION 2

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
    Part 2: Phase II Technical Proposal
c. Cost Volume (Volume 3)
d. Company Commercialization Report (Volume 4)
e. Supporting Documents (Volume 5)
f. Fraud, Waste, and Abuse (Volume 6)

The SCO SBIR Program is accepting Volume 5 (Supporting Documents). This volume should not exceed 10 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 (14 pages Maximum)**

1. **Phase I Justification:** 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:** 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 the DoD BAA Preface. 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.

VERSION 2

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 maybe 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.

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.

Access to CUI is required for performance on this contract. IAW DoDI 5200.48, EO 13556, 32 CFR Part 2002, NIST SP 800-171 Rev 1, DFAR Supplement Clause 252.204-7012 as amended, and applicable guidance provided by the CSA, certain types of information require safeguarding or dissemination controls to ensure it is not released improperly. CUI categories include, but are not limited to: (1) Procurement and Acquisition Information (i.e., contractor proposals and source selection information), (2) Proprietary Data (i.e., information protected under the Trade Secrets Act, 18 USC §1905), (3) Export Restricted or Controlled Technology (e.g., defense articles and technical data restricted by the International Traffic in Arms Regulations (ITAR), 22 CFR §§120-130), (4) Program-specific Financial Data, (5) Limited Distribution Unclassified Intelligence Information, (6) Law Enforcement Sensitive Information, (7) Personal Identifying Information (PII), (8) Critical Infrastructure, (9) North Atlantic Treaty (NATO) Restricted or Unclassified Information, (10) DoD Unclassified Controlled Nuclear Information. At a minimum, all SCO technical program information should be marked as CUI.

All organizations participating in SCO programs have an OPSEC requirement.
Due to SCO's increased media attention and the high potential for adversaries to target/collect program data, properly applied OPSEC measures must be taken into account to protect sensitive unclassified information. The PM at each work location (government and industry) is responsible for the protection of both unclassified and classified SCO technical program information. The PM will: (1) Not provide any SCO technical program information (unclassified or classified) to any individual or organization (this includes periphery program support; contracts, finance, etc.), until they have read and understand program-specific security requirements (This applies only if the individual has a Need- To-Know (NTK) for technical program information for execution of their duties.

7. TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The SCO SBIR Program will not participate in the Technical and Business Assistance.

8. 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 (Volume 4 of proposal submission). In addition, please send any corresponding Phase III documents in PDF format to: sbir@sco.mil. Information contained in the CCR will not be considered during proposal evaluations.

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.

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: sbir@sco.mil

NOTIFICATION OF SELECTION OR NON-SELECTION
Proposing firms will be notified of selection or non- selection status for a Phase II award within 90 days of the closing date of the BAA. The individual named as the Corporate Official on the Proposal Cover Sheet will receive an email for each proposal submitted from sbir@sco.mil with their official notification of proposal selection or non-selection

VERSION 2

SCO SBIR 21.3 Direct to Phase II Topic Index

VERSION 2

SCO 213-002 TITLE: Midpoint and tactical data aggregation to enable cyber operations

OUSD (R&E) MODERNIZATION PRIORITY: Cybersecurity

TECHNOLOGY AREA(S): 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 unsupervised, automated, and encrypted or secure means of exploiting machine learning algorithms in adversary space (midpoint or cloud-based aggregation points) to evaluate and securely exfiltrate only data of relevance to the government missions. The government must have the ability to specify how reporting is generated based on confidence thresholds of data screening, and primarily security of data during exfiltration and at rest (during investigation / inquiry).

DESCRIPTION: Securely exfiltrating or transferring data from a midpoint of aggregation into U.S. owned networks at a speed and quantity sufficient to support intelligence or operational needs represents a significant technical challenge to cyber and information warfare operations. The objective desired is secure, data transfer with low or no probability of detection from a point of presence in an adversary network, on a midpoint or cloud-based aggregation point. The SBIR would propose a manner of on sight or in situ analysis to decrease the size and amount of data copied and removed from that network or cloud. The method of obfuscation, encryption, or non-attributable exfiltration are key requirements for any proposed solution. 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 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.

Currently, exfiltrated data is backhauled to appropriate government systems for analysis and action. The logistics of this extensive data supply chain process is both expensive and time consuming, negatively impacting the speed to mission. By deploying analysis tools in a gray-space/midpoint aggregation architecture, the process can take advantage of data timeliness and overcome backhaul and storage constraints by applying advanced, encrypted filter and selection, and return only the most relevant, pre-selected data. This will decrease data exfiltration requirements and detection while increasing speed of analysis.

Proposed solutions should be able to integrate into existing infrastructures and workflows and scale for use across multiple domains and also allow aggregated data to maintain a low probability of detection in lower trust environments while sensitive operations (search, watch listing, analytics,) are conducted. 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 a successful operational prototype with full

government use rights. Awardees may use any developed efforts for other governmental or commercial opportunities, including continued service support in any Phase III options.

PHASE I: Documentation should be provided to allow government to make a feasibility determination to proceed direct to Phase II. This could include but is not limited to: examples or the technologies used in existing controlled scenarios or on wholly owned networks. Where else is the proposed encryption, transfer and analytical software used? How does it function? What are the technical limitations and requirements? How much memory is required? How much bandwidth? Processing time? Does it require software installed locally? Or is it accessible via remote solutions? Any reports on current use addressing Software Development Kit (SDK) size, analytical and processing speed, security of encryption and or packet transfer times along with availability and reliability reports (how often does the system go off line or require reprograming, software rewrites, and or updates? Any possible training available and time to train to use, and mastery levels, if required?

PHASE II: SCO will accept DP2 proposals for a cost of up to $1.5M for 24 months. The minimum required deliverable would be demonstration of the technology in a proxy 'adversary owned' network or cloud of the prototype technology allowing secure, low probability non-attributable exfiltration of selected data from a 'neutral' cloud.

PHASE III DUAL USE APPLICATIONS: Commercial applications would include providing select data from cloud environments for data analytics including support of machine learning and artificial intelligence for trend analysis and anomaly detection. This could reduce storage dependency and redundancy allowing cloud storage of most data and select targeted transfer of valued data. Awardees may use any developed efforts for other governmental or commercial opportunities, including continued service support in any Phase III options. Private sector commercial potential includes using the developed tools in a network security environment for data transfers either as a service provider or as a supplier to network security service providers. DOD and Military application of Midpoint and tactical data aggregation to enable cyber operations include intelligence gathering, cyber network analysis, target development, indications and warning, as well as transfer of technical data.

REFERENCES:

Williams, Ellison Anne. "Practical Homomorphic Encryption: Three Business Use Cases." *Forbes* Forbes Technology Council post, Aug 10, 2020 www.forbes.com/sites/forbestechcouncil/2020/08/10/practical-homomorphic-encryption-three-business-use-cases/?sh=bee4b9a2a460

Williams, Ellison Anne. "Homomorphic Encryption: Myths and Misconceptions." *Helpnet security* Feb 18 2021 www.helpnetsecurity.com/2021/02/18/homomorphic-encryption-myths-misconceptions/

Williams, Ellison Anne. "Encrypting data on the Internet of Battlefield Things." Video *C4ISRNET* June 11 2019. https://www.c4isrnet.com/video/2019/06/12/encrypting-data-on-the-internet-of-battlefield-things//

KEYWORDS: Encryption, AI, ML

SCO 213-003 TITLE: High Throughput Photonic Processor for AI/ML programs

OUSD (R&E) MODERNIZATION PRIORITY: Artificial Intelligence/ Machine Learning

TECHNOLOGY AREA(S): Information Systems

OBJECTIVE: The objective of this photonic processor is to address the need of a high throughput AI/ML processor that can address full sensor resolution output without the need for pre-filtering potential throughput of 480 frames per sec or 88k targets filtered and identified in 3 minutes. A one-step over a two-step inference process. All this capability could fit into a 1 or 1.5U rack system. The current processors are an adaptation of GPU and CPU performance that does not meet the Transition Partners' performance needs of throughput, weight, power, thermal, and size.

Phase II effort will use the latest photonic LED/LCD technology to accomplish photonic processor for automatic target recognition (ATR) of various sensor (i.e., E/O, MWIR, SAR, ISAR, etc.) inputs at a throughput >75k fps at full 4K imagery. A secondary goal would be to complete a study that 1) addresses ≥100k fps and throughput ≥8K imager resolution, and 2) addresses counter-adversarial issues.

DESCRIPTION: This SBIR topic 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 maximum funding limits. During the first 12 months of the SBIR Phase II effort, neither SCO, nor its partners, will provide access to any training material, government furnished information, or equipment.

Digital processing technology is reaching its limitation as circuit resolution is now at single-digit nano- (10^-9 m) resolution compared to 1995 of single-digit micron- (10^-6 m) resolution. Resolution at this level at or near the quantum level of circuitry that affects the binary processing results of 1s and 0s only. In approaching the quantum state the system must address the fact that electrons have mass and issue that Heisenberg's uncertainty principle states that it is impossible to measure or calculate exactly, both the position and the momentum of an object. Therefore, it is impossible to know if the value is on/off or 1 or 0 or both.

As an alternative, photons can serve the same function of processing and do not have mass. Without mass, the photonic processes are not bound by Heisenberg's uncertainty principle. At the same time a photonic processor in the 1990s was built to process 2,500 images per second in the identification of image content and was referred to as Automatic Target Recognition (ATR). This processor, using current LED and camera technology could do far faster processing and identification. A processor would be used to do training of known target types, i.e., car vs trucks, commercial vessel types, fingerprint types, or famous artist painting at the unclassified level.

Application can use any type of photonic processor to address training and inference processing together or separately. Such system includes but are not limited to: Correlator (4f inference), Fourier Optics (2f), photonic quantum (inference), optical based FFTs, etc. Key is that such systems should be low power, low heat transfer, and small footprint.

Proposals must:

- Describe in detail how the proposed solution will take sensor data and provide a repeatable topological solution via a SCO approved test and evaluation (T&E) process.
- Must develop a Zemax tool, or equivalent, within the first 9-months to describe the photonic system design and performance to receive government approval.
- Must use the latest photonic 4K imaging technology or proven next-generation technology.

Proposals will:

- Provide a detailed description of training criteria and applicable evaluation schema. It should also

explain the topological criteria for assessing imagery, and any non-selected criteria with reason why it was not used in the system.
- Identify and explain all featurettes of training associated with various levels of the topology.
- Address the use of Photonic RGB pixels technology for gray-scale processing.
- Deliver two studies:
  1. To explore next generation photonic capability with greater throughput and resolution,
  2. To assess counter-adversarial capability over current neural network capability.

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:
- A successful prototype processor with full government use rights in a U rack configuration
- Associated artifacts of all documentation required to replicate the build and use of the processor for both training and inference use. 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.
- Fully trained dictionary to include at least two sensor packages.
- If applicable, any open source behavior or signatures analysis and analytical tools being used, and the source for each
- A completed Study on:
  1. Next generation throughput (fps) and imagery resolution (≥8K) capabilities, including component sources, and
  2. Counter-adversary advantages/weakness of a photonic processor over current neural network GPU processor.

Awardees may use any developed efforts for other governmental or commercial opportunities, including continued service support in any Phase III options. The government shall have unlimited use rights to the resulting hardware, software, algorithms, dictionaries or other deliverables from this SBIR.

PHASE I: Feasibility study to be included in tech volume per proposal submission instructions.
A study will address plan system design/performance and address potential photonic risks. It must also address the specifications of size, weight, and heat transfer. Secondary would be addressing cybersecurity aspects of such a system. And finally, would like to the study to define classification plan, sources of unclassified training data, and understanding/exploitation of training featurettes and those advantages over traditional neural network approaches. The Program manager would like to see, if applicable any component or system demonstrations.

PHASE II: SCO will accept DP2 proposals for a cost of up to $1.5M for 24 months.
Use of Phase 1 information to build a working model of the Photonic processor for 3rd party laboratory evaluation, based on existing training data set provided by performer. SCO is looking for expertise to address 2020+ technology to address a photonic (optical) process a performance factor of 20x that of the 1990 capability of 2,500 images per second to collect imagery with a screen resolution of 2K or better. Such a system would use a combination of or existing open source neuro network operating libraries or operating systems, such as Python, Strawberry, PennyLane, Torch, TensorFlow, and others. The program manager would like delivery of working system and appropriate use and training documentation as well as a study on the cybersecurity risks for such a photonic system.

PHASE III DUAL USE APPLICATIONS:
Commercial applications can include but not limited to: Medical (i.e., breast or colon cancer nuclear imagery), Biometrics (i.e., non-minutia fingerprint identification and gender classification), Civil Mass Video network (i.e., highway or street Amber alert identification), next generation Self-driving vehicles, and complex drome swam multi-dimensional maneuvers. Private sector commercial potential includes uses in medical radiology imagery, autonomous vehicles, residential video security, and traffic/pedestrian city camera systems.

REFERENCES:

1. Miniature Ruggedized Optical Correlator (MROC) for flight testing, SPIE Vol. 2237 Optical Pattern Recognition V, 01 March 1994;
2. MROC module for Space, SPIE Vol. 3124 • 0277-786X197, 17 Oct 1997;
3. MROC module -3rd Gene, SPIE Vol. 3386 • 0277-786X1981, 23 March 1998;
4. Use of Laser Radar Signal Processing in optical pattern recognition, Mar 1998;
5. Pattern Recognition Prototyping Tool, Nov 1997; Recognition System Rapid Application Prototyping Tool, Mar 1997;
6. Second Generation Miniature Ruggedized Optical Correlator (MROC) module, Mar 1997;
7. Performance of a second-generation miniature ruggedized optical correlator module, Oct 1997;

KEYWORDS: Machine Learning, Processor Throughput, Photonic processor.

VERSION 3

UNITED STATES SPECIAL OPERATIONS COMMAND
21.3 Small Business Innovation Research (SBIR)
Phase I Proposal Submission Instructions

In addition to the formal announcement period, the USSOCOM SBIR/STTR Program Office will be hosting a virtual USSOCOM Industry Day on 22 September 2021 for Topic Number SOCOM213-003 only to further delineate requirements and stimulate small business/research institute partnership-building. Please visit https://events.sofwerx.org/sbir21.3/ for more information.

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 21.3 Program Broad Agency Announcement (BAA). A thorough reading of the "Department of Defense Small Business Innovation Research (SBIR) Program, SBIR 21.3 Program Broad Agency Announcement (BAA)" 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.

Table 1: Consolidated SBIR Topic Information

Topic	Technical Volume (Vol 2)	Additional Info. (Vol 5)	Period of Performance	Award Amount	Contract Type
Phase I SOCOM213-002	Not to exceed 5 pages	15 page PowerPoint	Not to exceed 6 months	NTE $150,000.00	Firm-Fixed-Price
Phase I SOCOM213-003	Not to exceed 5 pages	15 page PowerPoint	Not to exceed 6 months	NTE $150,000.00	Firm-Fixed-Price
Phase I SOCOM213-004	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 SOCOM213-003 may 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. SOCOM213-003 SBIR contract awards may be done through SOFWERX and result in a commercial contract between the firm and DEFENSEWERX. DEFENSEWERX will not conduct the evaluation of SOCOM213-003. The Government will conduct all evaluations for all topics. The Government will award all SBIR contracts for SOCOM213-002 and SOCOM213-004.

VERSION 3

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 21.3 Program BAA, all questions must be submitted in writing either by e-mail to sbir@socom.mil or to the online Defense SBIR/STTR Innovation Portal (DSIP) Topic Q&A. All questions and answers submitted to DSIP 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 the DoD SBIR 21.3 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 the DoD SBIR 21.3 Program BAA Instructions. USSOCOM does not allow inquirers to talk directly or communicate in any other manner to the topic authors (differs from the DoD SBIR 21.3 Program BAA instructions).

Site visits will not be permitted during the Pre-release and Open Periods of the DoD SBIR 21.3 Program BAA.

Proposal Volumes: Proposal Volumes are key in the qualification of the proposal. Offerors shall complete each of the following volumes. Those volume are (1) Cover Page, (2) Technical Volume, (3) Cost Volume, (4) Company Commercialization Report, (5) Pitch Day Presentation, and (6) Fraud, Waste and Abuse Training.

Volume 1: Cover Page is created as part of the DoD Proposal Submissions process.

Volume 2: Technical Volume
The Technical Volume page count will include all the required items under the DoD SBIR 21.3 instructions and shall **not exceed 5 pages**. There is no set format for this document.

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 the "Foreign Nationals" section of the DoD SBIR 21.3 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**.

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 (CCR)

VERSION 3

CCR is required to be submitted with proposals in response to USSOCOM 21.3 SBIR topics. Please refer to the DoD 21.3 SBIR BAA for full details. Information contained in the CCR will not be considered during proposal evaluations.

Volume 5: Supporting Documents (Pitch Day Presentation and Section K)
In addition to the documentation outlined in the DoD SBIR Program BAA, the following must also be included with Volume 5: (1) the Pitch Day presentation and (2) Section K.

(1) Pitch Day Presentation: Potential Offerors shall submit a slide deck **not to exceed 15 PowerPoint slides (inclusive of the cover sheet).** There is no set format for this document. 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 suitable for the 30 minutes presenting. Refer to the "Phase I Evaluations" Section of this instruction for more details.

(2) Section K: If Section K is not submitted with the proposal, the proposal will not be considered non-responsive, but, the completed Section K shall be required at the time of award.

Volume 6: Fraud, Waste and Abuse Training
Fraud, Waste and Abuse (FWA) training is required for Phase I and Direct to Phase II proposals. Please refer to the DoD 21.3 SBIR BAA for full details.

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.
7) Discretionary Technical and Business Assistance

Phase I Evaluations:

USSOCOM evaluates Phase I proposals using the evaluation criteria specified in the DoD 21.3 SBIR Announcement with the following exceptions:

1. Proposals missing any of the six stated volumes or does not comply with the 2/3rd rule will not be evaluated. Likewise, proposals e that exceed the maximum price allowed as per Table 1 of these instructions will be considered to be non-responsive.

2. The technical evaluation will utilize the Evaluation Criteria provided in DoD SBIR 21.3 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 the DoD SBIR 21.3 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 Government question and answer period) to the USSOCOM technical evaluation team, using virtual teleconference. This will be a technical presentation only of the proposed solution and the key personnel listed in the proposal should be conducting the presentation and responding to the questions of the evaluation team. This presentation is NOT intended for business development personnel, it is purely technical. Selected Offerors shall restrict their Pitch Day presentations to only the 15 page PowerPoint presentations that were submitted with their respective proposals. There will be no changes or updates to the presentations from what was proposed. All selected firms will be required to provide teleconference information for the presentation. This presentation will complete the evaluation of the proposal the panel did against the criteria listed under the DoD SBIR 21.3 BAA. Notifications of selection/non-selection for Phase I award will be completed within a timely manner.

3. The Cost Volume (Volume 3) evaluation:
   For this Phase I, the award amount is set at a not to exceed (NTE) amount and a technical evaluation of the proposal cost will be completed to assess price fair and reasonableness. Proposals above the established NTE for the Phase I 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, subcontractors and consultants (scope of work, expertise, participation and proposed effort), and other direct cost as proposed.

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 SOCOM213-003, the Defensewerx (also known as SOFWERX) may notify each Offeror whether they have been selected for award. Otherwise, the notifications will be sent out by the Government Contracting Officer. The e-mail notification will be sent to the Corporate Official (Business) identified by the Offeror.

For topics SOCOM213-002 and SOCOM213-004, 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 the "Debriefing" section of the DoD SBIR 21.3 Announcement.

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 the Contracting Officer (KO) from which the notice was generated and sent from.

USSOCOM SBIR Program Point of Contact:

Inquiries concerning the USSOCOM SBIR Program and these proposal preparation instructions should be addressed to sbir@socom.mil.

VERSION 3

SOCOM SBIR 21.3 Phase I Topic Index

VERSION 3

TOPIC: SOCOM213-002 TITLE: Concentrated Atropine Sulfate Formulations

TECHNOLOGY FOCUS AREAS: Biotechnology Space

KEY TECHNOLOGY AREAS: Chemical/Biological Defense, Biomedical

OBJECTIVE: Develop a novel stable, injectable, high concentration atropine sulfate (AS) formulation in a multi-dose vial to facilitate ease of treatment for severely poisoned nerve agent casualties in austere settings

DESCRIPTION: Organophosphorus nerve agents are highly toxic chemicals and difficult to treat. Exposure to nerve agents occurs through multiple routes, including dermal, ocular, ingestion, inhalation and mucous membranes. Severe effects from nerve agent exposure include respiratory failure and death. Nerve agent casualties require immediate and rapid administration of medical countermeasures (MCM). The current Service member-carried MCM therapeutic regimen for nerve agent exposure includes autoinjectors containing atropine (an anticholinergic), the cholinesterase reactivator, 2-PAM (2-pyridine aldoxime methyl chloride (pralidoxime)), and an anticonvulsant, to decrease morbidity and mortality. The Antidote Treatment Nerve Agent Autoinjector (ATNAA) sequentially delivers atropine (2.1 mg) and 2-PAM (600 mg) via intramuscular injection through a single needle. The ATNAA is designed for automatic self- and buddy-aid administration by military personnel as soon as possible after the onset of symptoms of nerve agent exposure. The Service Member will receive 3 ATNAAs if exhibiting severe signs of nerve agent exposure. Additional atropine can be administered by a medic or physician to block severe and life-threatening muscarinic effects of nerve agent poisoning. In severe cases, 50 to 100 mg of atropine may be needed over a period of 24 hours to control cholinergic symptoms. Using commercially available 0.4 mg/ml atropine vials would require approximately 13 vials to treat a single severely poisoned casualty.

The United States Special Operations Command (SOCOM) is interested in a concentrated vialed atropine formulation to ease administration of large amounts of atropine to control cholinergic symptoms of poisoned individuals under operational conditions. Formulations of sufficient concentration to make dosing 2 mg atropine bolus injections easy is desired. For example, a 4.0 mg/ml solution would require 0.5 ml to deliver a 2.0 mg dose. A multi-dose vial containing a higher concentration of AS would significantly decrease the logistical burden associated with having to use multiple vials to treat a single nerve agent casualty, thereby simplifying dosing, and decreasing material costs, medical waste, and storage needs. As atropine solutions are light sensitive, vials should be of appropriately sealed, pharmaceutical grade light restricting glass, as is routinely used for injectable drug formulations. Suitable vial sizes amenable to being carried by medical personnel into operational conditions range from 10 to 20 ml. Appropriate consideration for the inclusion of bacteriostatic and antimicrobial agents for use in austere, non-sterile environments is desired. Commercial formulations of AS for injection are marketed with a shelf-life of 2 years at 25 ± 2°C / 60% ± 5% RH and transient excursions. Given the nature of military operations, improvements in formulation stability to endure prolonged excursions are of interest.

PHASE I: Demonstrate the feasibility of a concentrated AS formulation in a multi-dose vial, developed under International Conference on Harmonization (ICH) Pharmaceutical Development Guidelines, to meet stability and quality requirements. Employing USP grade AS for preliminary studies is acceptable. Formulations should be evaluated against a U. S. Food and Drug Administration (FDA)-approved, AS formulation, which is available as USP sterile, non-pyrogenic

isotonic solution of atropine sulfate monohydrate in water for injection. Stability assessments could employ forced degradation and initial real time testing for measuring the atropine drug substance and development of degradants at targeted temperatures and relative humidity conditions: refrigerated (2-8°C), room temperature (25 ± 2°C / 60% ± 5% RH), stressed (40 ± 2°C / 75% ± 5% RH), and transient excursions as required to comply with FDA regulations.

PHASE II: Conduct further evaluation, improvements, and stability enhancements of the novel candidate formulations. Analytical testing may be performed to determine the presence and concentrations of extractables and leachables**.** Studies may determine the effects of potential stability enhancement techniques as needed, such as utilization of head-space nitrogen purge, vacuum seal, or others as needed to promote controlled storage stability to two years, as well as operational stability. Operational stability could be demonstrated by exposing the vial to temperature extremes. A syringe needle puncture study may be performed to evaluate up to 28-day drug stability (28 days at 2-8°C and 25 ± 2°C / 60% ± 5% RH). If indicated, the performer may evaluate the alternative use of lyophilization as dry powder stability enhancer after reconstitution with bacteriostatic saline, sterile water for injection or other appropriate solution. Antimicrobial agents may also be assessed. The performer may determine the shelf-life stability of the lyophilized powder if indicated under vacuum seal or nitrogen purge. A 28-day stability study might be conducted to determine shelf-life after reconstitution.

PHASE III DUAL USE APPLICATIONS: Develop scale-up processes and technology transfer protocol for pilot lot and GMP production. Develop regulatory strategy for commercialization and initiate interactions with the FDA. A more concentrated, multi-dose vialed atropine could reduce the logistical burden associated emergency medical personnel having to use multiple lower concentration vials to treat nerve agent casualties in the civilian sector, as well as the Department of Defense. Successful completion of all three phases under this solicitation will support small business valuation by confirming technical merit that invites further investment. This award mechanism will bridge the gap between laboratory-scale innovation and entry into a recognized FDA regulatory pathway leading to approval and commercialization.

References:

1. Selection of the Appropriate Package Type Terms and Recommendations for Labeling Injectable Medical Products Packaged in Multiple-Dose, Single-Dose, and Single-Patient-Use Containers for Human Use. Guidance for Industry. *Division of Drug Information, Center for Drug Evaluation and Research, FDA*. FDA-2015-D-3438. 2018
2. Allowable Excess Volume and Labeled Vial Fill Size in Injectable Drug and Biological Products. Guidance for Industry. *Division of Drug Information, Center for Drug Evaluation and Research, FDA.* June 2015 Pharmaceutical Quality/CMC. 2015
3. International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use. ICH Harmonized Tripartite Guideline. Pharmaceutical Development Q8 (R2). 2009.
4. Lee et al. 2010; Single versus Multi-Dose Vaccine Vials: An Economic Computational Model. Vaccine. 2020 July 19; 28(32): 5292-5300.

KEYWORDS: atropine; chemical nerve agent; medical countermeasure; drug formulation

VERSION 3

SOCOM213-003 TITLE: Stand-Off Precision Guided Munitions in a Contested Environment

TECHNOLOGY FOCUS AREAS: Microelectronics; Network Command, Control and Communications; Autonomy; Artificial Intelligence/ Machine Learning; General Warfighting Requirements (GWR)

TECHNOLOGY AREAS: Air Platform; Sensors; Electronics; Weapons

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 applied research toward an innovative capability to employ Stand Off Precision Guided Munitions (SOPGM) in a Global Positioning System (GPS) Contested Environment. SOPGMs of topic are launched from a Common Launch Tube (CLT) on Air Force Special Operations Command (AFSOC) aircraft.

DESCRIPTION: Innovative research on this topic is open to a variety of innovative CONOPS and technology implementations. The proposed innovative solution may be a CLT compatible addition to the existing SOPGM Family of Munitions which currently includes the AGM-176 Griffin and GBU-69/B Small Glide Munition (SGM). To fit in the Systima CLT, a munition must be no greater than 100 pounds, 42 inches in length, and 5.95 inches in diameter. The proposed innovative solution may augment or replace the existing GPS signal for Position, Navigation, and Timing (PNT) or provide a novel approach to navigate the munition to the target. As a part of this feasibility study, the proposers should address all viable overall system design options and investigate the capability trade space as it relates to CONOP, mission profile, accuracy, range, data link, environmental considerations, mid-course and terminal guidance.

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, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study on a Stand-Off Precision Guided Munitions (SOPGM) in a Contested Environment.

VERSION 3

PHASE III DUAL USE APPLICATIONS: This system could be used in a broad range of military applications where a requirement exists for delivery or placement of payloads, sensors, or munitions inside a GPS Contested Environment.

REFERENCES:

1. Systima Technologies, Inc, Aircraft Payload Integration, Common Launch Tube (CLT) https://www.systima.com/aircraft-payload-integration/

2. Systima Technologies Hits Major Milestone in Launch Tube Deliveries, 12 March 2019, https://www.systima.com/blog/systima-technologies-hits-major-milestone-in-launch-tube-deliveries/

3. SOCOM Replenishing Precision-Guided Weapon Stockpiles https://www.nationaldefensemagazine.org/articles/2018/5/11/socom-replenishing-precision-guided-weapon-stockpiles#:~:text=Dynetics%27%20standoff%20precision%2Dguided%20munition,systems%2C%20according%20to%20the%20company.&text=The%20kits%20will%20provide%20SOF,munitions%20and%20other%20weapon%20systems

KEYWORDS: Weapons; Missile; Munition; Special Operations; Standoff; Precision; Guidance; Global Positioning System; Navigation; Denied; Contested; Common Launch Tube.

VERSION 3

SOCOM213-004 TITLE: Electronics Embedded Glass

TECHNOLOGY FOCUS AREAS: Microelectronics; Directed Energy; Network Command, Control and Communications

TECHNOLOGY AREAS: Information Systems; Ground/Sea Vehicles; Electronics; Human Systems

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 applied research toward an innovative capability to allow transparent armor to be adapted, modified or fabricated in a way so it can also function as an in-vehicle display screen.

DESCRIPTION: As a part of this feasibility study, the proposers shall address all viable overall system design options with a focus on developing a means of displaying imagery from digital signal onto or into vehicle borne transparent armor for the purpose of providing an alternative to tablet viewing or for overlaying situational awareness information.

The resultant solution must consider that the prime purpose of the transparent armor is to be seen through, so the ability to use the transparent armor as a display screen must not degrade from this. Meaning, the see-through capability must be present full time, or it must be quickly re-accessible by an Operator. Similarly, as the co-related primary purpose of transparent armor is to stop ballistic threats, no reduction of the expected ballistic performance should be considered acceptable even with the integration of the SBIR developed transparent armor display solution.

Night vision capability will be assessed to ensure no degradation occurs based on the process used to make the transparent armor function as a display. The feasibility study should consider whether the transparent armor would need to be fully, electronically, occluded to function as a display, or whether augmented reality overlays are possible while still allowing some transparency. If semi transparency is determined possible, any augmented reality overlays in this manner should be assessed for their potential capability to enhance crew situational awareness by, for example, including object or threat detection and tracking for passengers; or points of interest, obstacles awareness, and navigation aid for a driver.

Transparent armor that is determined to be required to be fully electrically occluded or semi transparent must be able to accept and address signals being received from multiple in-vehicle sources, of which ATAK would be a key consideration. The feasibility study will also address the capability of providing laser protection to the crew via the projected or embedded display solution.

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, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study on an M-ATV that enable enhanced crew SA and/or driver cognitive workload reduction.

PHASE III DUAL USE APPLICATIONS: This system could be used in a broad range of military applications where a reduction of in-vehicle (portable or hard mounted) display screens in desired (reduced volume, weight and secondary projectile risk in a rollover or improvised explosive device (IED) event). It could also increase the survivability and safety of the crew by incorporating object and threat detection and tracking. The driver's cognitive workload could be reduced by the inclusion of heads up, on windshield, route guidance, waypoints, or terrain/obstacle highlighting.

This technology is applicable to the commercial sector primarily in regard to a transparent overlay mode which would include route guidance, key points of interest and potentially for safety in terms of object detection/prediction (kid running towards the street who may not stop).

REFERENCES:

1. ATPD 2352T – Purchase Description, Transparent Armor 8 May 2013. Available publicly at https://govtribe.com/file/government-file/w56hzv16r0216-atpd-2352t-transparent-armor-8may2013-dot-pdf

KEYWORDS: transparent overlay; augmented reality; transparent armor; embedded electronics; situational awareness; SA; drivers aid

VERSION 3

UNITED STATES SPECIAL OPERATIONS COMMAND
21.3 Small Business Innovation Research (SBIR)
Direct to Phase II Proposal Submission Instructions

In addition to the formal announcement period, the USSOCOM SBIR/STTR Program Office will be hosting a virtual USSOCOM Industry Day on 22 September 2021 for Topics Number SOCOM213-D005, D006, D007, and D008 only to further delineate requirements and stimulate small business/research institute partnership-building. Please visit https://events.sofwerx.org/sbir21.3/ for more information.

Introduction:

The United States Special Operations Command (USSOCOM) 21.3 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. The Government will evaluate only responsive proposals.

A thorough reading of the "Department of Defense Small Business Innovation Research (SBIR) Program, SBIR 21.3 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
Direct to Phase II SOCOM213-D005	Not to exceed 10 pages not including Feasibility Appendix	15-page PowerPoint	Maximum 12 months	Not to Exceed $1,500,000.00
Direct to Phase II SOCOM213-D006	Not to exceed 10 pages not including Feasibility Appendix	15-page PowerPoint	Maximum 12 months	Not to Exceed $730,000.00
Direct to Phase II SOCOM213-D007	Not to exceed 10 pages not including Feasibility Appendix	15-page PowerPoint	Maximum 12 months	Not to Exceed $1,523,000.00
Direct to Phase II SOCOM213-D008	Not to exceed 10 pages not including Feasibility Appendix	15-page PowerPoint	Maximum 12 months	Not to Exceed $1,280,000.00
Direct to Phase II SOCOM213-D009	Not to exceed 10 pages not including Feasibility Appendix	15-page PowerPoint	Maximum 18 months	Not to Exceed $1,626,000.00

Contract Awards:

VERSION 3

SBIR awards for topic SOCOM213-D005 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. SOCOM213-D005 SBIR contract awards will be done through SOFWERX and result in a commercial contract between the firm and DEFENSEWERX. DEFENSEWERX will not conduct the evaluation of SOCOM213-003. The Government will conduct all evaluations for all topics. The Government will award all SBIR contracts for SOCOM213-D006, SOCOM213-D007, SOCOM213-D008, and SOCOM213-D009.

SBIR awards for the Direct to Phase II topics SOCOM213-D006, SOCOM213-D007, SOCOM213-D008, and SOCOM213-D009 will be awarded as a fixed price (level of effort type), Other Transactions Agreements (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 defined as meeting one or more threshold requirements. Firms may download the template at https://www.socom.mil/SOF-ATL/Pages/SBIR-21-3.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 may be revised prior to execution. The document deliverables required for the effort are listed in the uploaded Statement of Objectives (SOO) for each topic. The OTA template uploaded is a basic draft and not tailored to the specific topic and is not the final document to be use in the award. Offerors must review these documents to develop their proposal.

The OTA template needs to be completed by only those Offerors selected for award and will be submitted directly to the Agreements Officer identified in the notification. Providing the completed OTA for those invited to present, is desirable but not required. The specific OTA template for each topic will be sent to those selected to present the slide deck.

Those selected for award 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).

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 the Contracting Officer (KO) from which the notice was generated and sent from.

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.

USSOCOM does not provide Discretionary Technical and Business Assistance for Direct to Phase II awards.

Technical Inquiries:

During the Pre-release Period of the DoD SBIR 21.3 Program BAA, all questions must be submitted in writing either by e-mail to sbir@socom.mil or to the online Defense SBIR/STTR Innovation Portal (DSIP) Topic Q&A. All questions and answers submitted to DSIP 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 the DoD SBIR 21.3 Program BAA instructions). **All inquiries must include the topic number in the subject line of the e-mail.**

During the Open Period, 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, all questions and answers are posted electronically for general viewing. Identifying information for the questioner and respondent is not posted.

Site visits will not be permitted during the Pre-release and Open Periods of the DoD SBIR 21.3 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 the DoD SBIR 21.3 instructions. Any additional pages will be deleted from the proposal prior to evaluation, only the first 10 pages will be evaluated.

The technical proposal shall include a Statement of Work (SOW) with the planned tasks and descriptions to meet the Statement of Objectives (SOO) goals detailed. Do not upload the whole SOO as your SOW with your proposal. The SOO and CDRL are provided to help the Offerors consider the required goals, scope, and deliverables when developing the proposal, but it is an Offeror's responsibility to provide fully responsive, complete, and clear submissions. Exceptions to the requirements need to be identified/explained. The SOO, with the list of CDRLs are provided and can be downloaded from https://www.socom.mil/SOF-ATL/Pages/SBIR-21-3.aspx.

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 applicable sections of the SOO and it shall include no proprietary information, data, or marking. The provided SOW will become Attachment 3 of the resulting OTA, incorporating any agreed upon changes if necessary.

Note: The Phase I feasibility Appendix (Appendix A) is required for the Direct to Phase II proposal and is specified in **Volume 5**.

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-21-3.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.

For the Direct to Phase II topic in this announcement, the total price 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 will not be evaluated or considered for award.**

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 agreement.

VERSION 3

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 as well as the reason on why said equipment is charge directly to the effort rather than in the indirect cost of the business.

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
CCR is required to be submitted with proposals in response to USSOCOM 21.3 SBIR topics. Please refer to the DoD 21.3 SBIR BAA for full details. Information contained in the CCR will not be considered during proposal evaluations.

Volume 5: Supporting Documents
In addition to the documentation outlined in the DoD STTR Program BAA, include the (1) Slide deck, (2) Feasibility Study, and (3) section K in this volume.

(1) Slide Deck: Potential Offerors shall submit a slide deck with the proposed technical solution **not to exceed 15 PowerPoint slides (includes introductory first slide)**. Must be separate and clearly marked. Any additional slides will not be evaluated, only slide 1-15 will be evaluated. It is recommended (but snot required) that more detailed information is included in the technical volume and higher-level information is included in the slide deck suitable for the 30 minutes presenting. Refer to the "Direct to Phase II Evaluations" Section of this instruction for more details.

(2) Feasibility Study: Offerors must provide documentation to satisfy the Phase I feasibility requirement as specified in the Phase I topic write-up. The documentation shall be included as a Feasibility Appendix in this volume. 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).

(3) Section K: The proposal must also include a completed Section K which does not count toward the page limit and should be uploaded with this volume. 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 21.3 Announcement) to work on a USSOCOM ITAR topic must possess an export license to receive a SBIR Phase II contract.

Volume 6: Fraud, Waste and Abuse Training
Fraud, Waste and Abuse (FWA) training is required for Phase I and Direct to Phase II proposals. Please refer to the DoD 21.3 SBIR BAA for full details.

Direct to Phase II Evaluations:
The Government will evaluate only responsive proposals.

USSOCOM evaluates Direct to Phase II proposals using the evaluation criteria specified in DoD 21.3 SBIR Announcement with the following exceptions/clarifications:

VERSION 3

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. Those proposals will be considered non-responsive.

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 of Phase I**. 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 the DoD SBIR 21.3 BAA instructions. 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 the DoD SBIR 21.3 BAA instructions. 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 technical evaluation team, using a virtual teleconference. This will be a **technical presentation** only of the proposed solution and the key personnel listed in the proposal should be conducting the presentation and responding to the questions of the evaluation team. This presentation is NOT intended for business development people but purely technical exchange. The technical approach and key personnel knowledge involved in the project will be considered. This presentation will complete the panel's evaluation of the proposal against the criteria listed in the DoD SBIR 21.3 BAA instructions. Notifications of selection/non-selection for Phase II award will be completed in a timely manner.

4. The Cost Volume (Volume 3) evaluation:

   For these direct to Phase II efforts, the award amount is set with not to exceed (NTE) amount. Technical evaluation of the proposals costs will be completed to assess the probability of success to obtain a working prototype. Proposals above the set NTE for the effort **will not** be considered for award. The team will assess the probability of success of the technical approach, presented for the efforts. The technical team will assess number of labor hours, labor categories, key personnel expertise and level of involvement, materials, equipment, subcontractors and consultants (scope of work, expertise, participation and proposed effort), travel and other direct cost to successfully complete the effort as proposed.

   The resulting award/s will be a fixed price OTA prototyping agreement 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 Office will notify 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. The Government will also notify the Offerors if their proposal is considered non-responsive (disqualified).

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 the DoD SBIR 21.3 Announcement instructions.

USSOCOM SBIR Program Point of Contact:
Inquiries concerning the USSOCOM SBIR Program and these proposal preparation instructions should be addressed to sbir@socom.mil.

VERSION 3

USSOCOM SBIR 21.3 DIRECT TO PHASE II TOPIC INDEX

VERSION 3

SOCOM213-D005 TITLE: Micro Raman Technology

RT&L FOCUS AREA(S): Microelectronics; 5G; General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Chem/Bio Defense; Electronics; Sensors.

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 applied research toward an innovative micro Raman capability through the creation of an inexpensive, spectroscopic technique which relies upon inelastic scattering of photons to provide the SOF Operators low-visibility scientific grade cellular phone or ATAC based attachment for quick stand-off identification of chemicals; bringing laboratory grade science to the tactical edge.

DESCRIPTION: As a part of this feasibility study, the proposers shall address all viable overall system design options with respective specifications on an orthogonal handheld Raman chemical, automated colorimetric identification system that is embedded on a cellular phone or ATAC platform.

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, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study on the micro Raman technology.

PHASE III DUAL USE APPLICATIONS: This system could be used in a broad range of military applications where non-destructive chemical analysis technique are employed to provide detailed information about chemical structure, phase and polymorphy, crystallinity and molecular interactions. Typical examples of commercial employment of Raman technology include:

- Art and archaeology – characterization of pigments, ceramics and gemstones;
- Carbon materials – structure and purity of nano-tubes, defect/disorder characterization.
- Chemistry – structure, purity, and reaction monitoring;
- Geology – mineral identification and distribution, fluid inclusions and phase transitions;
- Life sciences – single cells and tissue, drug interactions, disease diagnosis;
- Pharmaceutics – content uniformity and component distribution;
- Semiconductors – purity, alloy composition, intrinsic stress/strain microscope.

REFERENCES:

1. Jehlicka, Jan, Adam Culka, Lily Mana, and Aharon Oren. 2019. Comparison of Miniaturized Raman Spectrometers for Discrimination of Carotenoids of Halophilic Microorganisms. May 29. Accessed June 30, 2021. https://doi.org/10.3389/fmicb.2019.01155.

VERSION 3

KEYWORDS: raman; ATAC; colorimetric; spectroscopic; inelastic scattering; chemical analysis; microelectronics; forensics; chemistry; sensitive site; sensitive site exploitation; micro raman; raman technology; micro-raman technology

VERSION 3

SOCOM213-D006 TITLE: Squad Aiming Laser - Ultra High Power

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

TECHNOLOGY AREA(S): Sensors; Weapons; Human Systems; Battle Space; Lasers

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 applied research toward an innovative capability that will allow operators to illuminate and detect targets from 0-900 meters and beyond when using the PVS-31 or PVS-31A Binocular Night Vision Device (BNVD). The intent of this laser is to provide a compact, high powered aiming and illuminating system that will not interfere with the operation of the weapon platform that it is mounted on, which includes immediate and remedial corrective actions. This capability shall meet the requirements in the description below.

DESCRIPTION: The Special Operations Forces (SOF) operator is faced with a dynamic battlefield and evolving enemy. In order to maintain the advantage and increase the survivability and lethality of the operator on the battlefield, a compact, lightweight, aiming, pointing, and illuminating laser is required to allow the operator to detect and engage targets at the effective range at night when using the BNVD. Existing squad weapon mounted lasers do not have the power output required to provide suitable stand-off and engagement ranges in the compact size that is required. This needed capability shall consists of the following characteristics:

This topic is seeking information regarding advanced technology pertaining to advancements in materials, miniaturization, weight reduction, weapon shock and environmental durability, and laser aiming & illuminating performance.

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 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 known 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 up to 12 prototype systems determined to be the most feasible solution during the Phase I feasibility study on a SAL-UHP units that will allow operators to illuminate and detect targets when using the PVS-31 or PVS-31A Binocular Night Vision Device (BNVD). This capability shall meet the requirements in the description above. The testing and demonstration will contain scenarios, environments, and test objectives to demonstrate program operational objectives.

PHASE III DUAL USE APPLICATIONS: The Squad Aiming Laser - Ultra High Power could be used for rapid target acquisition of compact rifles (CR’s), assault rifles (AR’s), lightweight medium machine guns (LWMMG) along with pulse features utilized for signaling in both day and night environments in a broad range of military, law enforcement, and homeland security applications.

VERSION 3

REFERENCES:

1. MIL-STD-810H DEPARTMENT OF DEFENSE TEST METHOD STANDARD ENVIRONMENTAL ENGINEERING CONSIDERATIONS AND LABORATORY TESTS (https://quicksearch.dla.mil/ImageRedirector.aspx?token=5755401.35978);
2. MIL-STD-1913 NOTICE 1 MILITARY STANDARD DIMENSIONING OF ACCESSORY MOUNTING RAIL FOR SMALL ARMS WEAPONS (https://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=115317)

KEYWORDS: Optics; Weapon Mounted Lasers; Target Engagement; Laser

VERSION 3

SOCOM213-D007 TITLE: High Performance Lightweight White Phosphor Image Intensification Clip-On (LWPI2C)

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

TECHNOLOGY AREA(S): Sensors; Weapons; Human Systems; Battle Space; Night Vision; Clip-On

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 applied research toward an innovative capability that will allow operators to detect and engage targets for 0-1500 meters and beyond in night engagements in the Near Infrared (NIR) spectrum. This capability shall meet the requirements in the description below.

DESCRIPTION: The AN/PVS-26 and AN/PVS-30 Night Vision Clip-On Weapon Sights have been proven systems in the SOF and ARMY forces for the past 15 years. They were developed under the Improved Night/Day Fire Control/Observation Device INOD program which was an Evolutionary Acquisition (EA) of which these were Block II. They provide a sniper with the capability to easily and quickly transition from day to night operations by mounting this clip-on directly in front of their existing direct view sniper dayscope. The sniper can then use the same dayscope reticle and adjustments to accomplish his mission during night time operations. In addition, the transition to white phosphor image intensifier tubes over the past several years, for example, have provided better perceived contrast as well as the lower signal to noise ratio and higher resolution of these newer image intensifier tubes. Also, a significant reduction in weight is desired to reduce the payload of the operator.

This topic is seeking information regarding advanced technology pertaining to advancements in materials, miniaturization, weight reduction, weapon shock and environmental durability, and NIR detect/recognize/identify performance.

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, install, and demonstrate up to 12 prototype systems determined to be the most feasible solution during the Phase I feasibility study on a lightweight white phosphorus clip-on units that will allow operators to detect and engage targets for 0-1500 meters and beyond in engagements. This capability shall meet the requirements in the description above. The testing and demonstration will contain scenarios, environments, and test objectives to demonstrate program and operational objectives.

PHASE III DUAL USE APPLICATIONS: This LWPI2C unit could be used for observation, fire control, and target engagement for various rifles platforms that have a monolithic or extended MIL-STD-1913 mounting rail systems in a broad range of military, law enforcement, and homeland security applications.

VERSION 3

REFERENCES:

1. MIL-STD-810H DEPARTMENT OF DEFENSE TEST METHOD STANDARD ENVIRONMENTAL ENGINEERING CONSIDERATIONS AND LABORATORY TESTS (https://quicksearch.dla.mil/ImageRedirector.aspx?token=5755401.35978);
2. MIL-STD-1913 NOTICE 1 MILITARY STANDARD DIMENSIONING OF ACCESSORY MOUNTING RAIL FOR SMALL ARMS WEAPONS (https://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=115317);
3. JOINT PUB. 1-02, DOD DICTIONARY OF MILITARY AND ASSOCIATED TERMS; https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/dictionary.pdf

KEYWORDS: Optics; Night Vision; Clip-On; Target Engagement; Sniper; Sensors; Target Engagement; Image Intensification

VERSION 3

SOCOM213-D008 TITLE: Remote Sniper Heads Up Display

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

TECHNOLOGY AREA(S): Sensors; Electronics; Battle Space; Human Systems; Weapons

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 applied research toward an innovative capability that will allow operators to view critical target data from the LA-24/PEQ Precision Aiming Laser (PAL) while maintaining security and situational awareness. This capability shall meet the requirements in the description below.

DESCRIPTION: The Special Operations Forces (SOF) Sniper is faced with a dynamic battlefield and evolving enemy. SOF has recently began fielding 7-35 power scopes in conjunction with the highly accurate, long range MK22 Advanced Sniper Rifle (ASR) weapon system, as well as the continued fielding of the existing family of sniper rifles and designated marksmen rifles. A light weight, compact, rifle-mounted heads up display (HUD) is needed in order for the SOF Sniper to maintain the lethal advantage. A HUD that puts real-time information from the LA-24/PEQ to the operator's non-shooting eye for rapid engagement of multiple targets is required.

This topic is seeking information regarding advanced technology pertaining to advancements in materials, miniaturization, weight reduction, and weapon shock and environmental durability.

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 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 known 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 OBJECTIVE: Develop, install, and demonstrate up to 12 prototype systems determined to be the most feasible solution during the Phase I feasibility study on a Remote Sniper Heads Up Display (RSHUD) units that will allow operators to rapidly receive live ballistic information from the LA-24/PEQ and engage multiple targets. This capability shall meet the requirements in the description above. The testing and demonstration will contain scenarios, environments, and test objectives to demonstrate program and operational objectives.

PHASE III DUAL USE APPLICATIONS: This RSHUD could be used for rapid target acquisition for Sniper weapons and Designated Marksman Rifles as well as potentially machine guns in a broad range of military, law enforcement, and homeland security applications.

REFERENCES:

1. MIL-STD-810H DEPARTMENT OF DEFENSE TEST METHOD STANDARD ENVIRONMENTAL ENGINEERING CONSIDERATIONS AND LABORATORY TESTS (https://quicksearch.dla.mil/ImageRedirector.aspx?token=5755401.35978);

2. MIL-STD-1913 NOTICE 1 MILITARY STANDARD DIMENSIONING OF ACCESSORY MOUNTING RAIL FOR SMALL ARMS WEAPONS (https://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=115317);
3. Interface Control Document (ICD) for Weapon Mounted Ballistic Calculators and Micro-Displays Revision D.

KEYWORDS: HUD; Display; Micro-display; Sniper; Optics; Direct View Optics; Target Engagement

VERSION 3

SOCOM213-D009 TITLE: Multi-Domain Virtual Innovation

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

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

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. Offers' 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 SBIR is to develop a prototype innovative platform that supports and manages ability for Operators to participate in real-world collaboration events and environments.

DESCRIPTION: Operators need the ability to remotely discover and interact with the Internet of Things (IoT) innovation infrastructure of Smart City systems, tools, sensors, components, networks, and controllers. All technology for this platform should use broadly available commercial off the shelf (COTS) Smart City technologies or be assembled primarily from COTS. All software should be based on and/or carry an Open Source license that does not restrict Government Use. All data formats should, to the degree possible, conform to existing and/or emerging Open Standards.

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 a Multi-Domain Virtual Innovation.

PHASE III DUAL USE APPLICATIONS: This system could be used in a broad range of military applications where virtual participants need more parity with in-person participants.

REFERENCES:

1. 'Smart' Cities Are Surveilled Cities, 04/17/2021. https://foreignpolicy.com/2021/04/17/smart-cities-surveillance-privacy-digital-threats-internet-of-things-5g/ ;
2. FIT IoT Lab, 06/25/2021. https://www.iot-lab.info/ ;
3. A Smart Cities Complete View of Big Data, 06/25/2021. https://visco.no/MediaContent/SMART%20CITIES%20Complete%20view%20of%20big%20data....pdf ; 242.
4. Military Implications of Smart Cities, 06/04/2020. https://madsciblog.tradoc.army.mil/242-military-implications-of-smart-cities/ ;
5. MONICA Pilots, 05/15/2020. https://www.cnet.se/news/monica-pilots/;

6. A Survey of Smart City Assets for Future Military Usage, 06/2018. https://www.researchgate.net/publication/329393272_A_Survey_of_Smart_City_Assets_for_Future_Military_Usage ;
7. An Efficient Algorithm for Media-based Surveillance Systems (EAMSuS) in IoT Smart City Framework, 06/25/2021. https://ruomo.lib.uom.gr/bitstream/7000/304/1/FGCS.pdf ;
8. The Sensors That Power Smart Cities Are a Hacker's Dream, 08/09/2018. https://www.wired.com/story/sensor-hubs-smart-cities-vulnerabilities-hacks/ ;
9. A Cyber View Of Smart Cities, 04/03/2020. https://www.forbes.com/sites/forbestechcouncil/2020/03/03/a-cyber-view-of-smart-cities/?sh=5cf665f13b97 ;
10. Cybercrime Issues in Smart Cities Networks and Prevention Using Ethical Hacking, 04/29/2021. https://link.springer.com/chapter/10.1007/978-3-030-72139-8_16 ;
11. Smart City Security, 2016. https://core.ac.uk/download/pdf/231828624.pdf ;
12. Penetration Testing for Internet of Things and Its Automation, 2018. https://ieeexplore.ieee.org/document/8622982

KEYWORDS: Internet of Things (IoT); infrastructure; Smart City systems; Open Source; Open Standards