# DEPARTMENT OF DEFENSE
# SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM
# SBIR 24.2 Program Broad Agency Announcement (BAA)

**April 17, 2024:** DoD BAA issued for pre-release
**May 15, 2024:** DoD begins accepting proposals
**June 12, 2024:** Deadline for receipt of proposals no later than **12:00 p.m. ET**

Participating DoD Components:

- Department of Navy (Navy)
- Department of Air Force (Air Force)
- Defense Health Agency (DHA)
- Defense Logistics Agency (DLA)
- Defense Threat Reduction Agency (DTRA)
- Missile Defense Agency (MDA)
- Office of the Secretary of Defense – National Geospatial-Intelligence Agency (OSD – NGA)

## IMPORTANT

**This BAA incorporates MANDATORY foreign disclosure requirements and other important programmatic changes as required by the SBIR and STTR Extension Act of 2022 (Pub. L. 117-183). These updates can be found in sections 2.2, 2.5, 3.0, 4.2.e., 4.3, 6.0, 8.2, and Attachment 2. Proposals that do not include the fully completed and signed Attachment 2 of this BAA (labeled Version 2) in Volume 5 of the proposal submission will be deemed noncompliant and will not receive an evaluation. All small business concern/proposal identifying information and a response to every question on the form MUST be provided.**

**This BAA also incorporates FAR 52.204-29 and FAR 52.204-30, Federal Acquisition Supply Chain Security Act (FASCSA) Orders. Small business concerns are highly encouraged to review the full text of these clauses and required representations found in section 8.2 of this BAA.**

**Deadline for Receipt:** Complete proposals must be certified and submitted in the Defense SBIR/STTR Innovation Portal (DSIP) no later than **12:00 PM** ET on **June 12, 2024.** 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 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 DSIP 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. Proposing small business concerns are required to register for a Login.gov account and link it to their DSIP account. See section 4.16 for more information regarding registration.

**SBIR/STTR Updates and Notices:** To be notified of SBIR/STTR opportunities and to receive email 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:** **Please refer to the DSIP Customer Support Document for general information regarding the DoD SBIR/STTR process in DSIP.** For additional assistance with the DSIP application, please visit the Learning & Support section of the DSIP at https://www.dodsbirsttr.mil/submissions/learning-support/. Email DSIP Support at DoDSBIRSupport@reisystems.com only for further assistance with issues pertaining directly to the DSIP application. Questions submitted to DSIP Support 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 4.15 for further information on where to direct questions regarding instructions and topics in this BAA**.

## TABLE OF CONTENTS

## 1.0 INTRODUCTION

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. Consistent with the SBA SBIR/STTR Policy Directive, the Department of Defense (DoD) is soliciting proposals as a Broad Agency Announcement (BAA). The DoD SBIR/STTR Programs follow the policies and practices of the most current SBA SBIR/STTR Policy Directive. 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 HERE.

Navy, Air Force, DHA, DLA, DTRA, MDA and OSD-NGA, hereafter referred to as DoD Components, invite proposing small business concerns to submit proposals under this BAA for the Small Business Innovation Research (SBIR) Program. Proposing Small Business Concerns 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 a topic is accepting Direct to Phase II proposals**. A separate BAA will not be issued requesting Phase II proposals, and unsolicited proposals will not be accepted. All proposing small business concerns 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 proposing small business concern 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 a risk-based due diligence security review and the availability of funds. DoD is not responsible for any monies expended by the proposing small business concern before the issuance of any award. Proposals must conform to the terms of this announcement.

## 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 Due Diligence Program to Assess Security Risks

The SBIR and STTR Extension Act of 2022 (Pub. L. 117-183) requires the DoD, in coordination with the SBA, to establish and implement a due diligence program to assess security risks presented by small business concerns seeking a Federally funded award. The full text of the SBIR and STTR Extension Act of 2022 is available at https://www.congress.gov/117/plaws/publ183/PLAW-117publ183.pdf.

The DoD SBIR/STTR Programs follow the policies and practices of the SBA SBIR/STTR Policy

Directive. The Policy Directive was revised effective May 3, 2023, to incorporate requirements of the SBIR and STTR Extension Act of 2022. This revision is incorporated into this BAA, including the utilization of the Appendix III, Disclosure Questions, as Attachment 2 “Disclosures of Foreign Affiliations or Relationships to Foreign Countries”.

Small business concerns must submit Attachment 2 “Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Version 2)” of this BAA in Volume 5 of the proposal submission. Previous versions of Attachment 2 or versions created by other Federal agencies will not be accepted. All small business concern identifying information requested in Attachment 2 must be provided and all questions must be answered. Attachment 2 must also be signed, certifying information provided is accurate and complete. The Government may require the proposing small business concerns to provide additional information to assist the Government in evaluating the small business concerns’ disclosures in Attachment 2.

Small business concerns who: 1) fail to submit Attachment 2 in Volume 5 of the proposal submission; 2) do not use Attachment 2, version 2, as provided in this BAA; 3) do not provide their complete identifying information or do not completely answer all questions in Attachment 2; 4) fail to provide the Government additional information regarding Attachment 2 when requested; or, 5) fail to sign Attachment 2, **will be deemed noncompliant and will not receive an evaluation of their proposal**.

In accordance with Section 4 of the SBIR and STTR Extension Act of 2022, the DoD will review all proposals submitted in response to this BAA to assess security risks presented by small business concerns seeking a Federally funded award. The Department will use information provided by the small business concern in response to the Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Attachment 2) and the proposal to conduct a risk-based due diligence review on the following: cybersecurity practices; patent analysis; employee analysis and foreign ownership including the financial ties and obligations (which shall include surety, equity, and debt obligations) of the small business concern; and employees of the small business concern to a foreign country, foreign person, or foreign entity. The Department will also assess proposals utilizing open-source analysis and analytical tools, for the nondisclosures of the information set forth in 15 U.S.C. 638(g)(13).

DoD has partnered with Project Spectrum to provide an online course on Understanding Foreign Ownership, Control, or Influence (FOCI). This course defines FOCI, explains what it means to be under FOCI, and details FOCI's effect on a company seeking initial or continued eligibility for access to a federally funded award. Small business concerns can register and access this course by following the instructions below:

1. Go to projectspectrum.io
2. Click “Profile/Dashboard” in the top right and then click “Sign Up” from the dropdown menu.
3. Follow the instructions to sign up for an account. Descriptions of the account types are provided below each option.
4. Verify your email by entering the code sent to the email address you provided when signing up.
5. Log in to Project Spectrum by clicking “Profile/Dashboard > Login” in the top right.
6. Find the Training Course on “Understanding Foreign Ownership, Control, or Influence (FOCI)” by clicking “Courses > Training Courses”
7. Copy the provided password.
8. Click on the course and log in to Encite.io using your email address and the copied password.
9. Enroll in the course and click “Enter” to begin.

For assistance with registration or access to the Project Spectrum website, please contact support@projectspectrum.io.

### 2.3 OUSD(R&E) Critical Technology Areas

Although each DoD Component develops SBIR and STTR topics that are mission-oriented to their programs, topics generally align with the OUSD(R&E) Critical Technology Areas. While many technologies may cross between these categories, these areas represent the broad and different approaches required to advance technologies crucial to the Department. By focusing efforts and investments into these critical technology areas, the Department will accelerate transitioning key capabilities to the Military Services and Combatant Commands.

OUSD(R&E) Critical Technology Areas:

- FutureG
- Trusted AI and Autonomy
- Biotechnology
- Advanced Computing and Software
- Integrated Sensing and Cyber
- Directed Energy (DE)
- Hypersonics
- Microelectronics
- Integrated Network Systems-of-Systems
- Quantum Science
- Space Technology
- Renewable Energy Generation and Storage
- Advanced Materials
- Human-Machine Interfaces

Below are additional technology areas supporting DoD Component-specific mission-critical areas:

- Advanced Infrastructure & Advanced Manufacturing
- Combat Casualty Care
- Emerging Threat Reduction
- Military Infectious Diseases
- Military Operational Medicine
- Mission Readiness & Disaster Preparedness
- Nuclear
- Sustainment & Logistics

Full descriptions of the above technology areas can be reviewed here: [https://media.defense.gov/2023/Mar/21/2003183351/-1/-1/1/OUSDRE_SBIR_STTR_CRITICAL_TECH_AREAS.PDF](https://media.defense.gov/2023/Mar/21/2003183351/-1/-1/1/OUSDRE_SBIR_STTR_CRITICAL_TECH_AREAS.PDF).

### 2.4 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 current SBA Policy Directive guidelines. 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. Proposing small business concerns 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 proposing small business concerns based on 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 current SBA Policy Directive guidelines. 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 small business concern 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.

### 2.5 Program on Innovation Open Topics

Section 7 of the SBIR and STTR Extension Act of 2022 requires the DoD to establish innovation open topic activities in order to—

- (A) increase the transition of commercial technology to the DoD;
- (B) expand the small business nontraditional industrial base;
- (C) increase commercialization derived from investments of the Department of Defense; and
- (D) expand the ability for qualifying small business concerns to propose technology solutions to meet DoD needs.

Unlike conventional topics, which specify the desired technical objective and output, open topics can use generalized mission requirements or specific technology areas to adapt commercial products or solutions to close capability gaps, improve performance, or provide technological advancements in existing capabilities.

**A small business concern may only submit one (1) proposal to each open topic.** If more than one proposal from a small business concern is received for a single open topic, only the most recent proposal to be certified and submitted prior to the submission deadline will receive an evaluation. All prior proposals submitted by the small business concern for the same open topic will be marked as nonresponsive and will not receive an evaluation.

Open topics released under this BAA will be clearly identified as such in the title and objective of the topic. Proposal preparation instructions for open topics may vary significantly across DoD Components. Proposing small business concerns are advised to carefully read and follow all instructions from the DoD Component for the open topic of interest. Unless specifically noted in the Component instructions, all requirements outlined in this BAA remain in effect for open topics.

## 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 small business concern.

**Covered Individual**

An individual who contributes in a substantive, meaningful way to the scientific development or execution of a research and development (R&D) project proposed to be carried out with a Federally funded award from DoD. DoD has further designated covered individuals as including all proposed key personnel.

**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.

**Federally Funded Award**

A Phase I, Phase II (including Direct to Phase II, sequential Phase II/subsequent Phase II and cross-agency Phase II), or Phase III SBIR or STTR award made using a funding agreement.

**Foreign Affiliation**

As defined in 15 U.S.C. § 638(e)(16), foreign affiliation means a funded or unfunded academic, professional, or institutional appointment or position with a foreign government or government-owned entity, whether full-time, part-time, or voluntary (including adjunct, visiting, or honorary). This includes appointments or positions deemed adjunct, visiting, or honorary with research institutions located in a foreign country of concern.

**Foreign Country of Concern**

As defined in 15 U.S.C. § 638(e)(17), foreign country of concern means the People's Republic of China, the Democratic People's Republic of Korea, the Russian Federation, the Islamic Republic of Iran, or any other country determined to be a country of concern by the Secretary of State.

**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 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 contracts and other transaction authority (OTA) agreements 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).

**Malign Foreign Talent Recruitment Program**

As defined in 42 U.S.C § 19237, the term "malign foreign talent recruitment program" means-

(A) any program, position, or activity that includes compensation in the form of cash, in-kind compensation, including research funding, promised future compensation, complimentary foreign travel, things of non de minimis value, honorific titles, career advancement opportunities, or other types of remuneration or consideration directly provided by a foreign country at any level (national, provincial, or local) or their designee, or an entity based in, funded by, or affiliated with a foreign country, whether or not directly sponsored by the foreign country, to the targeted individual, whether directly or indirectly stated in the arrangement, contract, or other documentation at issue, in exchange for the individual-

(i) engaging in the unauthorized transfer of intellectual property, materials, data products, or other nonpublic information owned by a United States entity or developed with a Federal research and development award to the government of a foreign country or an entity based in, funded by, or affiliated with a foreign country regardless of whether that government or entity provided support for the development of the intellectual property, materials, or data products;

(ii) being required to recruit trainees or researchers to enroll in such program, position, or activity;

(iii) establishing a laboratory or company, accepting a faculty position, or undertaking any other employment or appointment in a foreign country or with an entity based in, funded by, or affiliated with a foreign country if such activities are in violation of the standard terms and conditions of a Federal research and development award;

(iv) being unable to terminate the foreign talent recruitment program contract or agreement except in extraordinary circumstances;

(v) through funding or effort related to the foreign talent recruitment program, being limited in the capacity to carry out a research and development award or required to engage in work that would result in substantial overlap or duplication with a Federal research and development award;

(vi) being required to apply for and successfully receive funding from the sponsoring foreign government's funding agencies with the sponsoring foreign organization as the recipient;

(vii) being required to omit acknowledgment of the recipient institution with which the individual is affiliated, or the Federal research agency sponsoring the research and development award, contrary to the institutional policies or standard terms and conditions of the Federal research and development award;

(viii) being required to not disclose to the Federal research agency or employing institution the participation of such individual in such program, position, or activity; or

(ix) having a conflict of interest or conflict of commitment contrary to the standard terms and conditions of the Federal research and development award; and

(B) a program that is sponsored by-

(i) a foreign country of concern or an entity based in a foreign country of concern, whether or not directly sponsored by the foreign country of concern;

(ii) an academic institution on the list developed under section 1286(c)(8) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (10 U.S.C. 2358 note; 1 Public Law 115–232) ; or

(iii) a foreign talent recruitment program on the list developed under section 1286(c)(9) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (10 U.S.C. 2358 note; 1 Public Law 115–232).

**Performance Benchmark Requirements**

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.

The SBIR and STTR Extension Act of 2022 (Pub. L. 117-183) amended the application of these benchmarks for more experienced firms. Detailed information on benchmark calculations and increased performance standards for more experienced firms can be found at https://www.sbir.gov/performance-benchmarks.

**Personal Conflict of Interest**

A situation in which an individual has a financial interest, personal activity, or relationship that could impair the employee's ability to act impartially and in the best interest of the Government when performing under the contract. (A de minimis interest that would not "impair the employee's ability to act impartially and in the best interest of the Government" is not covered under this definition.)

Among the sources of personal conflicts of interest are-
(i) Financial interests of the covered employee, of close family members, or of other members of the covered employee's household;
(ii) Other employment or financial relationships (including seeking or negotiating for prospective employment or business); and
(iii) Gifts, including travel.

Financial interests referred to in paragraph (1) of this definition may arise from-
(i) Compensation, including wages, salaries, commissions, professional fees, or fees for business referrals;
(ii) Consulting relationships (including commercial and professional consulting and service arrangements, scientific and technical advisory board memberships, or serving as an expert witness in litigation);
(iii) Services provided in exchange for honorariums or travel expense reimbursements;
(iv) Research funding or other forms of research support;
(v) Investment in the form of stock or bond ownership or partnership interest (excluding diversified mutual fund investments);
(vi) Real estate investments;
(vii) Patents, copyrights, and other intellectual property interests; or
(viii) Business ownership and investment interests.

**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 proposing small business concern 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 proposing small business concern 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 any information that a small business concern considers to be non-public information that is owned by the small business concern and is marked accordingly.

**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. Proposing small business concerns 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 small business concern 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. DoD does not guarantee Direct to Phase II opportunities will be offered in future BAAs.

Each eligible topic requires proposing small business concerns 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 proposing small business concern and/or the principal investigator. If technology in the feasibility documentation is subject to Intellectual Property (IP), the proposing small business concern 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 proposing small business concern 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 Proposing Small Business Concern Eligibility and Performance Requirements

a. Each proposing small business concern 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). Proposing small business concern must meet eligibility requirements for Small Business Ownership and Control (see 13 CFR § 121.702).

b. A minimum of two-thirds of the research and/or analytical work in Phase I must be conducted by the proposing small business concern. For Phase II, a minimum of one-half (50%) of the research and/or analytical work must be performed by the proposing small business concern. The percentage of work is measured by both direct and indirect costs. Occasionally, deviations from these SBIR requirements may occur, and must be approved in writing by the Funding Agreement officer after consultation with the agency SBIR/STTR program manager/coordinator. For more information on the percentage of work calculation during proposal submission, refer to section 5.3.

c. For both Phase I and II, the primary employment of the principal investigator must be with the proposing small business concern 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**. Proposing small business concern with prior SBIR/STTR awards must meet two performance benchmark requirements as determined by the SBA on June 1 each year.
   (1) Phase I to Phase II Transition Rate: For all proposing small business concerns 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 proposing small business concerns with greater than 15 Phase II awards over the last 10 fiscal years excluding the last two years, the proposing small business concern 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.

   The SBIR and STTR Extension Act of 2022 (Pub. L. 117-183) amended the application of these benchmarks for more experienced firms. Detailed information on benchmark calculations, increased performance standards for more experienced firms and consequence of failure to meet benchmarks can be found at https://www.sbir.gov/performance-benchmarks.

   As defined by the SBIR/STTR Policy Directive, Department of the Army, Department of the Navy, and Department of the Air Force each constitute its own Federal agency, and the remaining

DoD Components fall under the executive agency of the Department of Defense. Companies that fail to meet either of the benchmarks under the Increased Performance Standards for more Experienced Firms may not receive more than an overall total of 80 awards from DoD, as detailed in the breakdown below:

Army – 20 total Phase I and Direct to Phase II awards
Navy – 20 total Phase I and Direct to Phase II awards
Air Force – 20 total Phase I and Direct to Phase II awards
All other DoD Components - 20 Phase I and Direct to Phase II awards, combined

## 4.3 Disclosures Regarding Ties to People's Republic of China and Other Foreign Countries

Each proposing small business concern is required to submit Attachment 2 "Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Version 2)" of this BAA in Volume 5 of the proposal submission. Previous versions of Attachment 2 or versions created by other Federal agencies will not be accepted. All small business concern identifying information requested in Attachment 2 must be provided and all questions must be answered. Attachment 2 must also be signed, certifying that information provided is accurate and complete. The Government may require the proposing small business concerns to provide additional information to assist the Government in evaluating the small business concerns' disclosures in Attachment 2.

Small business concerns who: 1) fail to submit Attachment 2 in Volume 5 of the proposal submission; 2) do not use Attachment 2, version 2, as provided in this BAA; 3) do not provide their complete identifying information or do not completely answer all questions in Attachment 2; 4) fail to provide the Government additional information regarding Attachment 2 when requested; or, 5) fail to sign Attachment 2, **will be deemed noncompliant and will not receive an evaluation of their proposal**.

The disclosure requires the following information:

(A) the identity of all owners and covered individuals of the small business concern who are a party to any foreign talent recruitment program of any foreign country of concern, including the People's Republic of China;
(B) the existence of any joint venture or subsidiary of the small business concern that is based in, funded by, or has a foreign affiliation with any foreign country of concern, including the People's Republic of China;
(C) any current or pending contractual or financial obligation or other agreement specific to a business arrangement, or joint venture-like arrangement with an enterprise owned by a foreign state or any foreign entity;
(D) whether the small business concern is wholly owned in the People's Republic of China or another foreign country of concern;
(E) the percentage, if any, of venture capital or institutional investment by an entity that has a general partner or individual holding a leadership role in such entity who has a foreign affiliation with any foreign country of concern, including the People's Republic of China;
(F) any technology licensing or intellectual property sales to a foreign country of concern, including the People's Republic of China, during the five-year period preceding submission of the proposal; and
(G) any foreign entity, offshore entity, or entity outside the United States related to the small business concern.

After reviewing the above listed disclosures of the proposing small business concern, and if determined appropriate by the DoD, the Department may ask the small business concern may to provide true copies of any contractual or financial obligation or other agreement specific to a business arrangement or joint-venture like arrangement with an enterprise owned by a foreign state or any foreign entity in effect during the five-year period preceding submission of the proposal with respect to which the small business concern made the disclosures.

### 4.4 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. Proposing small business concern must disclose joint ventures with existing (or planned) relationships/partnerships with any foreign entity or any foreign government-controlled companies.

A small business joint venture entity must submit, with its proposal, the representation required in paragraph (c) of FAR solicitation provision 52.212-3, Offeror Representations and Certifications-Commercial Products and Commercial Services, and paragraph (c) of FAR solicitation provision 52.219-1, Small Business Program Representations, in accordance with 52.204-8(d) and 52.212-3(b) for the following categories:

- (A) Small business;
- (B) Service-disabled veteran-owned small business;
- (C) Women-owned small business (WOSB) under the WOSB Program;
- (D) Economically disadvantaged women-owned small business under the WOSB Program; or
- (E) Historically underutilized business zone small business.

These representations can be found as Attachment 3 to this BAA and must be uploaded to Volume 5, Supporting Documents of the proposal submission in DSIP, if applicable.

### 4.5 Export-Controlled Topic Requirements

For proposals submitted under export-controlled topics, either International Traffic in Arms or Export Administration Regulations (ITAR/EAR), a copy of the certified DD Form 2345, Militarily Critical Technical Data Agreement, or evidence of application submission must be included. The form, instructions, and FAQs may be found at the United States/Canada Joint Certification Program website, https://www.dla.mil/Logistics-Operations/Services/JCP/DD23%2045Instructions/.

DD Form 2345 approval will be required if a proposal submitted in response to a topic marked as ITAR/EAR is selected for award.

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

Unless otherwise noted in the participating Component instructions, proposing small business concerns 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 proposing small business concern 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 proposing small business concern, whether such equity stake is directly or indirectly held. The proposing small business concern 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.

## 4.7 Conflicts of Interest

Contract awards to proposing small business concern 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.

## 4.8 Organizational Conflicts of Interest (OCI)

FAR 9.5 Requirements
In accordance with FAR 9.5, proposing small business concerns are required to identify and disclose all facts relevant to potential OCIs involving the proposing small business concern's organization and any proposed team member (sub-awardee, consultant). Under this Section, the proposing small business concern is responsible for providing this disclosure with each proposal submitted to the BAA. The disclosure must include the proposing small business concern's, and as applicable, proposed team member's OCI mitigation plan. The OCI mitigation plan must include a description of the actions the proposing small business concern has taken, or intends to take, to prevent the existence of conflicting roles that might bias the proposing small business concern's judgment and to prevent the proposing small business concern 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 prohibiting 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. As part of the FAR 9.5 disclosure requirement above, a proposing small business concern must affirm whether the proposing small business concern 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 determined selectable under the BAA evaluation criteria and funding availability.

The Government may require proposing small business concerns to provide additional information to assist the Government in evaluating the proposing small business concern's OCI mitigation plan.

If the Government determines 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.

### 4.9 Classified Proposals

Classified proposals will not be accepted under the DoD SBIR Program. If topics will require classified work during Phase II, the proposing small business concern must have a facility clearance 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/.

### 4.10 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. Proposing small business concerns 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 to avoid potential delay of contract award.**

### 4.11 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 to avoid potential delay of contract award.**

### 4.12 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.

### 4.13 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.

### 4.14 Pre-Award and Post Award BAA Protests

Interested parties have the right to protest in accordance with the procedures in FAR Subpart 33.1.

Protests exclusively related to the terms of this BAA must be served to:
osd.ncr.ousd-r-e.mbx.SBIR-STTR-Protest@mail.mil

For the purposes of a protest related to a particular topic selection, non-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 email address 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 proposing small business concern may also be made to the SBA.

Size protests regarding the small business status of a selected proposing small business concern may be made to the SBA in accordance with the procedures in FAR § 19.302.

### 4.15 Award Information

All proposals will be evaluated and judged on a competitive basis in terms of technical capability and technical value. Proposals will be initially screened to determine responsiveness to the topic objective. Proposals passing this initial screening will be technically evaluated by engineers, scientists or subject matter experts to determine the most promising technical and scientific approaches. As a common statement of work does not exist, each proposal will be assessed on the merit of the approach in achieving the technical objectives established in the topic. DoD is under no obligation to fund any proposal or any specific number of proposals in each topic. It also may elect to fund several or none of the proposed approaches to the same topic.

a. **Number of Awards**. The number of awards will be consistent with the Component's RDT&E budget. No contracts will be awarded until evaluation of all qualified proposals for a specific topic is completed.

b. **Type of Funding Agreement**. Each proposal selected for negotiation and possible 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 proposing small business concerns 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**. Contract value varies among the DoD Components; it is important for proposing small business concerns to review Component-specific instructions regarding award size.

d. **Timing**. Proposing small business concerns will be notified of selection or non-selection status for an award by the DoD Component that originated the topic no later than 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 agencies should issue the award no more than 180 days after the closing date of the BAA.

### 4.16 Questions about this BAA and BAA Topics

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

(1) **DSIP Support**:
Email DSIP Support at DoDSBIRSupport@reisystems.com only for assistance with using the DSIP application. Questions regarding DSIP can be emailed to DSIP Support 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). Please include information on your small business concern, a proposal number (if applicable), and screenshots of any pertinent errors or issues encountered.

DSIP Support 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**:
DSIP (https://www.dodsbirsttr.mil/submissions/login) 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. Proposing small business concerns submitting through this site for the first time will be asked to register on https://www.dodsbirsttr.mil/submissions.

DoD SBIR/STTR website (https://www.defensesbirsttr.mil/) provides the following resources:

- Customer Support Information
- 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 email 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.** Questions pertaining to a particular DoD Component or the Component-specific BAA instructions should be submitted in accordance with the instructions given at the beginning of that Component's topics.

c. **Direct Contact with Topic Authors**. From **April 17, 2024 – May 15, 2024,** this BAA is issued for pre-release with the names of the topic authors and their phone numbers and email addresses. During the pre-release period, proposing small business concerns have an opportunity to contact topic authors by telephone or email 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 small business concerns 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 **May 15, 2024,** no further direct contact between proposing small business concerns and topic authors is allowed unless the Topic Author is responding to a question submitted during the pre-release period. Proposing small business concerns 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 small business concerns 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 **April 17, 2024**, and closes to new questions on **June 5, 2024, 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 small business concerns are advised to monitor Topic Q&A during the BAA period for questions and answers. Proposing small business concerns should also frequently monitor DSIP for updates and amendments to the topics.**

### 4.17 Registrations and Certifications

Individuals from proposing small business concerns must be registered in the DSIP to prepare and submit proposals. **The DSIP application is only accessible from within the United States, which is defined as 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.** All users are required to have an individual user account to access DSIP. As DSIP user accounts are authenticated by Login.gov, all users, who do not already have a Login.gov account, will be required to create one. 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, can be accessed here: https://www.dodsbirsttr.mil/submissions/learning-support/training-materials.

**Be advised the sharing of accounts and passwords is a violation of the Terms of Use for Login.gov and DoD policy.**

Please note 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 UEI or DUNS number and your Firm PIN 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 UEI or 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 UEI or 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.

**Users should complete their account registrations as soon as possible to avoid any delays in proposal submissions.**

The System for Award Management (SAM) allows proposing small business concerns interested in conducting business with the Federal Government to provide basic information on business structure and capabilities as well as financial and payment information. Proposing small business concerns must be registered in SAM. To register, visit www.sam.gov. A proposing small business concern that is already registered in SAM should login to SAM and ensure its registration is active and its representations and certifications are up to date to avoid delay in award.

The Federal Government will use the Unique Entity ID (SAM) to identify organizations doing business with the Government. The DUNS number will no longer be a valid identifier. If the proposing small business concern has an entity registration in SAM.gov (even if the registration has expired), a UEI

(SAM) has already been assigned. This can be found by signing into SAM.gov and selecting the Entity Management widget in the Workspace or by signing in and searching entity information. **For proposing small business concerns with established Defense SBIR/STTR Innovation Portal (DSIP) accounts, update the small business concern profile with the UEI (SAM) as soon as possible.**

For new proposing small business concern registrations, follow instructions during SAM registration on how to obtain a Commercial and Government Entry (CAGE) code and be assigned the UEI (SAM). Once a CAGE code and UEI (SAM) are obtained, update the proposing small business concern's profile on the 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 proposing small business concerns at time of award and during the award life cycle. Each proposing small business concern 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.

### 4.18 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.

### 4.19 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 negotiation for contracts 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 5.3.c(11).

### 4.20 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 DoD, Office of Inspector General Hotline ("Defense Hotline") is an important avenue for reporting fraud, waste, abuse, and mismanagement within the DoD. 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 email addressed to hotline@dodig.mil.

### 4.21 State and Other Assistance Available

Many states have established programs to provide services to those proposing small business concerns 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 business concerns may seek general administrative guidance from small and disadvantaged business utilization specialists located in various Defense Contract Management activities throughout the continental United States.

### 4.22 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. The proposing small business concerns 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 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. Proposing small business concerns are required to submit proposals via DSIP; proposals submitted by any other means will be disregarded. Proposing small business concerns submitting through this site for the first time will be asked to register. It is recommended proposing small business concerns 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. A completed proposal submission in DSIP does NOT indicate that each proposal volume has been completed in accordance with the Component-specific instructions. Accordingly, it is the proposing small business concern's responsibility to consult the Component-specific instructions for detailed guidance, including required proposal documentation and structure, 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) MANDATORY
b. Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Attachment 2) MANDATORY
c. Verification of Eligibility of Small Business Joint Ventures (Attachment 3), if applicable
d. Other supporting documentation (Refer to Component-specific instructions for additional Volume 5 requirements)
**A completed proposal submission in DSIP does NOT indicate the mandatory supporting documents have been uploaded. It is the responsibility of the proposing small business concern to ensure the mandatory documents listed above have been uploaded and included with the proposal submission.**

Volume 6: Fraud, Waste and Abuse Training

All proposing small business concerns **must** complete the following:

- Volume 4: Company Commercialization Report (upload of CCR from SBIR.gov to DSIP is required for proposing small business concerns 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): Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Attachment 2)
- Volume 6: Fraud, Waste and Abuse training

**DO NOT lock, password protect, or encrypt any files uploaded to DSIP.**

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 proposing small business concern 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 negotiation and possible award, the DoD Component program will contact the proposing small business concern for signatures prior to award.

## 5.2 Marking Proprietary Proposal Information

Proposing small business concerns that include data in their proposals 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 proposing small business concern 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 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 DSIP at https://www.dodsbirsttr.mil/submissions/, prepare the Proposal Cover Sheet.

The Cover Sheet must include a brief technical abstract that describes the proposed R&D project and a discussion of anticipated benefits and potential commercial applications. Each section should be no more than 200 words. **Do not include proprietary or classified information in the Proposal Cover Sheet**. If your proposal is selected for negotiation and possible 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.

Effective January 2023, the amounts listed in the Percentage of Work (POW) certification question on the Proposal Cover Sheet are derived from information entered by the proposing small business concern in the Cost Volume (Volume 3). Details on the calculation can be viewed in DSIP during proposal submission.

If the POW calculations fall below eligibility requirements, a letter of explanation or approval by the Funding Agreement officer must be uploaded to the certification question to complete the submission. Some DoD Components will not accept any deviations from the POW minimum requirements. Please refer to the Component instructions regarding acceptance of deviations to the POW requirements.

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 small business concern'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 proposing small business concern 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)**

The Technical Volume should cover the following items <u>in the order given below</u>:

(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. If 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 the proper approvals have been obtained (see Sections 4.9 - 4.11). **Small Business Concerns proposing research involving human and/or animal use are encouraged to separate these tasks in the technical proposal and cost proposal 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 small business concern, 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 proposing small business concern'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 proposing small business concern'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 your proposing small business concern 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. The proposal may be deemed nonresponsive if the requested information is not provided. The proposing small business concerns should report all individuals expected to be involved on this project considered a foreign national as defined in Section 3 of the BAA. You may 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)).

(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 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 small business concern, 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, proposing small business concerns 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 DSIP. Some items in the cost breakdown may not apply to the proposed project. There is no need to provide information on each individual 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; 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 negotiation and possible 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.

The proposing small business concern 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 proposing small business concern 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 proposing small business concern 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 small business concern 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 proposing small business concern. 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.
    - **<u>WARNING:</u>** 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 small business concern 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 small business concerns will have to recertify and resubmit such proposals. If a proposing small business concern does not recertify or resubmit such proposals, they will not be considered fully submitted and will not be evaluated.

b. If the proposing small business concern 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 proposing small business concern 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 proposing small business concern 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 small business concern 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 small business concern will select NO. The CCR section of the proposal will be marked complete.

While all proposing small business concerns 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 proposing small business concerns to submit additional documentation to support the Coversheet (Volume 1), Technical Volume (Volume 2), and the Cost Volume (Volume 3).

All proposing small business concerns 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)
2. Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Attachment 2)

**A completed proposal submission in DSIP does NOT indicate the mandatory supporting documents have been uploaded. It is the responsibility of the proposing small business concern to ensure that the mandatory documents listed above have been uploaded and included with the proposal submission.**

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. Verification of Eligibility of Small Business Joint Ventures (Attachment 3)
8. DD Form 2345, if applicable (see section 4.5)
9. 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 proposing small business concern's authorized proposing small business concern representative. The DFARS provisions and clause may be found in BAA Attachment 1. **These certifications must be signed by the authorized proposing small business concern 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 the proposing small business concern and any contractors that may be proposed as a part of the submission including research partners and suppliers. The proposing small business concerns 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. **Disclosures of Foreign Affiliations or Relationships to Foreign Countries**

In accordance with Section 4 of the SBIR and STTR Extension Act of 2022 and the SBA SBIR/STTR Policy Directive, the DoD will review all proposals submitted in response to this BAA to assess security risks presented by small business concerns seeking a Federally funded award.

Small business concerns must submit Attachment 2 “Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Version 2)” of this BAA in Volume 5 of the proposal submission. Previous versions of Attachment 2 or versions created by other Federal agencies will not be accepted. All small business concern identifying information requested in Attachment 2 must be provided and all questions must be answered. Attachment 2 must also be signed, certifying that information provided is accurate and complete. The Government may require the proposing small business concerns to provide additional information to assist the Government in evaluating the small business concerns’ disclosures in Attachment 2.

Small business concerns who: 1) fail to submit Attachment 2 in Volume 5 of the proposal submission; 2) do not use Attachment 2, version 2, as provided in this BAA; 3) do not provide their complete identifying information or do not completely answer all questions in Attachment 2; 4) fail to provide the Government additional information regarding Attachment 2 when requested; or, 5) fail to sign Attachment 2, **will be deemed noncompliant and will not receive an evaluation of their proposal**. DO NOT lock, password protect or encrypt the form when uploading to Volume 5 in DSIP.

For additional details, please refer to Section 2.2 and 4.3.

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 small business concern. 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 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 proposing small business concern.

## 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 a determination of the overall technical value of each proposal and an evaluation of the cost volume, with the appropriate method of analysis given the contract type to be awarded, for selection of the proposal(s) most advantageous 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 reviewers are acquainted with the proposing small business concern 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.

**Denial of Awards**

The DoD will not make an award under the SBIR program if it determines that—

(A) the small business concern submitting the proposal –

- (i) has an owner or covered individual that is party to a malign foreign talent recruitment program;
- (ii) has a business entity, parent company, or subsidiary located in the People's Republic of China or another foreign country of concern; or
- (iii) has an owner or covered individual that has a foreign affiliation with a foreign entity located in the People's Republic of China or another foreign country of concern; and

(B) the relationships and commitments described in clauses (i) through (iii) of subparagraph (A)—

- (i) interfere with the capacity for activities supported by the DoD to be carried out;
- (ii) create duplication with activities supported by the DoD;
- (iii) present concerns about conflicts of interest;
- (iv) were not appropriately disclosed to the DoD;
- (v) violate Federal law or terms and conditions of contracts or other agreements awarded by the DoD; or
- (vi) pose a risk to national security.

## 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, will be rejected without evaluation. Phase II proposal preparation and submission instructions will be provided by the DoD Components to Phase I awardees.

### 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 negotiation for 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 proposing small business concern 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 proposing small business concern 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 proposing small business concern contain marketing expertise and, if not, how will that expertise be brought into the small business concern?
(5) Who are the proposing small business concern'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 proposing small business concern 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

To reduce risk to the small business and avoid potential contracting delays, companies interested in pursuing Phase II SBIR contracts and other contracts of similar size with the 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 proposing small business concern 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 DoD SBIR/STTR Program 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-tech-transition@mail.mil.

## 8.0 CONTRACTUAL REQUIREMENTS

### 8.1 Additional Contract Requirements

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 examples below are 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 (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 22.2803.
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. All awards resulting from this BAA will include DFARS 252.225-7048. Full text of the clause may be found at https://www.govinfo.gov/content/pkg/CFR-2013-title48-vol3/pdf/CFR-2013-title48-vol3-sec252-225-7048.pdf.

w. **Cybersecurity**. Any small business concern receiving an SBIR/STTR award is required to provide adequate cybersecurity on all covered contractor information systems. Specific security requirements and cyber incident reporting requirements are listed in DFARS 252.204.7012. To learn about cybersecurity resources for your SBIR/STTR contract visit the Blue Cyber webpage: https://www.safcn.af.mil/CISO/Small-Business-Cybersecurity-Information/.

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.

## 8.2 Federal Acquisition Supply Chain Security Act (FASCSA) Orders

FAR 52.204-29 Federal Acquisition Supply Chain Security Act Orders—Representation and Disclosures and FAR 52.204-30 Federal Acquisition Supply Chain Security Act Orders—Prohibition are included in this solicitation. In accordance with FAR 52.204-29 and FAR 52.204-30, proposers must review FASCSA orders at https://sam.gov/content/supplychainorders for covered articles, or any products or services produced or provided by a source, that are prohibited by an applicable FASCSA order.

During contract performance, the Contractor shall review SAM.gov at least once every three months, or as advised by the Contracting Officer, to check for covered articles or for products or services produced by a source subject as part of any new FASCSA order(s) that could impact their supply chain, and report to the Contracting Officer if any covered article or product or service produced or provided by a source was provided to the Government or used during contract performance.

**By submission of a proposal in response to this BAA, the proposing small business concern represents that it has conducted a reasonable inquiry, and that the small business concern does not propose to provide or use in response to this BAA any covered article, or any products or services produced or provided by a source, if the covered article or the source is prohibited by an applicable FASCSA order in effect on the date the BAA was issued.**

FULL TEXT:

**FAR 52.204-29 Federal Acquisition Supply Chain Security Act Orders—Representation and Disclosures (Dec 2023)**

(a) *Definitions.* As used in this provision, *Covered article, FASCSA order, Intelligence community, National security system, Reasonable inquiry, Sensitive compartmented information, Sensitive compartmented information system,* and *Source* have the meaning provided in the clause 52.204-30, Federal Acquisition Supply Chain Security Act Orders—Prohibition.

(b) *Prohibition.* Contractors are prohibited from providing or using as part of the performance of the contract any covered article, or any products or services produced or provided by a source, if the prohibition is set out in an applicable Federal Acquisition Supply Chain Security Act (FASCSA) order, as described in paragraph (b)(1) of FAR 52.204-30, Federal Acquisition Supply Chain Security Act Orders—Prohibition.

(c) *Procedures*.

(1) The Offeror shall search for the phrase "FASCSA order" in the System for Award Management (SAM)( *https://www.sam.gov)* for any covered article, or any products or services produced or provided by a source, if there is an applicable FASCSA order described in paragraph (b)(1) of FAR 52.204-30, Federal Acquisition Supply Chain Security Act Orders—Prohibition.

(2) The Offeror shall review the solicitation for any FASCSA orders that are not in SAM, but are effective and do apply to the solicitation and resultant contract (see FAR 4.2303(c)(2)).

(3) FASCSA orders issued after the date of solicitation do not apply unless added by an amendment to the solicitation.

(d) *Representation.* By submission of this offer, the offeror represents that it has conducted a reasonable inquiry, and that the offeror does not propose to provide or use in response to this solicitation any covered article, or any products or services produced or provided by a source, if the covered article or the source is prohibited by an applicable FASCSA order in effect on the date the solicitation was issued, except as waived by the solicitation, or as disclosed in paragraph (e).

(e) *Disclosures.* The purpose for this disclosure is so the Government may decide whether to issue a waiver. For any covered article, or any products or services produced or provided by a source, if the covered article or the source is subject to an applicable FASCSA order, and the Offeror is unable to represent compliance, then the Offeror shall provide the following information as part of the offer:

(1) Name of the product or service provided to the Government;

(2) Name of the covered article or source subject to a FASCSA order;

(3) If applicable, name of the vendor, including the Commercial and Government Entity code and unique entity identifier (if known), that supplied the covered article or the product or service to the Offeror;

(4) Brand;

(5) Model number (original equipment manufacturer number, manufacturer part number, or wholesaler number);

(6) Item description;

(7) Reason why the applicable covered article or the product or service is being provided or used;

(f) *Executive agency review of disclosures.* The contracting officer will review disclosures provided in paragraph (e) to determine if any waiver may be sought. A contracting officer may choose not to pursue a waiver for covered articles or sources otherwise subject to a FASCSA order and may instead make an award to an offeror that does not require a waiver

(End of clause)

**FAR 52.204-30 Federal Acquisition Supply Chain Security Act Orders—Prohibition**

(a) Definitions. As used in this clause— https://www.acquisition.gov/far/52.204-30.

(b) *Prohibition.*

(1) Unless an applicable waiver has been issued by the issuing official, Contractors shall not provide or use as part of the performance of the contract any covered article, or any products or services produced or provided by a source, if the covered article or the source is prohibited by an applicable FASCSA orders as follows:

(i) For solicitations and contracts awarded by a Department of Defense contracting office, DoD FASCSA orders apply.

(ii) For all other solicitations and contracts DHS FASCSA orders apply.

(2) The Contractor shall search for the phrase “FASCSA order” in the System for Award Management (SAM) at *https://www.sam.gov* to locate applicable FASCSA orders identified in paragraph (b)(1).

(3) The Government may identify in the solicitation additional FASCSA orders that are not in SAM, which are effective and apply to the solicitation and resultant contract.

(4) A FASCSA order issued after the date of solicitation applies to this contract only if added by an amendment to the solicitation or modification to the contract (see FAR 4.2304(c)). However, see paragraph (c) of this clause.

(5)

(i) If the contractor wishes to ask for a waiver of the requirements of a new FASCSA order being applied through modification, then the Contractor shall disclose the following:

(A) Name of the product or service provided to the Government;

(B) Name of the covered article or source subject to a FASCSA order;

(C) If applicable, name of the vendor, including the Commercial and Government Entity code and unique entity identifier (if known), that supplied or supplies the covered article or the product or service to the Offeror;

(D) Brand;

(E) Model number (original equipment manufacturer number, manufacturer part number, or wholesaler number);

(F) Item description;

(G) Reason why the applicable covered article or the product or service is being provided or used;

(ii) *Executive agency review of disclosures.* The contracting officer will review disclosures provided in paragraph (b)(5)(i) to determine if any waiver is warranted. A contracting officer may choose not to pursue a waiver for covered articles or sources otherwise covered by a FASCSA order and to instead pursue other appropriate action.

(c) *Notice and reporting requirement.*

(1) During contract performance, the Contractor shall review *SAM.gov* at least once every three months, or as advised by the Contracting Officer, to check for covered articles subject to FASCSA order(s), or for products or services produced by a source subject to FASCSA order(s) not currently identified under paragraph (b) of this clause.

(2) If the Contractor identifies a new FASCSA order(s) that could impact their supply chain, then the Contractor shall conduct a reasonable inquiry to identify whether a covered article or product or service produced or provided by a source subject to the FASCSA order(s) was provided to the Government or used during contract performance.

(3)

(i) The Contractor shall submit a report to the contracting office as identified in paragraph (c)(3)(ii) of this clause, if the Contractor identifies, including through any notification by a subcontractor at any tier, that a covered article or product or service produced or provided by a source was provided to the Government or used during contract performance and is subject to a FASCSA order(s) identified in paragraph (b) of this clause, or a new FASCSA order identified in paragraph (c)(2) of this clause. For indefinite delivery contracts, the Contractor shall report to both the contracting office for the indefinite delivery contract and the contracting office for any affected order.

(ii) If a report is required to be submitted to a contracting office under (c)(3)(i) of this clause, the Contractor shall submit the report as follows:

(A) If a Department of Defense contracting office, the Contractor shall report to the website at *https://dibnet.dod.mil*.

(B) For all other contracting offices, the Contractor shall report to the Contracting Officer.

(4) The Contractor shall report the following information for each covered article or each product or service produced or provided by a source, where the covered article or source is subject to a FASCSA order, pursuant to paragraph (c)(3)(i) of this clause:

(i) Within 3 business days from the date of such identification or notification:

(A) Contract number;

(B) Order number(s), if applicable;

(C) Name of the product or service provided to the Government or used during performance of the contract;

(D) Name of the covered article or source subject to a FASCSA order;

(E) If applicable, name of the vendor, including the Commercial and Government Entity code and unique entity identifier (if known), that supplied the covered article or the product or service to the Contractor;

(F) Brand;

(G) Model number (original equipment manufacturer number, manufacturer part number, or wholesaler number);

(H) Item description; and

(I) Any readily available information about mitigation actions undertaken or recommended.

(ii) Within 10 business days of submitting the information in paragraph (c)(4)(i) of this clause:

(A) Any further available information about mitigation actions undertaken or recommended.

(B) In addition, the Contractor shall describe the efforts it undertook to prevent submission or use of the covered article or the product or service produced or provided by a source subject to an applicable FASCSA order, and any additional efforts that will be incorporated to prevent future submission or use of the covered article or the product or service produced or provided by a source that is subject to an applicable FASCSA order.

(d) *Removal*. For Federal Supply Schedules, Governmentwide acquisition contracts, multi-agency contracts or any other procurement instrument intended for use by multiple agencies, upon notification from the Contracting Officer, during the performance of the contract, the Contractor shall promptly make any necessary changes or modifications to remove any product or service produced or provided by a source that is subject to an applicable FASCSA order.

(e) *Subcontracts*.

(1) The Contractor shall insert the substance of this clause, including this paragraph (e) and excluding paragraph (c)(1) of this clause, in all subcontracts and other contractual instruments, including subcontracts for the acquisition of commercial products and commercial services.

(2) The Government may identify in the solicitation additional FASCSA orders that are not in SAM, which are effective and apply to the contract and any subcontracts and other contractual instruments under the contract. The Contractor or higher-tier subcontractor shall notify their subcontractors, and suppliers under other contractual instruments, that the FASCSA orders in the solicitation that are not in SAM apply to the contract and all subcontracts.

(End of clause)

### 8.3 Agency Recovery Authority and Ongoing Reporting

In accordance with Section 5 of the SBIR and STTR Extension Act of 2022, the DoD will –

1) require a small business concern receiving an award under its SBIR program to repay all amounts received from the Federal agency under the award if—
    - (A) the small business concern makes a material misstatement that the Federal agency determines poses a risk to national security; or
    - (B) there is a change in ownership, change to entity structure, or other substantial change in circumstances of the small business concern that the Federal agency determines poses a risk to national security; and
2) require a small business concern receiving an award under its SBIR program to regularly report to the Federal agency and the Administration throughout the duration of the award on—
    - (A) any change to a disclosure required under subparagraphs (A) through (G) of section 4.3 above;
    - (B) any material misstatement made under section 8.2 paragraph (A) above; and
    - (C) any change described in section 8.2 paragraph (B) above.

### 8.4 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.

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

DFARS 252.225-7055, Representation Regarding Business Operations with the Maduro Regime, is incorporated into this solicitation. In accordance with section 890 of the National Defense Authorization Act for Fiscal Year 2020 (Pub. L. 116-92), DoD is prohibited from 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 the person has a valid license to operate in Venezuela issued by the Office of Foreign Assets Control of the Department of the Treasury.

### 8.6 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.

### 8.7 Patents

Small business concerns 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 U.S.C. § 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 Section 8.7, Invention Reporting.

### 8.8 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.

### 8.9 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 Government Purpose 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 proposing small business concern 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.

### 8.10 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 are available 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 proposing small business concern in its Phase II proposal to report Phase I progress may also be used in the final report.

(2) For each unclassified report, the proposing small business concern 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 proposing small business concern'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 | |
| Small Business Concern 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)

**ATTACHMENT 2**

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

## Disclosures of Foreign Affiliations or Relationships to Foreign Countries
**(Version 2)**

In accordance with the SBIR and STTR Extension Act of 2022 (Pub. L. 117-183) and the Small Business Administration (SBA) SBIR/STTR Policy Directive, small business concerns are required to disclose the information requested below about the small business's investment and foreign ties. Small business concerns who: 1) fail to submit this form in Volume 5 of the Defense SBIR/STTR Innovation Portal (DSIP) proposal submission; 2) do not use this form, version 2, as provided herein; 3) do not provide their complete identifying information in the table below or do not completely answer all questions in this form; 4) fail to provide the Government additional information regarding this form when requested; or, 5) fail to sign this form, **will be deemed noncompliant and will not receive an evaluation of their proposal**. DO NOT lock, password protect or encrypt this form when uploading to Volume 5 in DSIP.

Relevant definitions can be found at the end of this document. An up-to-date list of countries determined to be countries of concern by the Secretary of State will be maintained and accessible on SBIR.gov.

| | |
|---|---|
| Small Business Concern (SBC) | |
| SBC Unique Entity ID (UEI) | |
| Proposal #<br>(assigned by DSIP when proposal is created) | |
| SBC Point of Contact (POC) Name | |
| SBC POC Phone # | |
| SBC POC Email | |

Responses to disclosure questions may contain trade secrets or commercial or financial information that is privileged or confidential and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with an award between the submitter and the Government.

**The information provided in response to the Disclosure Questions listed below is certified to be accurate and complete. 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.**

Name of person authorized to sign: ____________________________________________

Signature of person authorized: ____________________________________________

Date: ____________________________________________

## Disclosure Questions

**1.** Is any owner or covered individual of the applicant or awardee party to any malign foreign talent recruitment program?

☐ Yes ☐ No

If yes, disclose the first and last name of each owner or covered individual, identify their role (i.e., owner or covered individual), and the malign foreign talent recruitment program.

**2.** Is there a parent company, joint venture, or subsidiary, of the applicant or awardee that is based in or receives funding from, any foreign country of concern?

☐ Yes ☐ No

If yes, disclose the name, full address, applicant or awardee relationships (i.e., parent company, joint venture, or subsidiary) of each entity based in, or funded by, any foreign country of concern.

**3.** Does the applicant or awardee have any current or pending contractual or financial obligation or other agreement specific to a business arrangement, or joint venture-like arrangement with an enterprise owned by a foreign state or any foreign entity?

☐ Yes ☐ No

If yes, disclose the name of each enterprise or foreign entity, type of obligation, agreement, or arrangement ( *i.e.,* contractual, financial, or other), description of obligation, agreement, or arrangement, and the foreign state(s) and/or the country of the foreign entity (or entities).

**4.** Is the applicant or awardee wholly owned in a foreign country?

☐ Yes ☐ No

If yes, disclose the foreign country.

**5.** Does the applicant or awardee have any venture capital or institutional investment?

☐ Yes ☐ No

If yes, proceed to question 5a. If no, proceed to question 6.

**5a**. Does the investing entity have a general partner or any other individual holding a leadership role who has a foreign affiliation with any foreign country of concern?

☐ Yes ☐ No ☐Unable to determine

If yes or unable to determine, disclose the venture capital or institutional investing entity's name, the percentage of ownership obtained by the investing entity, and the type of investment (i.e., equity, debt, or combination of equity and debt).

**6.** During the previous 5-year period, did the applicant or awardee have any technology licensing or intellectual property sales or transfers, to a foreign country of concern?

☐ Yes ☐ No

If yes, disclose the name, address, and country, of the institution or entity that licensed, purchased, or received the technology or intellectual property.

**7.** Is there any foreign business entity, offshore entity, or entity outside the United States related to the applicant or awardee?

☐ Yes ☐ No

If yes, disclose the entity name, relationship type (i.e., foreign business entity, offshore entity, entity outside the United States), description of the relationship to the applicant or awardee, and entity address and country.

**8.** Does the applicant or awardee have an owner, officer, or covered individual that has a foreign affiliation with a research institution located in a foreign country of concern?

☐ Yes ☐ No

If yes, disclose the first and last name of each owner, officer, or covered individual that has a foreign affiliation with a foreign country of concern, identify their role (i.e., owner, officer, or covered individual), and the name of the foreign research institution and the foreign country of concern where it is located.

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**Relevant Definitions**

*Covered individual* — An individual who contributes in a substantive, meaningful way to the scientific development or execution of a research and development (R&D) project proposed to be carried out with a Federally funded award from DoD. DoD has further designated covered individuals as including all proposed key personnel.

*Federally funded award* — A Phase I, Phase II (including Direct to Phase II, sequential Phase II/subsequent Phase II and cross-agency Phase II), or Phase III SBIR or STTR award made using a funding agreement.

*Foreign affiliation* — As defined in 15 U.S.C. § 638(e)(16), foreign affiliation means a funded or unfunded academic, professional, or institutional appointment or position with a foreign government or government-owned entity, whether full-time, part-time, or voluntary (including adjunct, visiting, or honorary). This includes appointments or positions deemed adjunct, visiting, or honorary with research institutions located in a foreign country of concern.

*Foreign country of concern* — As defined in 15 U.S.C. § 638(e)(17), foreign country of concern means the People's Republic of China, the Democratic People's Republic of Korea, the Russian Federation, the Islamic Republic of Iran, or any other country determined to be a country of concern by the Secretary of State.
*Malign foreign talent recruitment program* — As defined in 42 U.S.C § 19237, the term "malign foreign talent recruitment program" means-

(A) any program, position, or activity that includes compensation in the form of cash, in-kind compensation, including research funding, promised future compensation, complimentary foreign travel, things of non de minimis value, honorific titles, career advancement opportunities, or other types of remuneration or consideration directly provided by a foreign country at any level (national, provincial, or local) or their designee, or an entity based in, funded by, or affiliated with a foreign country, whether or not directly sponsored by the foreign country, to the targeted individual, whether directly or indirectly stated in the arrangement, contract, or other documentation at issue, in exchange for the individual-

- (i) engaging in the unauthorized transfer of intellectual property, materials, data products, or other nonpublic information owned by a United States entity or developed with a Federal research and development award to the government of a foreign country or an entity based in, funded by, or affiliated with a foreign country regardless of whether that government or entity provided support for the development of the intellectual property, materials, or data products;
- (ii) being required to recruit trainees or researchers to enroll in such program, position, or activity;
- (iii) establishing a laboratory or company, accepting a faculty position, or undertaking any other employment or appointment in a foreign country or with an entity based in, funded by, or affiliated with a foreign country if such activities are in violation of the standard terms and conditions of a Federal research and development award;
- (iv) being unable to terminate the foreign talent recruitment program contract or agreement except in extraordinary circumstances;
- (v) through funding or effort related to the foreign talent recruitment program, being limited in the capacity to carry out a research and development award or required to engage in work that would result in substantial overlap or duplication with a Federal research and development award;
- (vi) being required to apply for and successfully receive funding from the sponsoring foreign government's funding agencies with the sponsoring foreign organization as the recipient;
- (vii) being required to omit acknowledgment of the recipient institution with which the individual is affiliated, or the Federal research agency sponsoring the research and development award, contrary to the institutional policies or standard terms and conditions of the Federal research and development award;
- (viii) being required to not disclose to the Federal research agency or employing institution the participation of such individual in such program, position, or activity; or
- (ix) having a conflict of interest or conflict of commitment contrary to the standard terms and conditions of the Federal research and development award; and

(B) a program that is sponsored by-

- (i) a foreign country of concern or an entity based in a foreign country of concern, whether or not directly sponsored by the foreign country of concern;

(ii) an academic institution on the list developed under section 1286(c)(8) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (10 U.S.C. 2358 note; 1 Public Law 115–232) ; or

(iii) a foreign talent recruitment program on the list developed under section 1286(c)(9) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (10 U.S.C. 2358 note; 1 Public Law 115–232).

**ATTACHMENT 3**

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

## Verification of Eligibility of Small Business Joint Ventures

A small business joint venture offeror must submit, with its offer, the representation required in paragraph (c) of FAR solicitation provision 52.212-3, Offeror Representations and Certifications-Commercial Products and Commercial Services, and paragraph (c) of FAR solicitation provision 52.219-1, Small Business Program Representations, in accordance with 52.204-8(d) and 52.212-3(b) for the following categories:

(A) Small business;
(B) Service-disabled veteran-owned small business;
(C) Women-owned small business (WOSB) under the WOSB Program;
(D) Economically disadvantaged women-owned small business under the WOSB Program; or
(E) Historically underutilized business zone small business

| | |
|---|---|
| Contractor's Name | |
| Small Business Concern Name | |
| Office Tel # | |
| Mobile # | |
| Email | |

Name of person authorized to sign: ____________________________________________

Signature of person authorized: ____________________________________________

Date: ______________________________

FAR Provision Incorporated in Full Text:

**52.219-1 Small Business Program Representations (Oct 2022)**

(a) *Definitions*. As used in this provision-

*Economically disadvantaged women-owned small business (EDWOSB) concern* means a small business concern that is at least 51 percent directly and unconditionally owned by, and the management and daily business operations of which are controlled by, one or more women who are citizens of the United States and who are economically disadvantaged in accordance with 13 CFR part 127, and the concern is certified by SBA or an approved third-party certifier in accordance with 13 CFR 127.300. It automatically qualifies as a women-owned small business concern eligible under the WOSB Program.

*Service-disabled veteran-owned small business concern-*

(1) Means a small business concern-

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a service-disabled veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) "Service-disabled veteran" means a veteran, as defined in 38 U.S.C.101(2), with a disability that is service-connected, as defined in 38 U.S.C.101(16).

*Small business concern—*

(1) Means a concern, including its affiliates, that is independently owned and operated, not dominant in its field of operation, and qualified as a small business under the criteria in 13 CFR part 121 and the size standard in paragraph (b) of this provision.

(2) *Affiliates*, as used in this definition, means business concerns, one of whom directly or indirectly controls or has the power to control the others, or a third party or parties control or have the power to control the others. In determining whether affiliation exists, consideration is given to all appropriate factors including common ownership, common management, and contractual relationships. SBA determines affiliation based on the factors set forth at 13 CFR 121.103.

*Small disadvantaged business concern*, consistent with 13 CFR 124.1002, means a small business concern under the size standard applicable to the acquisition, that-

(1) Is at least 51 percent unconditionally and directly owned (as defined at 13 CFR 124.105) by-

(i) One or more socially disadvantaged (as defined at 13 CFR 124.103) and economically disadvantaged (as defined at 13 CFR 124.104) individuals who are citizens of the United States, and

(ii) Each individual claiming economic disadvantage has a net worth not exceeding $750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and

(2) The management and daily business operations of which are controlled (as defined at 13 CFR 124.106) by individuals who meet the criteria in paragraphs (1)(i) and (ii) of this definition.

*Veteran-owned small business concern* means a small business concern-

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C.101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

*Women-owned small business concern* means a small business concern-

(1) That is at least 51 percent owned by one or more women; or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

*Women-owned small business (WOSB) concern eligible under the WOSB Program* (in accordance with 13 CFR part 127) means a small business concern that is at least 51 percent directly and unconditionally owned by, and the management and daily business operations of which are controlled by, one or more women who are citizens of the United States, and the concern is certified by SBA or an approved third-party certifier in accordance with 13 CFR 127.300.

(b) (1) The North American Industry Classification System (NAICS) code for this acquisition is _________ *[insert NAICS code]*.

(2) The small business size standard is ________ *[insert size standard]*.

(3) The small business size standard for a concern that submits an offer, other than on a construction or service acquisition, but proposes to furnish an end item that it did not itself manufacture, process, or produce (*i.e.*, nonmanufacturer), is 500 employees if the acquisition—

(i) Is set aside for small business and has a value above the simplified acquisition threshold;

(ii) Uses the HUBZone price evaluation preference regardless of dollar value, unless the offeror waives the price evaluation preference; or

(iii) Is an 8(a), HUBZone, service-disabled veteran-owned, economically disadvantaged women-owned, or women-owned small business set-aside or sole-source award regardless of dollar value.

(c) *Representations.*

(1) The offeror represents as part of its offer that—

(i) it ☐is, ☐ is not a small business concern; or

(ii) It ☐is, ☐is not a small business joint venture that complies with the requirements of 13 CFR 121.103(h) and 13 CFR 125.8(a) and (b). [*The offeror shall enter the name and unique entity identifier of each party to the joint venture:* __.]

(2) [*Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.*] The offeror represents that it ☐is, ☐ is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) [*Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.]* The offeror represents as part of its offer that it ☐ is, ☐ is not a women-owned small business concern.

(4) *Women-owned small business (WOSB) joint venture eligible under the WOSB Program.* The offeror represents as part of its offer that it ☐ is, ☐ is not a joint venture that complies with the requirements of 13 CFR 127.506(a) through (c). [*The offeror shall enter the name and unique entity identifier of each party to the joint venture:* __.]

(5) *Economically disadvantaged women-owned small business (EDWOSB) joint venture.* The offeror represents as part of its offer that it ☐ is, ☐ is not a joint venture that complies with the requirements of 13 CFR 127.506(a) through (c). [ *The offeror shall enter the name and unique entity identifier of each party to the joint venture:* __.]

(6) [*Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.*] The offeror represents as part of its offer that it ☐ is, ☐ is not a veteran-owned small business concern.

(7) [*Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (c)(6) of this provision.*] The offeror represents as part of its offer that

(i) It ☐ is, ☐ is not a service-disabled veteran-owned small business concern; or

(ii) It ☐ is, ☐ is not a service-disabled veteran-owned joint venture that complies with the requirements of 13 CFR 125.18(b)(1) and (2). [ *The offeror shall enter the name and unique entity identifier of each party to the joint venture:* __.] Each service-disabled veteran-owned small business concern participating in the joint venture shall provide representation of its service-disabled veteran-owned small business concern status.

(8) [*Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.*] The offeror represents, as part of its offer, that-

(i) It ☐ is, ☐ is not a HUBZone small business concern listed, on the date of this representation, as having been certified by SBA as a HUBZone small business concern in the Dynamic Small Business Search and SAM, and will attempt to maintain an employment rate of HUBZone residents of 35 percent of its employees during performance of a HUBZone contract (see 13 CFR 126.200(e)(1)); and

(ii) It ☐ is, ☐□ is not a HUBZone joint venture that complies with the requirements of 13 CFR 126.616(a) through (c). [*The offeror shall enter the name and unique entity identifier of each party to the joint venture:* __.] Each HUBZone small business concern participating in the HUBZone joint venture shall provide representation of its HUBZone status.

(d) *Notice.* Under 15 U.S.C.645(d), any person who misrepresents a firm's status as a business concern that is small, HUBZone small, small disadvantaged, service-disabled veteran-owned small, economically disadvantaged women-owned small, or women-owned small eligible under the WOSB Program in order to obtain a contract to be awarded under the preference programs established pursuant to section 8, 9, 15, 31, and 36 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall-

(1) Be punished by imposition of fine, imprisonment, or both;

(2) Be subject to administrative remedies, including suspension and debarment; and

(3) Be ineligible for participation in programs conducted under the authority of the Act.

(End of provision)

**DEPARTMENT OF THE NAVY (DoN)**
**24.2 Small Business Innovation Research (SBIR)**
**Proposal Submission Instructions**

**IMPORTANT**

- **The following instructions apply to topics:**
  - **N242-070 through N242-104**

- Submitting small business concerns are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic changes.
  - The DoD Program BAA is located at: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements. Select the tab for the appropriate BAA cycle.
  - Review the Attachments of the DoD Program BAA and ensure the correct versions of the following MANDATORY items are uploaded to the Supporting Documents, Volume 5:
    - Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Attachment 1)
    - Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Attachment 2)
  - Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

- 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.**

- Proposing small business concerns 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 proposing small business concerns 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.

- This BAA is issued under regulations set forth in Federal Acquisition Regulation (FAR) 35.016 and awards will be made under “other competitive procedures”. The policies and procedures of FAR Subpart 15.3 shall not apply to this BAA, except as specifically referenced in it. All procedures are at the sole discretion of the Government as set forth in this BAA. Submission of a proposal in response to this BAA constitutes the express acknowledgement to that effect by the proposing small business concern.

## 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 | Navy SBIR/STTR Program Management Office usn.pentagon.cnr-arlington-va.mbx.navy-sbir-sttr@us.navy.mil or appropriate Program Manager listed 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)<br>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 | DSIP Support via email at dodsbirsupport@reisystems.com |
| Navy-specific BAA instructions and forms | Always | DoN SBIR/STTR Program Management Office usn.pentagon.cnr-arlington-va.mbx.navy-sbir-sttr@us.navy.mil |

**TABLE 2: DoN SYSTEMS COMMANDS (SYSCOM) SBIR PROGRAM MANAGERS**

| Topic Numbers | Point of Contact | SYSCOM | Email |
|---|---|---|---|
| N242-070 to N242-071 | Mr. Jeffrey Kent | Marine Corps Systems Command (MCSC) | sbir.admin@usmc.mil |
| N242-072 to N242-086 | Ms. Kristi DePriest | Naval Air Systems Command (NAVAIR) | navair-sbir@us.navy.mil |
| N242-087 | Mr. Jason Schroepfer | Naval Sea Systems Command (NAVSEA) | NSSC_SBIR.fct@navy.mil |
| N242-088 to N242-099 | Ms. Lore-Anne Ponirakis | Office of Naval Research (ONR) | usn.pentagon.cnr-arlington-va.mbx.onr-sbir-sttr@us.navy.mil |

| Topic Numbers | Point of Contact | SYSCOM | Email |
|---|---|---|---|
| N242-100 to N242-104 | Mr. Jon M. Aspinwall III (Acting) | Strategic Systems Programs (SSP) | ssp.sbir@ssp.navy.mil |

**PHASE I SUBMISSION INSTRUCTIONS**

The following section details requirements for submitting a compliant Phase I proposal to the DoD SBIR/STTR Programs.

(NOTE: Proposing small business concerns 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).** Proposing small business concerns 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. Proposing small business concerns submitting through DSIP for the first time will be asked to register. It is recommended that small business concerns 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. Proposals that are encrypted, password protected, or otherwise locked in any portion of the submission will be REJECTED unless specifically directed within the text of the topic to which you are submitting. 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 the proposal will be REJECTED:
    - Not to exceed ten (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 ten-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.
    - Work proposed for the Phase I Base must be exactly six (6) months.
    - Work proposed for the Phase I Option must be exactly six (6) months.

  - Additional information:

- It is highly recommended that proposing small business concerns 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, proposing small business concerns 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 the proposal 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.
    - For Phase I, a minimum of two-thirds of the work is performed by the proposing small business concern. The two-thirds percentage of work requirement must be met in the Base costs as well as in the Option costs. DoN will not accept deviations from the minimum percentage of work requirements for Phase I. The percentage of work is measured by both direct and indirect costs. To calculate the minimum percentage of work for the proposing small business concern the sum of all direct and indirect costs attributable to the proposing small business concern represent the numerator and the total cost of the proposal (i.e., Total Cost before Profit Rate is applied) is the denominator. The subcontractor percentage is calculated by taking the sum of all costs attributable to the subcontractor (Total Subcontractor Costs (TSC)) as the numerator and the total cost of the proposal (i.e., Total Cost before Profit Rate is applied) as the denominator.
      - Proposing Small Business Concern Costs (included in numerator for calculation of the small business concern):
        - Total Direct Labor (TDL)
        - Total Direct Material Costs (TDM)
        - Total Direct Supplies Costs (TDS)
        - Total Direct Equipment Costs (TDE)
        - Total Direct Travel Costs (TDT)
        - Total Other Direct Costs (TODC)
        - General & Administrative Cost (G&A)

        **NOTE:** G&A, if proposed, will only be attributed to the proposing small business concern.
      - Subcontractor Costs (numerator for subcontractor calculation):
        - Total Subcontractor Costs (TSC)
      - Total Cost (i.e., Total Cost before Profit Rate is applied, denominator for either calculation)
    - **Cost Sharing: Cost sharing is not accepted on DoN Phase I proposals.**

  - 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 proposing small business concerns must review and submit the following items, as applicable:
  - **Telecommunications Equipment Certification.** Required for all proposing small business concerns. 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 proposing small business concerns 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.
  - **Disclosures of Foreign Affiliations or Relationships to Foreign Countries.** Each proposing small business concern is required to complete Attachment 2 of this BAA, “Disclosures of Foreign Affiliations or Relationships to Foreign Countries” and upload the form to Volume 5, Supporting Documents. Please refer to the following sections of the DoD SBIR/STTR Program BAA for details:
    - Program Description
    - Proposal Fundamentals
    - Phase I Proposal
    - Attachment 2
  - **Majority Ownership in Part.** Proposing small business concerns 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:
    - Proposing small business concerns 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 proposing small business concern 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
  - Details of Request for Discretionary Technical and Business Assistance (TABA), if proposed, is to be included under the Additional Cost Information section if using the DoN Supporting Documents template.
  - Do not include documents or information to substantiate the Technical Volume (Volume 2) in Volume 5 (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, proposing small business concerns 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 DSIP submission requirements will be forwarded to the DoN SBIR/STTR Programs. Prior to evaluation, all proposals will undergo a compliance review to verify compliance with DoD and DoN SBIR/STTR proposal eligibility requirements. Proposals not meeting submission requirements will be REJECTED and not evaluated.

- **Proposal Cover Sheet (Volume 1).** The Proposal Cover Sheet (Volume 1) will undergo a compliance review to verify the proposing small business concern has met eligibility requirements and followed the instructions for the Proposal Cover Sheet as specified in the DoD SBIR/STTR Program BAA.

- **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. The information considered for this decision will come from Volume 2. This is not a FAR Part 15 evaluation and proposals will not be compared to one another. Cost is not an evaluation criterion and will not be considered during the evaluation process; the DoN will only do a compliance review of Volume 3. 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 (prior to evaluation) to verify the proposing small business concern has met the following requirements or the proposal will be REJECTED:
  - Not to exceed ten (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.
- Work proposed for the Phase I Base must be exactly six (6) months.
- Work proposed for the Phase I Option must be exactly six (6) months.

- **Cost Volume (Volume 3).** The Cost Volume (Volume 3) will not be considered in the selection process and will only undergo a compliance review to verify the proposing small business concern has met the following requirements or the proposal will be REJECTED:
  - Must not exceed values for the Base ($140,000) and Option ($100,000).
  - Must meet minimum percentage of work; a minimum of two-thirds of the work is performed by the proposing small business concern. The two-thirds percentage of work requirement must be met in the Base costs as well as in the Option costs. DoN will not accept deviations from the minimum percentage of work requirements for Phase I.
  - **Cost Sharing: Cost sharing is not accepted on DoN Phase I proposals.**

- **Company Commercialization Report (CCR) (Volume 4).** The CCR (Volume 4) will not be evaluated by the Navy nor will it be considered in the Navy's award decision. However, all proposing small business concerns must refer to the DoD SBIR/STTR Program BAA to ensure compliance with DSIP Volume 4 requirements.

- **Supporting Documents (Volume 5).** Supporting Documents (Volume 5) will not be considered in the selection process and will only undergo a compliance review to ensure the proposing small business concern 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 proposing small business concerns to consider during proposal preparation and submission process.

**Due Diligence Program to Assess Security Risks.** The SBIR and STTR Extension Act of 2022 (Pub. L. 117-183) requires the Department of Defense, in coordination with the Small Business Administration, to establish and implement a due diligence program to assess security risks presented by small business concerns seeking a Federally-funded award. Please review the Program Description section of the DoD SBIR/STTR Program BAA for details on how DoD will assess security risks presented by small business concerns. The Due Diligence Program to Assess Security Risks will be implemented for all Phases.

**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. Proposing small business concerns 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 $2,000,000 or lower limit specified by the SYSCOM). As with Phase I, the amount proposed for TABA cannot include any profit/fee by the proposing small business concern and must be inclusive of all applicable indirect costs. TABA cannot be used in the calculation of general and administrative expenses (G&A) for the SBIR proposing small business concern. 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 small business concern receiving TABA will be required to submit a report detailing the results and benefits of the service received. This TABA report will be due at the time of submission of the final report.

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 (to include the purpose and objective of the assistance)
- Total TABA provider(s) cost, number of hours, and labor rates (average/blended rate is acceptable)

TABA must <u>NOT</u>:
- Be subject to any indirect costs, profit, or fee by the SBIR proposing small business concern
- Propose a TABA provider that is the SBIR proposing small business concern
- Propose a TABA provider that is an affiliate of the SBIR proposing small business concern
- Propose a TABA provider that is an investor of the SBIR proposing small business concern
- Propose a TABA provider that is a subcontractor or consultant of the requesting small business concern 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 5) – a detailed request for TABA (as specified above) specifically identified as “TABA” in the section titled Additional Cost Information when using the DoN Supporting Documents template.
- 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 “TABA” in the section titled Additional Cost Information when using the DoN Supporting Documents template.

Proposed values for TABA must <u>NOT</u> 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

If a proposing small business concern requests and is awarded TABA in a Phase II contract, the proposing small business concern 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 participate in the virtual Navy STP Kickoff during the first or second year of the Phase II contract. While there are no travel costs associated with this virtual event, Phase II awardees should budget time of up to a full day to participate. STP information can be obtained at: https://navystp.com. Phase II awardees will be contacted separately regarding this program.

**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 proposing small business concern 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 small business concern 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 as a separate PDF file to the Supporting Documents (Volume 5) in DSIP 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.** Proposing small business concerns 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 proposing small business concerns 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, small business concerns must register with the SBA Company Registry Database.
b. The proposing small business concern 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 proposing small business concern become a member of this ownership class after submitting its proposal and prior to any receipt of a funding agreement, the proposing small business concern 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 proposing small business concerns 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, proposing small business concerns should confirm that they are registered to receive contracts (not just grants) and the address in SAM matches the address on the proposal. A small business concern selected for an award MUST have an active SAM registration at the time of award or they will be considered ineligible.

**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 small business concern 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 proposing small business concern 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.nre.navy.mil/work-with-us/how-to-apply/compliance-and-protections/research-protections. 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 proposal of the proposing small business concern 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.** Interested parties have the right to protest in accordance with the procedures in FAR Subpart 33.1.

Pre-award agency protests related to the terms of the BAA must be served to: osd.ncr.ousd-r-e.mbx.SBIR-STTR-Protest@mail.mil. A copy of a pre-award Government Accountability Office (GAO) protest must also be filed with the aforementioned email address within one day of filing with the GAO.

Protests related to a selection or award decision should be filed with the appropriate Contracting Officer for an Agency Level Protest or with the GAO. Contracting Officer contact information for specific DoN Topics may be obtained from the DoN SYSCOM Program Managers listed in Table 2 above. For protests filed with the GAO, a copy of the protest must be submitted to the appropriate DoN SYSCOM Program Manager and the appropriate Contracting Officer within one day of filing with the GAO.

**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 compliance review of Volume 3 to confirm eligibility of the proposing small business concern, 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 small business concern per topic. The maximum Phase I proposal/award amount including all options 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 $2,000,000 (unless non-SBIR/STTR funding is being added). Individual SYSCOMs may award amounts, including Base and all Options, of less than $2,000,000 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 |

**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 (as stated in this BAA). The Phase I Final Report and Initial Phase II Proposal will be used to evaluate the small business concern's potential to progress to a workable prototype in Phase II and transition the 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 small business concerns (e.g., the Navy 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.

## Navy SBIR 24.2 Phase I Topic Index

| | |
|---|---|
| N242-091 | An Open-Source Academic Publication Platform Tailored Toward Future Open Science Communications |
| N242-092 | GigEVision-compliant Event-based Cameras |
| N242-093 | Distributed Acceleration Sensor for Integrated Flight and Structural Control |
| N242-094 | Anti-Corrosion Coating for Gas Turbine Compressor Components Operating in Marine Environments |
| N242-095 | Directional Wave Spectra Sensing Module for Autonomous Underwater Vehicle Gliders |
| N242-096 | Context Aware Data Stream Pre-processor for Time-Sensitive Applications |
| N242-097 | Unmanned Aerial System for Tag Deployment in Marine Mammal Monitoring |
| N242-098 | Signal Cueing in Complex Environments |
| N242-099 | Wireless Power Transfer |
| N242-100 | Photonics-Based Optical Frequency Shifter in the Near-Infrared (NIR) |
| N242-101 | Reentry Plasma Onset and Emergence Sensor |
| N242-102 | Radiation-Hardened Super High Frequency (SHF) Electronics |
| N242-103 | Radiation-Hardened Quartz Oscillators |
| N242-104 | Fast 1-to-N Polarization Maintaining Fiber Optical Switches for the Near Infrared (NIR) |

N242-070 TITLE: Hydrogen Generation Salt-water Electrolysis with Chemical Compression

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Renewable Energy Generation and Storage

OBJECTIVE: Develop a hydrogen generation system that uses salt water to produce one to five kg of hydrogen over a 24-hour period in an austere environment. All components of the system shall be stored, transported, and operated in quad-con ISO containers. The system shall be required to leverage Onboard Vehicle Power (OVP), currently fielded tactical generators, and alternative power sources (e.g., solar or mobile nuclear power generation).

DESCRIPTION: As part of its future force modernization efforts, the Marine Corps seeks to deploy small, disaggregated hydrogen generation units to foreign locations where access to energy sources will be limited or unavailable. These units are to specifically support the U.S. Marine Corps' Expeditionary Advanced Base Operations (EABO), a form of expeditionary warfare that involves the employment of mobile, low-signature, naval expeditionary forces that operate from a series of austere, temporary locations.

Definitions:
Systems must meet Threshold requirements = (T)
It is highly desirable that the system meet Objective requirements = (O)

- The system shall produce 1-3 kg (T) or 3-5 kg (O) of Hydrogen over a 24-hour period.
- The system shall accept a water source with up to 60K PPM of Total Dissolved Solids (TDS) (T=O).
- The system will be powered by 28 VDC; 208VAC, 3 -phase; or 120VAC, single-phase (T=O).
- Can fit and be secured in a Quadcon (T) or a JMIC (O) ISO containers.
- The system will be transportable via MTVR or JLTV Trailer (T=O).
- Applicable MIL-STD 810 standards (T=O).
    - Hi/Low Temp
    - Environmental
    - Shock and Vibration
    - Transportability
- Applicable MIL-STD-1472 standards (T=O).
    - Weight
    - Lifting
    - Displays
    - Alarms

PHASE I: Develop concepts for Hydrogen Generation via Salt-water Electrolysis with Chemical Compression that meets the requirements described above. Demonstrate the feasibility of the concepts in meeting Marine Corps requirements. Establish that the concepts can be developed into a useful product for the Marine Corps. Feasibility will be established by material testing and analytical modeling, as appropriate. Provide a Phase II development plan with performance goals and key technical milestones, and that will address technical risk reduction.

PHASE II: Develop 1-2 prototype Hydrogen Generation Salt-water Electrolysis with Chemical Compression systems for evaluation to determine their capability in meeting the performance goals defined in the Description above. Demonstrate technology performance through prototype evaluation and modeling over the required range of parameters. Evaluation results will be used to refine the prototype into an initial design that will meet Marine Corps requirements; and for evaluation to determine its effectiveness in an operationally relevant environment approved by the Government. Prepare a Phase III development plan to transition the technology to Marine Corps use. The technology should reach TRL 6/7 at the conclusion of this phase.

PHASE III DUAL USE APPLICATIONS: Support the Marine Corps in transitioning the technology for Marine Corps use. Support the Marine Corps for test and validation to certify and qualify the system for Marine Corps use. The prototypes shall by TRL 8 at the conclusion of testing.
Commercial applications may include, but not be limited to: fuel cells, automotive applications, alternative energy, home power systems, humanitarian aid, disaster relief, homeland security, and emergency services.

REFERENCES:

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2. “Advances in Electrochemical Hydrogen Compression and Purification.” Peter Jaime Bouwman. The Electrochemical Society. 2016
3. Department of Defense. MIL-STD-810H, Environmental Engineering Considerations and Laboratory Tests. 31 January 2019
4. Dept of Defense. MIL-STD-1472H, Human Engineering. 15 September 2020


KEYWORDS: Hydrogen; Electrolysis; Energy; Compression; Water; Electrochemical


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N242-071 TITLE: Intelligent Hydrogen Filling System

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Renewable Energy Generation and Storage

OBJECTIVE: Develop an intelligent hydrogen filling system that safely and quickly fills hydrogen storage tanks in an austere environment. All components of the system shall be stored, transported, and operated in man-portable containers. The system shall be required to leverage Onboard Vehicle Power (OVP), currently fielded tactical generators, alternative power sources (e.g., solar), or energy storage devices (batteries or fuel cells).

DESCRIPTION: As part of its future force modernization efforts, the Marine Corps seeks to deploy small, disaggregated intelligent hydrogen filling units to foreign locations where access to energy sources will be limited or unavailable. These units are to specifically support the U.S. Marine Corps' Expeditionary Advanced Base Operations (EABO), a form of expeditionary warfare that involves the employment of mobile, low-signature, naval expeditionary forces that operate from a series of austere, temporary locations. Intelligent hydrogen filling systems will provide a capability to distribute hydrogen to Expeditionary Advanced Bases from tactical hydrogen generation and storage system locations.

Definitions:
Systems must meet Threshold requirements = (T).
It is highly desirable that the system meet Objective requirements = (O).
• The system shall be capable of metering and tracking the hydrogen transferred bi-directionally, either into or from, the hydrogen storage/compressor or generation system (T=O).
• The system shall be capable of metering and tracking the hydrogen transferred into the portable hydrogen tanks (T=O).
• The system shall be capable of filling Type 4 (T), Type 3 or conformal tanks (O).
• The system shall be capable of leak testing the portable storage tank and provide a "go/no go" indication to the user (T=O).
• The system shall provide a display to provide users with system performance and status information. This will include, at a minimum:
  o Flow rate
  o Pressure
  o Portable storage tank fill percentage
  o Time to fill
  o Leak check status
• The system shall utilize a HGV2 standard fitting.
• The system shall fill any 500 gram hydrogen storage tank, without pre-cooling, at a fill rate of 50 g/min (T) or 100 g/min (O).
• The system shall provide overflow protection to restrict hydrogen flow to protect equipment being filled (T=O).
• The system shall be able to fill tanks at an operational pressure up to 10k PSI (T=O).
• The system shall be powered by 28 VDC or 120VAC, single-phase (T=O).
• The system shall fit and be secured in a 12 cubic foot container (T) or 3 cubic foot container (O).
• The system shall not exceed the requirements of a 2-person lift/carry (T) or 1-person lift/carry (O).
• The system shall be operable by personnel with limited training (plug and play (T) or no training (plug and play) (O).
• Minimum applicable MIL-STD 810 standards (T=O).
  o Hi/Low Temp
  o Environmental
  o Shock and Vibration

    - o Transportability
- • Minimum applicable MIL-STD-1472 standards (T=O).
    - o Weight
    - o Lifting
    - o Displays
    - o Alarms

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

PHASE II: Develop 3-5 prototype Intelligent Hydrogen Filling Systems for evaluation to determine their capability in meeting the performance goals defined in the Description above. Demonstrate technology performance through prototype evaluation and modeling over the required range of parameters. Evaluation results will be used to refine the prototype into an initial design that will meet Marine Corps requirements; and for evaluation to determine its effectiveness in an operationally relevant environment approved by the Government. Prepare a Phase III development plan to transition the technology to Marine Corps use. The transition plan shall address commercialization and manufacturing. The technology should reach TRL 6/7 at the conclusion of this phase.

PHASE III DUAL USE APPLICATIONS: Support the Marine Corps in transitioning the technology for Marine Corps use. Support the Marine Corps for test and validation to certify and qualify the system for Marine Corps use. The prototypes shall be TRL 8 at the conclusion of testing.
Commercial applications may include, but not be limited to: fuel cells, automotive applications, alternative energy, home power systems, humanitarian aid, disaster relief, homeland security, and emergency services.

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3. Dept of Defense. MIL-STD-1472H, Human Engineering. 15 September 2020.

KEYWORDS: Hydrogen; storage; filling; fueling; energy; tank

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N242-072 TITLE: Improved Heat Blanket Technology for Aircraft Composite Bonding Operations

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Sustainment

OBJECTIVE: Develop technology capable of providing a militarized heat blanket available in various sizes that have uniform heating as far up to the edge as possible, with no heat sinks or dead spots.

DESCRIPTION: Composite hot bonder repair sets are used to apply heat and vacuum pressure to composite patches via heat blankets to achieve structurally sound repairs of aircraft structural components in the fleet. Composite aircraft structural repairs at the I-level typically are compromised due to dead spots and uneven/inadequate distribution of heat towards the ends of the blankets, leading to improperly cured repairs if the users do not know the actual heating area of the blanket in relation to the size of the repair. Lack of uniform heating leads to premature failure of bonded parts. Present composite hot bonding technology is unable to properly cure complex geometries, leading to heat sinks or improperly cured parts. The objective of this SBIR topic is to seek technical solutions from industry to this problem. The technology must be capable of providing a militarized heat blanket available in various sizes that have uniform heating as far up to the edge as possible, with no heat sinks or dead spots. Additionally, the Navy desires a system that can be used with all of the material combinations/geometries for composite components on current Navy aircraft. The radome window repair requires a cure at 365 °F (185 °C) for five hours, and then a cure at 400 °F (204.44 °C) for four hours.

PHASE I: Develop, design, and demonstrate feasibility of how the chosen technology works, how it could be adapted for the military environment, Develop a test plan. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Perform a current required high-temperature hot-bonded repair at a Navy site, evaluate results, determine next steps/path forward. The radome window repair requires a cure at 365 °F (185 °C) for five hours, and then a cure at 400 °F (204.44 °C) for four hours.

PHASE III DUAL USE APPLICATIONS: Successfully perform a range of high-temperature repairs on five separate layup combinations. The commercial airline industry has the same issues with heat sinks during composite structural repair and could benefit from this technology.

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KEYWORDS: Aircraft; composite; structural; heat-sink; heat blanket; hot bonder

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N242-073 TITLE: Transient Voltage Suppressor (TVS) for F/A-18 E/F and EA-18G

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): FutureG; Sustainment

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 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 Transient Voltage Suppressor (TVS) that will limit the overvoltages to avionics components to 150 volts root-mean-square (Vrms) maximum, instead of the MIL-STD-704E requirement of 180 Vrms.

DESCRIPTION: F/A-18 E/F and EA-18G use MIL-STD-704E Aircraft Electric Power Characteristics, the electrical power interface specification. MIL-STD-704E requires avionics to withstand overvoltage transients to 180 Vrms, but many avionics components were not tested to the 180 Vrms causing reduced avionics reliability.

MIL-STD-704E requires avionics to withstand overvoltage transients to 180 Vrms, but many Avionics were not tested to the 180 Vrms transients, and are failing in the fleet as a result. The reason testing was not performed for F/A-18 was because in 1999 when aircraft went into full-rate production, there was no test method for MIL-STD-704E; the test method was not implemented until 2010. The most economical solution per aircraft is to place the TVS on two electrical busses instead of inside 50 avionic boxes. The TVS needs to limit the overvoltages to 150 Vrms maximum instead of the MIL-STD-704E of 180 Vrms requirement. The TVS needs to start limiting when the voltage gets to between 130–140 Vrms, and clamp at a maximum of 150 Vrms.

PHASE I: Perform a study to design a TVS that meets F/A 18- E/F and EA-18G capabilities. Use MIL-STD-704E Aircraft Electric Power Characteristics, the electrical power interface specification, as a basis for the design. The Phase I effort will include prototype plans to be developed under Phase II. The TVS needs to limit the overvoltages to a maximum of 150 Vrms instead of the MIL-STD-704E of 180 Vrms requirement. The TVS needs to start limiting when the voltage gets to between 130–140 Vrms, and clamp at a maximum of 150 Vrms.

PHASE II: Development of two TVS prototypes that should meet the following test requirements:
1. Joule dissipation at 25 °C < 2625 Joules,
2. Joule dissipation on infinite heatsink at TL = 75 °C < 2625 Joules,
3. Peak forward surge current, 1025ms single half-sinasoidal wave (bidirectional only) 350 amperes root mean square (Arms),
4. Operating and storage temperature range -55 °C to +175 °C,
5. Vrms minimum range 130 to maximum range 140,
6. Arms maximum reverse leakage 5 mA to 2 µA at Voltage Reverse Working Maximum 108 Vrms,
7. Voltage Reverse Working Leakage of a Vrms 108,
8. Maximum Reverse Surge Current I peak to peak Amps rms 172.9 Ipp, and
9. Maximum Clamping Voltage 150 Vrms at Ipp.
Navy Military Standards & Testing:
10. MIL STD 704 Electrical interface,

11. MIL STD 810 needs to be environmentally qualified,
12. MIL STD 461 EMI

PHASE III DUAL USE APPLICATIONS: Perform laboratory testing and then install the prototype(s) in an aircraft for an aircraft ground and flight test.

Commercial electrical system developers that use the electrical power interface specification can use TVS. Commercial aircraft requires avionics to withstand overvoltage transients to 180 Vrms, but many avionics components were not tested to the 180 Vrms.

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KEYWORDS: Electrical; transient; voltage; suppressor; avionics; MIL-STD-704


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N242-074 TITLE: Infrared Window/Dome Refurbishment and Repair

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Hypersonics; Sustainment

OBJECTIVE: Design and develop methods to refurbish and/or repair infrared (IR) sensor or missile seeker system windows and domes that have been damaged through their operational environments to their pristine optical and physical/mechanical condition.

DESCRIPTION: Over the course of the last 50 years, the Military Services have increasingly relied on sensors, trackers, and seeker systems operating in the IR spectrum. Windows and domes for such systems, exposed to rain, sand, salt spray, contaminants, and other degraders in their intended operational environments, typically erode with the resulting surface damage degrading optical quality and limiting their serviceable lifetime. Consequences include degraded sensor system performance and significant yearly investment for replacement.

Environmental damage to IR windows and domes may include optical coating full or partial delamination, pitting and/or gouging, both shallow and deep scratching, wide-area abrasion, and smudging from contaminants typical of operational environments. Coating remnants may be uneven, as dielectric coatings are sometimes applied over a sparse metallic mesh on the window/dome surface. Additionally, coating remnants on damaged windows and domes may contain trace amounts of hazardous materials (e.g., heavy metals such as cadmium and chalcogenides). To date, no approach has satisfactorily demonstrated removal or repair of damaged surface layers in single or poly-crystalline (e.g., sapphire, spinel, Silicon (Si) or Germanium (Ge)) optical windows or domes, to include maintenance of the original optical quality (i.e., transmission, absorption, and wavefront error) of the pre-damaged material. Past limited attempts to fill pits or provide spot repairs have resulted in optical quality degradation and limitations due to mismatches in indices of refraction, stress, or thermal expansion.

The integrated circuit and solar cell industries, however, routinely cut and polish single and poly-crystalline window materials such as Si, Ge, and gallium arsenide (GaAs) from boules via slicing and chemical-mechanical processing (CMP) to a level of surface quality, with the absence of defects and underlying strain/stress, that far exceeds current requirements for IR windows and domes. Surface finish, as measured via the bi-directional reflectance distribution function (BRDF), for instance, routinely approaches 1 x 10E-7 sr-1 without any further processing or treatment. It is postulated that damaged optical windows and domes made of these or other single-boule grown crystalline materials could be restored in a multi-step process that includes removal of the damaged surface layers, CMP or other processing to restore a pristine surface with undamaged underlayer, and epitaxial, chemical vapor deposition (CVD), or other deposition mechanisms to "grow" a new top layer to the optical window/dome using the same material and crystalline structure as the original substrate. The result would be a window/dome of a single optical material, eliminating prior barriers to window/dome repair, such as thermal mismatch, refractive index mismatch, mechanical stress, and sub-surface defects. In the case of single-crystal sapphire, use of the same material, deposited in the same crystallographic orientation, would also eliminate impacts to design and performance due to single-crystal sapphire's inherent birefringence.

Further processing of the restored window/dome blank would be limited to final polishing/shaping and surface coating, with no changes required to polishing methods, coating materials, or coating design currently employed in the window/dome production process.

Innovative sources and methods are sought for the repair/refurbishment of sapphire, Ge, and Si IR windows and domes that have experienced damage as described above to the strength (i.e., Young's modulus, Poisson's ratio, Knoop hardness), shape (including original thickness), material (sapphire, Ge, or Si, depending on the substrate), crystallographic orientation, and optical quality (i.e., absorptivity, transmissivity, refractive index) of a pre-damaged, pre-coated (i.e., no anti-reflective coating), pre-polished window or dome blank, with the project goals of a final per-unit refurbishment cost not to exceed $30,000 and 3 months for flat sapphire windows, to 10 in. (25.40 cm) across, and for hemispheric Ge domes to 9 in. (22.86 cm) in diameter. The notional approach described above serves only as an example; providers are free to explore approaches that may or may not be similar. All proposed methods, however, must explicitly address the challenges of thermal and mechanical stress, possible separation of the repair layer and understructure, and impacts to optical performance, birefringence, and current processing/polishing techniques and coating designs.

PHASE I: Design and demonstrate feasibility of novel approach(es) to repair/refurbish single-boule-grown IR optical windows and domes that have surface damage characterized by pitting, scratches, abrasions, oil-based and salt spray contamination, and fragmented/delaminated surface coatings and/or coating remnants. First demonstrations will include optical grade flat single-crystal sapphire substrates of 0.75 in. (1.9 cm) diameter or larger, with no fundamental physical barrier to later applications of similar approaches to dome or ogive shapes, or other common boule-grown crystalline IR window material systems listed in the references. Selected methods and materials must have no intrinsic limitations to scaling to sizes of 100 square in. (254 square cm) (flat sapphire window) or 10 in. (25.4 cm) in diameter (hemispherical Ge dome). The Phase I effort will include selection of measurement and assessment techniques to evaluate the repaired window internal structure, stress/strain, refractive index, mechanical strength, and optical quality, as well as development of prototype plans to be implemented under Phase II.

PHASE II: Optimize processes developed under Phase I and demonstrate restoration of a scratched, eroded, partially-coated 5-in. (12.7 cm) (minimum) diameter, 0.25 in. (.635 cm) thick sapphire flat to the optical quality (i.e., absorptivity, transmissivity, lack of surface/subsurface defects), strength (i.e., Young's modulus, Poisson's ratio, Knoop hardness), and thickness of a pristine, unpolished, uncoated 0.25 in. (.635 cm) thick sapphire window blank, with nothing to preclude extension of the technology to larger sizes and to Ge dome materials systems, at a per-unit cost below $30,000. Process may be demonstrated on either government-furnished damaged single-crystal sapphire window pieces, or a supplier-produced surrogate made with at least one dielectric layer deposited over an uneven or partial metallic deposition layer on a single-crystal sapphire substrate.

PHASE III DUAL USE APPLICATIONS: Demonstrate the repair/refurbishment of up to 8 damaged optical windows or domes provided as government furnished equipment (GFE), at a per unit repair cost below $30,000, and time to repair below 3 months. GFE units will be 0.25 in. (.635 cm) thick boule-grown Ge (to 9 in. [22.86 cm] diameter) or Si (to 4 in. [10.16 cm] diameter) hemispherical domes or 0.25 in. (.635 cm) thick single crystal sapphire flats to 100 square in. (254 square cm) in size, with damage that may include surface pitting, scratching, abrasion, contamination/smudging, and full or partial delamination of metallic micro-mesh and/or multilayer dielectric surface coatings. Repair must be to the full original substrate thickness, allowing for additional material removal during a subsequent GFE polishing step (i.e., substrate will maintain 0.25 in. [.635 cm] thickness after polishing), with material hardness, optical quality, index of refraction, and internal stress commensurate with that of a single uniformly-boule-grown flat or dome of the same substrate material. Repaired/refurbished items will be delivered to the U.S. Government for further testing.

Sapphire windows are routinely used in grocery store check-out lines as a durable optical quality material through which laser scanners may read barcodes over long durations, without fear of degradation or damage. Being able to repair/refurbish such windows could have a marked impact on the grocery store infrastructure suppliers. Of greater impact, the ability to repair optical-grade windows will have a tremendous effect on the cost and availability of laboratory-grade sensors, cameras, and laser optics.

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KEYWORDS: infrared windows; infrared domes; IR windows; IR domes; infrared sensors; IR sensors; missile seekers; missile warning; optical window

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N242-075 TITLE: Alternative Navigation System for Hypersonic Vehicles in Global Positioning System (GPS)-Degraded and GPS-Denied Environment

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Hypersonics; Integrated Sensing and Cyber;Microelectronics

OBJECTIVE: Develop a navigation system that can provide precise navigation for the entire flight trajectory of hypersonic vehicle operating under GPS-degraded/denied environments.

DESCRIPTION: Naval aerial platforms traditionally rely on GPS signal technology for positioning, navigation, and timing (PNT) system application. When a hypersonic vehicle is traveling at hypersonic speed through the atmosphere, a plasma sheath envelops the aerial vehicle because of the ionization and dissociation of the atmosphere surrounding the vehicle [Refs 1-3]. The plasma sheath prevents radio communication, telemetry, and GPS signal reception for navigation [Ref 4]. This radio “blackout” period poses a serious challenge for GPS-enabled PNT for the hypersonic vehicle.

This SBIR topic seeks the development of non-GPS-based technology solutions for hypersonic vehicles that utilize systems taking advantage of alternate signals that enable precision navigation comparable to GPS, but without GPS in a GPS-denied environment. Such solutions include, but are not limited to magnetometer aided navigation [Ref 5], micro-electromechanical gyroscope for Inertial Navigation System (INS) [Ref 6], integrated optic inertial navigation system [Ref 7], Electro-Optical/Infra-Red (EO/IR) imaging sensors [Ref 8], and so forth. The proposed solution can be a single system solution or an integrated system with the fusion of two orthogonal signal systems for improved PNT.

The proposed system solution should have minimized size, weight, and power (SWaP) compatible with current and future SWaP-constrained hypersonic vehicles. It should also be able to be sufficiently ruggedized to withstand harsh hypersonic high-velocity and high-g environmental and operating conditions. The system technologies should produce accuracy for the vehicle’s entire flight trajectory comparable to, or better than, current GPS technologies. The hypersonic vehicle’s terminal navigation success metrics are: (a) a miss distance less than 5 m and a terminal speed of at least 1,700 m/s at the target; and (b) navigation path constraints are satisfied while performing divert and evasive maneuvers to the target. The hypersonic vehicle’s terminal phase begins at a distance of 200 km at an altitude of 25 km and a speed of 3,000 m/s.
The initial terminal hypersonic vehicle flight conditions are:
(a) Range (km) min 200, max 200,
(b) Azimuth min 10°, max 10°,
(c) Heading Error min 10°, max 10°,
(d) Altitude (km) min 24.8, max 25.2,
(e) Speed (m/s) min 2,900, max 3,100,
(f) Flight Path Angle min -5°, max 0°,
(g) Angle of Attack min 1°, max 3°,
(h) Bank Angle min 2°, max 2°,
(i) Sideslip Angle min 2°, max 2°,
(j) Crosswind Wind Speed (m/s) min 0, max 20,
(k) Longitudinal Wind Speed (m/s) min 0, max 10, and
(l) Atmospheric Density (kg/m$^3$) min 1.293, max 1.210.

It is also required that the system should produce signals similar to GPS output codes. The system is also required to maintain compatibility with the DoD’s security, environmental, and other requirements for autonomous aviation navigation systems.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVAIR 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Develop PNT system concept solutions for use in hypersonic vehicles. Specify the signal systems for the proposed approach that will meet the specifications stated in the Description. Perform modeling and simulation and preliminary experimental demonstration to demonstrate the feasibility of the proposed design that will meet the required navigation success metrics in the Description in the hypersonic vehicle terminal phase. Simulations are to be run in three different scenarios to verify the effectiveness of the proposed navigation system. In Scenario I, the noise conforms to the Gaussian distribution. In Scenario II, the pseudo range and pseudo range rate measurement information are interfered by pulses. In Scenario III, the navigation information is interrupted intermittently. The Phase I final report will detail all methods studied plus evidence of their feasibility on an aerial platform. The final report will also include an initial prototype design to be implemented in Phase II. All hardware and software requirements should be defined.

PHASE II: Develop a prototype based on the design of Phase I and demonstrate a navigation system based on the proposed signal systems. Evaluate, test, and validate the system's feasibility to meet the project objective. The final test and evaluation of the system should be carried out under relevant operation conditions as close to hypersonic flight conditions as possible.
Work in Phase II may become classified. Please see note in Description paragraph.

PHASE III DUAL USE APPLICATIONS: Integrate and install the navigation system prototype onto a representative hypersonic vehicle for demonstration and evaluation in Advanced Naval Technology Exercise (ANTX) events.

As a new type of high-speed, large-range, and fast-response aircraft, the Airbreathing Hypersonic Vehicle (AHV) must not only cruise at high speed in the atmosphere, but also travel through the atmosphere as a space transportation vehicle. It has a wide range of applications in the military and civilian fields.
In the military field, its advantages are embodied in large combat airspace, wide range, fast flight speed, high maneuverability, strong penetration ability, flexible deployment and launch methods, high mission execution efficiency, large flight kinetic energy. Because it flies in the near space above 20 km altitude, which has low atmospheric density and low aerodynamic drag, it can effectively and quickly strike various long-range targets around the world. Meanwhile, it can shorten the enemy's radar detection time and defense system response time. The above mentioned advantages determine that the hypersonic vehicle can be used as a long-range assault weapon launch platform or a direct strike weapon to efficiently complete various military tasks such as surveillance, reconnaissance, and strike operations.

In the civil field, the hypersonic vehicle can be used as a new type of intercontinental passenger/cargo transportation vehicle to improve human lifestyle and living standards. Hypersonic cargo vehicle can easily realize the rapid and accurate remote delivery of high-value materials, improve transportation efficiency, and stimulate global economic growth. Hypersonic passenger vehicles can shorten passenger travel time to improve work efficiency.

Hypersonic flight is attracting attention beyond civil aviation. The space industry is eyeing the technology to build craft that can take off like a plane, a development that could reduce the need for expensive rocket launches.

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KEYWORDS: Hypersonic; missile; navigation; terminal; guidance; global position system (GPS)

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N242-076 TITLE: Wireless Integrated Network—High-Capacity Low-Probability-of-Detection (WIN-HL)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Network Systems-of-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 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 waveforms designed to address gaps in current tactical waveform technology. These waveforms shall include high-capacity throughput and Low-probability-of-Detection/Identification/Tracking/(LPx) features to counter rapidly evolving threats with an open architecture digital interface to minimize application integration risks, and challenges. These waveforms should be power efficient and portable across multiple hardware instantiations for beyond line of sight and omni-directional line of sight (threshold) and directional communications (objective).

DESCRIPTION: Current Radio Frequency (RF) communications systems have become common in both infantry dismounted and mounted operations used to communicate beyond line of sight (BLOS) and line of sight (LOS) with maritime vessels, air assets, ground command and control, and with adjacent units. Trusted secure communications are required to ensure elements are employed effectively. Having the ability to communicate without being detected, intercepted, or tracked is highly desired to protect a high-risk element that may be compromised by threat electronic warfare assets. Ground elements need to pass authenticated mission critical data and voice traffic to share situational awareness data, command and control, targeting data, and voice traffic. It is desirable for the new waveforms to defeat current and anticipated threat systems. High-data throughput waveforms are designed to transmit large volumes of data at near-real-time to real-time rates within line of sight and are essential to support combat operations. Waveforms will be designed to run on the Field Programmable Gate Array (FPGA) environment. Digital data interface will leverage IEEE standards that are easier to interface with (e.g., Internet Protocol). The waveforms developed should not interfere with other aircraft subsystems inside the aircraft or other systems over RF. Existing systems are based on hardware designs that operate a single waveform and any updates/modernization requires replacing hardware. The design should enable adding updates to existing waveforms or completely new waveforms into the system without requiring new hardware or being returned to the factory/depot for the update.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain at least a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVAIR 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 during the advanced phases of this contract IAW the National Industrial Security

Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Design and develop a framework that supports development of FPGA hosted waveforms. Provide a detailed description of the system architecture and necessary input and output interfaces. Identify key components necessary for operation. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Build, test, and validate a prototype waveform that successfully defeats realistic threat vectors and demonstrate the prototype operating in a relevant environment. Identify code framework that allows for easiest integration in a modeling and simulation environment (Threshold) and an operational type of system (Objective). Develop an implementation plan. At the conclusion of Phase I NAWCAD will coordinate with Fleet Users and Operational Testers to designate a suitable threat vector(s) against which the waveform will be evaluated. Demonstrate the waveform passing data two-way using government selected software suites (e.g., ATAK). Produce and deliver a final Technical Data Package (TDP) that includes system and subcomponent specifications, interface descriptions and definitions, and operating instructions/procedures for the prototype. Prepare the prototype for transition to deployment.
A representative operational scenario will be defined for Phase II in the appropriate classified environment. Please see note in Description section. Joint Interoperability tests will be planned and coordinated for the end of Phase II demonstrations.

Work in Phase II may become classified. Please see note in Description paragraph.

PHASE III DUAL USE APPLICATIONS: Conduct government verification and validations, including the design development conducted in the initial phases to show the technical feasibility of the idea and lay the groundwork for the demonstration in the next phase. Demonstrate that the design is technically and operationally feasible with test points that will validate the waveform and lay the groundwork for transitioning to appropriate laboratories and/or platforms to bring the capability to the Fleet. The system will be assessed against existing systems operating the same waveform(s) to verify they meet the appropriate interoperability standards as the existing baseline systems do with the applicable Navy, Joint Tactical Networking Center (JTNC), and Defense Information Systems Agency (DISA) tests.

Software Defined Radios (SDR) are widely in use in DoD and commercial communications systems, as are efforts to develop Open Systems Architecture (OSA) designs. These software-driven designs support rapid updates and incorporation of new technologies to enable addition of future requirements and to grow to address evolving threats.

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KEYWORDS: Tactical-Data-Link; Secure; Robust; High-Capacity; Low-Probability-of-Detection; Communications

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N242-077 TITLE: Scalable Wideband Multifunction Radio Frequency (RF) Payloads

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Sensing and Cyber;Microelectronics

OBJECTIVE: Design, develop, and demonstrate wideband multifunction Radio Frequency (RF) payloads using an innovative Modular Open Systems Approach (MOSA) that is scalable across Unmanned Aerial Systems (UAS) Groups 1 through 3 with Electronic Warfare (EW); Radar; Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance, and Targeting (C5ISRT); and edge-based High-Performance Computing (HPC) capabilities.

DESCRIPTION: UAS require Rugged Small Form Factor (RSFF) multifunction payloads adhering to the MOSA that conform to stringent Size, Weight, and Power and Cost (SWaP-C) constraints. The American National Standards Institute/VMEbus International Trade Association (ANSI/VITA) standards based on the 3U Printed Circuit Board (PCB) dimensions of 100 mm X 160 mm (e.g., VERSAmodule Europe (VME), Virtual Path Cross-Connect (VPX), and OpenVPX) have been very successful in military applications for larger UAS (Groups 3–5). However, 3U is too large in most SWaP-C aspects for Groups 1–2 UAS. To address smaller-than-3U implementations, the Sensors Open Systems Architecture (SOSA) Consortium is provisioning for two different approaches: Short VPX (sVPX) and VNX+.

sVPX leverages just about all of the VPX/OpenVPX standard by adding an additional printed circuit board (PCB) dimension option of 100 mm x 100 mm. While sVPX does shrink the module to smaller than 3U, the primary motivation for this additional PCB option is to support VPX/OpenVPX integration into cylindrical/tubular platforms such as 8 in. (20.32 cm) diameter or larger pods/fuselages. VNX+ proposes an entirely different backplane/module/connector definition that does not provide any inherent interoperability with the 3U VPX/OpenVPX ecosystem but is capable of smaller SWaP-C than sVPX, enabling possible integration into 5 in. (12.7 cm) diameter pods/fuselages. Both sVPX and VNX+ are immature at the moment, with very few commercial-off-the-shelf products available. Ultimately, the commercial marketplace will determine the success of sVPX and VNX+ as a solution for the smaller-than-3U space. However, solutions are required now for advanced Science & Technology (S&T) and Research & Development (R&D) efforts aiming to deliver advanced capabilities to the warfighter in a variety of custom and standard form factors.

A highly-scalable MOSA methodology is needed that enables HPC, mixed-signal acquisition/generation, and RF front-end building blocks to be combined to provide solutions that span across UAS Groups 1–3, without having to use completely different hardware/software solutions for each group. While sVPX, VNX+, or 3U VPX/OpenVPX may be the ultimate form factor utilized, the desired building blocks should be modular and able to be integrated into any of these standard form factors. The ANSI/VITA community has leveraged the use of mezzanine cards (e.g., PMC, XMC, FMC, etc.) to perform digital and mixed-signal processing functions for decades; this approach could be further explored to accomplish the modularity and scalability objective, such as Single-Board Computer (SBC), System-on-Chip (SoC), and Field Programmable Gate Array (FPGA) mezzanine cards that can be integrated onto a standard VNX+, sVPX, or 3U module, or into a custom form factor. A similar approach must be applied to the RF sub-systems as well, likely incorporating the latest Multi-Chip Module (MCM) and System-In-Package (SIP) technologies. As SWaP-C constraints are alleviated, additional building blocks can be added to improve digital/mixed signal processing capabilities and/or RF performance specifications. For instance, the number of RF channels or additional frequency bands can be added to the system as more SWaP-C is available. Other examples include improving maximum power output by adding additional stages of amplification or in-band/out-of-band spurious performance by incorporating better RF filter sub-components.

Specifications for the desired scalable wideband multifunction RF payload include, but are not limited to, the following:
a. Total Payload Volume: scalable from 40–6,550 cubic cm (2.5–400 cubic in.)
b. Operating Frequency: scalable across multiple frequency bands from 0.01–40 GHz
c. Instantaneous Bandwidth: configurable based on the function up to 2 GHz wide as the threshold with goal of 4 GHz or more
d. Number of full-duplex phase-coherent TX/RX channels: scalable from 1 up to 4 as the threshold with 16 as a goa,
e. Radar and Electronic Attack (EA) Digital RF Memory (DRFM) RF front-end performance considerations (i.e., coherency, latency, sensitivity, flatness, receive/transmit gain, RF/digital tuning, etc.)
f. Power Output: scalable from 1 W–100 W depending on application and frequency band
g. Heterogeneous Processing Elements: combinations of Single Board Computer (SBC), General Purpose Processor (GPP), Graphical Processing Unit (GPU), Artificial Intelligence/Machine Learning Accelerator, Field Programmable Gate Array (FPGA), System-on-Chip (SoC), Microprocessors, and other advanced processors
h. Designed for rugged operating environments including sub-sonic/super-sonic flight

The following will be used as evaluation criteria of the proposal and at each phase:
a. satisfying the modularity and scalability objectives while adhering to Modular Open Systems Approach (MOSA) principles
b. maximizing the incorporation of open standards and commercial-off-the-shelf solutions
c. potential to become a U.S. Government or Industry standard (e.g., MIL-STD, ANSI/VITA, etc.)
d. satisfying the wideband multifunction RF payload technical specifications

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVAIR 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Develop a highly-scalable MOSA methodology and system architecture that supports multifunction EW, Radar, C5ISRT, and HPC capabilities using digital/mixed-signal processing and RF modules targeting the following payload form factors: Custom (2.5 cm x 2.5 cm x 10 cm), VNX+ (78 mm x 89 mm x 19 mm), and 3U VPX/OpenVPX (100 mm x 160 mm x 25.4 mm). Evaluate through modeling and simulation and/or laboratory testing of the anticipated digital/mixed-signal processing and RF performance characteristics of the three payloads while detailing power, cooling, and environmental requirements, assumptions, and considerations. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Produce a prototype of the custom form factor payload, with primary focus on developing the sub-systems that are novel and critical to the approach. For non-critical sub-systems, commercial-off-the-shelf or other solutions can be utilized, but feasibility on how these sub-systems can be modified and integrated must be addressed in detail. Demonstrate the modular and scalability of the approach by producing a VNX+ payload (threshold) and a SOSA-aligned 3U VPX/OpenVPX payload (goal). Quantify digital/mixed-signal processing and RF performance improvements/gains between the payload prototypes.

Work in Phase II may become classified. Please see note in Description paragraph.

PHASE III DUAL USE APPLICATIONS: The prototype(s) generated in Phase II will be further developed for the intended mission(s) and aerial platform(s), and then tested to ensure environmental and EMI/EMC qualification requirements are satisfied.

The U.S. Government desires the private sector provide MOSA solutions that adhere to standards such as ANSI, VITA, and SOSA. Developing digital/mixed-signal processing and RF sub-system solutions that can be integrated into different industry standards such as VNX+, sVPX, and 3U VPX/OpenVPX will enable wider use of the technology/capability. Commercial industries that can leverage this technology include: very small and low-power wireless devices for the Internet of Things (IoT); mobile/fixed 5G and 6G cellular technologies; commercial satellite and digital land mobile radio (DLMR) communications/datalinks; portable RF test and measurement devices; and radar for automotive and UAS applications.

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KEYWORDS: Modular; Open; Unmanned; radio frequency; RF; Radar; electronic warfare; EW; System


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N242-078 TITLE: Artificial Intelligence Tools for Autonomous Counter-Countermeasures

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy

OBJECTIVE: Develop novel methods to identify and mitigate vulnerabilities in autonomy agents designed to carry out Department of Defense (DoD) missions and develop software tools to automatically assess and identify vulnerabilities prior to deployment in government systems.

DESCRIPTION: Rapid advancements in Artificial Intelligence (AI) have resulted in increased development of autonomous agents that perform complex tasks previously requiring human operators. In the academic domain, AI agents have been used to defeat world-class experts in games such as Go and Shogi, and more recently, multiplayer games such as Quake III, Starcraft II and DOTA II. The DoD has rapidly adapted these technologies for a variety of tasks including mission planning, air combat operations, missile defense, and so forth. As with any rapidly advancing technology, identifying the weakness and vulnerabilities of the technology are as important as advancing the technology itself, which exploit the fragility of AI models often underpinning these autonomy solutions. However, these efforts typically focus only on perturbation in input data received by an AI model and not the autonomy system as a whole.

In this effort, the Navy intends to analyze the entire autonomy development, integration, and deployment process to develop methods that can identify strategies to counter opponent autonomous systems, as well as development of red-teaming methods to mitigate the effectiveness of potential counter autonomy techniques developed by adversaries.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVAIR 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Analyze existing autonomy approaches for relevant air combat missions. Identify potential attack surfaces in which counter autonomy could potentially be employed to defeat the autonomy and determine the risk potential of these vulnerabilities. Using information from all missions and analysis develop a counter autonomy ontology and suggested approaches. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Extend the research toward government provided reference scenarios. Develop and refine prototype algorithms for identifying high-risk vulnerabilities in autonomy agents. Demonstrate the ability to identify multiple types of vulnerabilities in deployable agents. Ensure that developed prototype can be integrated with Navy systems in Phase III.

Work in Phase II may become classified. Please see note in Description section.

PHASE III DUAL USE APPLICATIONS: Develop operational capability for use in Navy DevSecOps air worthiness framework including user and design documentation.

This research on decomposing the Autonomy and AI software supply chain aims to identify vulnerabilities from a security perspective, offering significant dual-use potential for both the DoD and private sectors. Industries such as telecommunications, transportation, and critical infrastructure can leverage these insights for enhanced cybersecurity measures. The findings will inform improved software development practices, aiding tech companies in creating more secure AI systems. Additionally, sectors handling sensitive data, like finance and healthcare, can benefit from advanced risk management strategies. While the research has broad commercial applications, particularly in AI safety and ethics, the dissemination of sensitive findings will be carefully managed to maintain a balance between public sector innovation and national security. This approach ensures the strategic advantages of the research are preserved while supporting technological advancement in various industries.

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KEYWORDS: Artificial Intelligence; A.I.; Machine Learning; Counter-counter measures; Autonomy; Reinforcement Learning


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N242-079 TITLE: Material and Manufacturing Technology Solutions for Advanced Composite Cases for Tactical Solid Rocket Motor Applications

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Hypersonics

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 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 advanced material and manufacturing composite case technologies for high supersonic and hypersonic air, land, and sea launched missile systems.

DESCRIPTION: The Navy currently employs tactical missile polymer composite motor case structures that are moderately lightweight and thick walled to meet pressure containment, but they are generally relegated to surface launched systems [Ref 1]. Evolving capability gaps require significant improvements to current state-of-the-art composite cases, including lighter composite case, greater damage tolerance, external thermal protection, and external attachments/joints. These advanced composites need to develop technologies and databases that will allow integration onto naval aircraft, as no current composite case rocket motors are used on naval aircraft despite previous efforts.

Key Technology Goals:
1. Environments include: platform loads (platform vibration, eject shock, etc.), flight loads, aerothermal environments, internal heating environments, rain/salt, fog/humidity, lightning/E^3, lifecycle packaging, handling, storage, and transportation (PHS&T), etc.
2. Reduce mass from traditional filament wound graphite/epoxy composite technology by 10% threshold (THR)/30% objective (OBJ). May include mass savings from advanced internal insulation, novel attachment/fitting designs, alternate polymer composite materials and manufacturing methods, and new thermal protection materials.
3. Support ability to incorporate nonsymmetrical features and attachments onto safety critical pressure vessels that contain high-pressure gases (up to 3,000 psi) up to 6500 °R in temperature.
4. Strong preference to support aircraft carry and launch environments. Navy tactical weapons incorporate rails or lugs on rocket motor segments, therefore the composite structures and attachments must withstand high g-loads and fatigue in temperature and moisture extremes.
5. Impact and handling tolerance or provide indication and/or warning when critical flaw size is exceeded. Navy requires composite structures meet MIL-M-8856B “barely visible impact damage” [(Ref 4] and still have 100% structural capability. Composite structures must withstand pressure loads, flight loads, and captive carry loads with such damage.
6. Provide path to B-basis and A-basis material properties under relevant material architecture, application load environments, and material knockdown (e.g., hot-wet) environments, within 1 year after achieving Technology Readiness Level (TRL) 5. It is desirable to have S-basis properties at TRL-4 level maturity.
7. Support rapid development cycles (can start with TRL-3 technology, but must show path to support a < 2 year tactical composite case development cycle, after maturation).

PHASE I: Develop an advanced composite case concept relative to 10 in. (25.4 cm) diameter air-launched missile airframe structures that serve as rocket motor combustion chamber pressure vessels during missile operation and solid propellant storage vessels during the rocket motor lifecycle. Outline compliance to the Key Technology Goals listed above including advanced materials and manufacturing methods. Identify key technology risks and perform initial feasibility testing and/or analysis of high-risk areas to develop risk reduction plans. Prepare a report to the Navy on designs and simulations and a Phase II testing plan. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Demonstrate feasibility and capability of the selected technologies for application in a 10 in. (25.4 cm) diameter tactical missile rocket motor/airframe application. These demonstrations can include analysis, laboratory, subscale composite test item build/test, and rocket motor composite case or case simulant build/test activities.

Activities shall be scoped to mature selected innovative material/manufacturing solutions to at least a TRL of 4 (component validation in a laboratory environment), for implementation in future high-speed tactical missile rocket motor/airframe applications. Demonstration to a TRL-5 (component demonstration in relevant environment) or above is preferred. Demonstrate prototype of the applied material/manufacturing solutions to demonstrate compliance to the Key Technical Goals. A final report will be provided to the Navy that outlines the prototype design, fabrication, and testing. The report will also outline the low maturing aspects of the technology and provide a plan to further mature the technology in Phase III.

PHASE III DUAL USE APPLICATIONS: Demonstrate scalability of the selected technologies in a relevant production environment, Manufacturing Readiness Level (MRL) 5. Demonstrate prototype integration of the technology into a complete missile system.

Rocket motors are proliferating in the private sector to launch satellites into earth's orbit. NASA and some aerospace companies are pushing the limit of high-velocity atmospheric flight. Composites offer low weight for efficiency, but require special attention to be suitable for these uses. Technology developed in this SBIR topic has the potential to improve composite performance in these extreme environments. Furthermore, composites in general are weak when struck through the thickness, that is, impact damage. Solutions in this topic could affect not only the aerospace industry, but also automobiles, boats, wind energy, sporting goods, and some drilling/mining operations.

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KEYWORDS: Composites; rocket motors; hypersonic; impact damage; thermal protection; missile attachments

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N242-080 TITLE: Portable Test Equipment for Wavelength Division Multiplexed (WDM) Optical Interconnects

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): FutureG; Sustainment

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 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 portable light source and an optical power meter capable of simultaneously measuring the optical power in optical fiber cable at multiple wavelengths in the range of 850 nm to 1500 nm.

DESCRIPTION: Current airborne military (mil-aero) core avionics, electro-optic (EO), communications and electronic warfare systems require ever-increasing bandwidths while simultaneously demanding reductions in space, weight, and power (SWaP). The replacement of shielded twisted pair wire and coaxial cable with earlier generation, bandwidth-length product, multimode optical fiber has given increased immunity to electromagnetic interference, bandwidth, throughput, and a reduction in size and weight on aircraft. The effectiveness of these systems hinges on optical communication components that realize high-per-lane throughput, low latency, large-link budget, and are compatible with the harsh avionic environment.

In the future, data transmission rates of 100 Gbps and higher will be required. Substantial work has been done to realize data rates approaching this goal based on the use of multilevel signal coding; but multilevel signal encoding techniques trade off link budget and latency to achieve high digital bandwidth. To be successful in the avionic application, existing non-return-to-zero (NRZ) signal coding with large link budget and low latency must be maintained. The Navy requires advances in optical receiver designs that leverage novel photo-detector technology, semiconductor process technology, circuit designs, architectures, and packaging and integration techniques. One approach to meeting the 100 Gbps threshold utilizes wavelength division multiplexing in the 850 to 1050 nm shortwave wavelength division multiplexing (SWDM) band or the 1260 nm to 1400 nm coarse wavelength division multiplexing (CWDM) band. Traditional optical light sources and power meters cannot separate the power in each of the wavelengths. Portable support equipment is needed to quantitatively assess fiber-optic cable performance at discrete optical wavelengths in the SWDM and CWDM bands.

PHASE I: Design an optical system and instrumentation capable of simultaneously transmitting and measuring the power in each of the SWDM and CWDM wavelengths. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Finalize the optical, electrical, and mechanical design of the optical multiwavelength light source and power meter. Develop prototype devices for testing and evaluation by the Navy.

PHASE III DUAL USE APPLICATIONS: Collaborate with defense avionics industries, as well as support equipment companies to accelerate transition to production.

Commercial sector telecommunication systems, fiber-optic networks, and data centers will benefit from the development of the WDM-based test equipment that is portable. These applications will be able to easily test the performance of WDM-based links operating at a higher speed.

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KEYWORDS: Wavelength Division Multiplexing; coarse wavelength division multiplexing, CWDM; shortwave wavelength division multiplexing; SWDM; 100 Gbps; link budget support equipment


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N242-081 TITLE: Electronic Threat Detection for Countermeasure Support

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software

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 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: Demonstrate a technology capable of extracting actionable information from in real-time and wideband electronic threats including low-probability-of-intercept (LPI)/low-probability-of-detection (LPD) transmissions to support electronic attack countermeasures. For this technology, develop a set of performance metrics to identify which threats may be identified, and what information may be extracted from the detected threat.

DESCRIPTION: Knowledge of the electromagnetic battlefield is imperative for any situational awareness (SA) system. Monitoring persistent threats allows for appropriate countermeasures and the development of effective tactics to neutralize or exploit them. Such threats may include unauthorized communication signals in our networks or red force communications, radar emissions, and other forms of electronic warfare signals. These SA systems must be able to identify threats quickly and accurately in dynamic operational environments to provide meaningful information to an operator or Electronic Warfare (EW) system. These environments may include adverse conditions such as dense, irrelevant signals density (a “noisy environment”), weak signals with low-signal-to-noise ratios, LPI/LPD transmissions, heavy cosite interference, and jamming. LPI/LPI threats can include waveforms that employ fast frequency hopping or Direct Sequence Spread Spectrum techniques (DSSS).

Proposals must define a detailed path to an experimental demonstration of the proposed threat detection mechanisms during the Phase I period and an expanded plan for demonstrating a functional prototype platform before the end of the Phase II period. Phase I should include a detailed synopsis of the technology’s threat information extraction capabilities, its limitations, a roadmap to overcome these limitations, and a feasible proposed platform for Phase II execution. A successful Phase II should include a non-hardened prototype capable of ingesting real-time data and characterize the prototype in terms of the performance metrics defined in Phase I. It is anticipated that the hardware elements sufficient to develop, test, and demonstrate electronic threat detection already exist. Therefore, the proposed effort should utilize Commercial Off-the-Shelf (COTS) hardware as much as practical.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVAIR 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 during the advanced phases of this contract IAW the National Industrial Security

Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Demonstrate the feasibility of the proposed wideband threat detection mechanisms of countermeasure support functionality. The threshold and objective performance of wideband threat waveform are 1 GHz and 2 GHz respectively. A successful Phase I should include a detailed synopsis of the technology's threat information extraction capabilities, its limitations, a roadmap to overcome these limitations, and a feasible proposed platform for Phase II execution. Prepare a preliminary Phase II plan that describes how to scale the performance metrics explored within the Phase I feasibility study. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Develop a prototype system that can demonstrate the threat information extraction performed in Phase I. Include a non-hardened prototype capable of ingesting real-time data and characterize the prototype in terms of the performance metrics defined in Phase I. Phase II shall overcome the technical limitations outlined in Phase I, and further quantify which limitations are insurmountable and therefore bound the scope of system capabilities.

Work in Phase II may become classified. Please see note in Description paragraph.

PHASE III DUAL USE APPLICATIONS: Include the demonstrated prototype in an end-to-end receiver demonstration for a classified program.
The importance of encrypted communications has become obvious to many industries after their demonstration by the criminal world. If the signals are hard to detect, the pressure on the robustness of password keys is sharply reduced.

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KEYWORDS: Low-probability-of-detection; low-probability-of-interception; situational awareness; EW counter-measures; threat recognition; digital signal processing


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N242-082 TITLE: Selective Stripping of Cadmium and Zinc-Nickel Coatings

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Sustainment

OBJECTIVE: Develop a method for selectively stripping cadmium (Cd) and zinc-nickel (Zn-Ni) coatings from small areas (i.e., several square inches/centimeters) on high-strength steel components, without generating dusts that pose an inhalation risk.

DESCRIPTION: Cadmium (Cd) coatings and Zn-Ni coatings are used on many high-strength steel components on aircraft, such as landing gear assemblies on fixed-wing aircraft and the rotor masts of rotary aircraft. These coatings prevent corrosion and protect the integrity of the underlying steel. However, over time as the coating gets damaged or worn, the coating must be removed and repaired. For parts that are overhauled at the depot level (D-level), spent Cd or Zn-Ni coatings can be stripped by immersing the part in a chemical tank. After the coatings are stripped, the underlying metal can be inspected, repaired as necessary, and then recoated with fresh Cd or Zn-Ni coatings. Depot level facilities have chemical processing plants that allow for this type of work to be performed safely.

However, this chemical process is not feasible to perform at intermediate (I-level) or organizational (O-level) level maintenance facilities. Dozens of I-level and O-level facilities around the world perform touch-up repairs of Cd or Zn-Ni coatings on aircraft components, often to fix localized damage that requires stripping and recoating several square inches (centimeters) of surface area. To remove the old coating when a chemical processing plant is not available, maintainers use methods such as hand sanding, wet sanding, or abrasive blasting to abrade away the Cd or Zn-Ni layer. Unlike with full immersion in a chemical processing tank, using abrasive methods to remove coatings generate inhalation and exposure risks to the maintainer, as well as to the surrounding environment. Particularly with Cd coatings, Cd is carcinogenic and long-term exposure can increase the risk of various cancers and other health effects. There have also been cases where maintainers use an incorrect abrasive that is too aggressive, inadvertently causing damage to the component they are processing. This results in increased rework costs and delays in returning the component to the fleet.

This SBIR topic seeks a method for stripping Cd and Zn-Ni coatings that generate no inhalation exposure risks for maintainers, eliminates the possibility of Cd dust release into the maintenance hangar or surrounding environment, and a method that is repeatable and easy for maintainers to use with no risk of causing inadvertent damage. An ideal solution should be able to remove both Cd and Zn-Ni coatings, be simple and cost-effective, and be easy to deploy to I-level and O-level maintenance sites around the world. The method must selectively strip Cd and Zn-Ni coatings without damaging other coating types, such as primers and topcoats. The method must also not damage the underlying steel component, such as through corrosion or hydrogen embrittlement.

PHASE I: Develop a concept for a Cd and Zn-Ni removal system that can selectively remove these coatings from selected areas of aircraft components, while reducing worker and environmental exposure to toxic or carcinogenic materials. Demonstrate the feasibility of the stripping method, evaluating parameters such as stripping effectiveness, stripping duration, hydrogen embrittlement risks, and the overall ease of use. Prepare a report on the designed method, as well as a Phase II test plan. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Prepare a prototype system for Cd and Zn-Ni removal that reduces exposure to toxic or carcinogenic materials. Assess and optimize key parameters such as system portability, material compatibility, impact to the underlying substrate, process costs, and maintainer ease-of-use. Evaluate and ensure that there are no adverse effects to the substrate through the use of this method, such as inadvertent pitting, etching, corrosion, or hydrogen embrittlement. Provide a report that documents the design of the prototype system, results of system performance, and the results of the material testing. Provide a prototype stripping system to NAVAIR for evaluation.

PHASE III DUAL USE APPLICATIONS: Ensure that product functions as intended, stripping Cd and Zn-Ni coatings within a reasonable amount of time (~1–2 hr), and does not produce any detrimental effects to the base substrate. Have the product made into a commercial product that is available for widespread distribution. Create a National Stock Number (NSN) for the product so that it can be easily procured by Department of Defense (DoD) maintenance activities worldwide.

This product has applications both in military and in commercial aviation maintenance activities. Cd and Zn-Ni has widespread usage as coatings for corrosion protection on high-strength steels, including on commercial airliners, passenger helicopters, corporate jets, and general aviation aircraft. Removal of these coatings is a common maintenance task on all types of aircraft, and a method of removing these coatings without producing hazardous dusts is highly desirable.

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KEYWORDS: Cadmium; Cd; Zinc-Nickel; Zn-Ni; Stripping; Coatings; Corrosion; High-Strength Steel


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N242-083 TITLE: Recovery System for Group 3–5 UAVs for Sea-Based Operations

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Human-Machine Interfaces; Sustainment; Trusted AI and Autonomy

OBJECTIVE: Develop a novel recovery system for arresting Group 3–5 fixed-wing Unmanned Aerial Vehicles (UAVs) aboard air capable ships that minimizes required deck landing area and footprint on the ship.

DESCRIPTION: The Navy needs to operate fixed-wing UAVs from ships other than aircraft carriers—a capability that, if introduced, would significantly increase lethality, ability to project force, and the range of Intelligence, Surveillance, and Reconnaissance (ISR) [Ref 1]. A key enabler is recovery of UAVs spanning a large recovery envelope, that is, varying in weight, size, and approach velocity. The recovery system should be capable of arresting Group 3–5 [Ref 2] fixed wing UAVs (objective) or UAVs with a weight range of approximately 500–10,000 lb (454–4536 kg) (threshold), wingspan of approximately 15–70 ft (4.5–21.5 m) (threshold), and approach velocity of approximately 50–150 knots (92.6–277.8 kph) (threshold). Rotor-borne flight solutions (e.g., deploying rotors for landing, or tail-sitters) are not within the scope of this SBIR topic.

The Navy is interested in novel approaches to recovery that minimize required deck landing area and footprint on the ship. Respondents are encouraged to consider a total systems approach that includes novel flight control techniques as part of the proposed total concept. For example, solutions may consider putting the aircraft into a stall prior to capture/arrestment to reduce velocity. Solutions are not limited to a particular ship class or installation methodology. Concepts that utilize permanent installation (e.g., recovery equipment embedded within/under the flight deck) are acceptable, as are nonpermanent concepts (e.g., those temporarily attached to the top of the flight deck, above the flight deck, or extending out from the side of the ship). Non-permanent concepts should consider portability, stow-ability, and modularity, and should not impede safe movement of people, aircraft, and other equipment across the flight deck. Potentially relevant air capable ships (ACS) may include the Destroyer (DDG), Expeditionary Sea Base (ESB), Amphibious Transport Dock (also known as Landing Platform Dock [LPD]), or a new ship class or sea-based platform entirely. Relevant flight decks may be approximately 50–200 ft (15.2–61 m) long and 40–100 ft (12.2–30.5 m) wide. Solutions should consider deck dynamics and ship motion, including ship air-wake and related aerodynamics/aeromechanics, wind-over-deck, ship direction of travel, operation in sea state 5, survival in sea state 8 (including ship motion and flexure), and associated trim, list, pitch, roll, and heave requirements.

Given variable ship and aircraft sizes, concepts may be modular or include a family of systems that scale for higher and lower energy vehicles. Designs that follow a system-based approach, where the system is composed of the aircraft and recovery method, are preferred. Although the recovery system should be capable of arresting a range of UAVs, concepts that include a new, clean-sheet aircraft that integrates with a new recovery methodology are acceptable to promote compatibility between future UAVs and future UAV Aircraft Launch and Recovery Equipment (ALRE). In addition, solutions that provide the recovery system with initial conditions (UAV weight, velocity, approach vector) of the arrestment as the aircraft approaches, are allowable and encouraged. Strategies for collecting/sharing this information (e.g., avionics, communication between aircraft/recovery system, sensors aboard ship, etc.) are within the scope of this SBIR topic.

UAVs utilizing the recovery system may be low cost and attritable (i.e., affordable mass), potentially enabling higher risk acceptance than carrier-based, manned ALRE. Increasing automation is also desirable to minimize additional manning requirements. Solutions should take into account time for recovery and boarding rate as they will impact energy absorption and thermal/cooling requirements. A sortie rate of 25 arrestments per day per recovery system (objective) or 15 arrestments per day per recovery system (threshold) is acceptable. Military standards should be referenced for environmental factors (MIL-STD-810H [Ref 3]), electromagnetic interference (MIL-STD-461G [Ref 4]), shock (MIL-DTL-901E [Grade A] [Ref 5]), and vibration (MIL-STD-167-1A [Type 1] [Ref 6]) since the recovery system must be rugged to be viable.

In the interest of promoting ALRE that is common to multiple aircraft and multiple ships, the Navy recommends a holistic/systematic approach. In other words, although design of a launch system is not within the scope of this SBIR topic, the need for launch and recovery systems to both fit and work together on a single ship should not be ignored. Concepts should also consider pre-launch and post-recovery storage of UAVs and ALRE. Solutions that use shared equipment for launch and recovery and modular/scalable concepts will reduce overall ALRE weight, deck space, and volume. There are also potential impacts to topside weight, ship storage tradeoffs, power, and cooling water requirements driven by congruous versus incongruous designs.

PHASE I: Develop a conceptual design and provide proof-of-concept analysis in a computer simulated environment. Analysis should include both recovery system functionality and flight control dynamics. Specifically address areas of technical risk such as aircraft/recovery system interfaces and absorption of aircraft kinetic energy. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Provide more detailed design and digital analysis of all components, potentially including, but not necessarily limited to, mechanical, electrical/power, controls, thermal, and communications subsystems. Deliver a subscale prototype of the recovery system with adequate representation of the geometries and functioning major subsystems. Demonstrate that the prototype is capable of recovering a subscale UAV, or representative vehicle in terms of scaled size, weight, and velocity. Report results of the demonstration, including next steps, improvements required, and detailed plans for how to construct a full-scale prototype.

PHASE III DUAL USE APPLICATIONS: Design, develop, and fabricate a full-scale working prototype of the recovery system based on work completed during earlier phases. Determine a safe and effective means of testing the recovery system using aircraft-representative deadload(s) in a land-based test environment and work with relevant stakeholders to coordinate instrumentation, data collection, and metrics of success. Conduct deadload testing to validate and verify performance. If successful, plan and perform initial aircraft testing.

A recovery system (and launch system) for fixed-wing UAVs has secondary applications in the delivery, shipping and receiving, and transportation industries. Autonomous, unmanned aircraft can assist with package delivery, whether over long distances or the last mile. An efficient and effective launch and recovery solution for fixed-wing aircraft enables delivery of retail packages, food, medical equipment, and other cargo at greater speed, range, and endurance. As demonstrated by Zipline in Rwanda, fixed-wing UAVs can provide a useful solution for quickly shipping medical supplies to remote areas. In congested urban environments, replacing gas-powered delivery trucks (e.g., FedEx, UPS, and Amazon) and personally owned vehicles (e.g., DoorDash) with electric UAVs can also reduce traffic congestion and pollution. Although vertical takeoff and landing (VTOL) UAVs present an alternative, they may only be viable for a limited range and present noise pollution challenges.

Expanding launch and recovery technologies to higher UAV weights can increase cargo capacity for deliveries over longer distances. Introducing ALRE allows the aircraft to take off and land over a shorter distance, reducing reliance on airports, which can decrease land area used for runways, and the time and logistics footprint associated with sending packages from a warehouse to an airport. ALRE also does not need to be situated on land or stationary structures, but could be used to launch/recover aircraft off of trucks, cars, tractor trailers, trains, ships, barges, or other aircraft. For example, a larger UAV could be launched from a warehouse; then, while in the air and near a delivery location, it could deploy a high quantity of smaller UAVs for final delivery; those smaller UAVs could be recovered by the larger UAV to return to the original warehouse, or the smaller UAVs could be recovered on land at a location near the delivery location.

Systems that meet safety requirements and have acceptable G-forces at launch and recovery could also be used for transportation of people. There is a long history of launch and recovery of manned aircraft aboard aircraft carriers; however, a system used for mass transportation would need to significantly reduce acceleration and deceleration forces to be acceptable for the general public. Some concepts may be capable of significantly reducing these forces to permit transport of people.

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KEYWORDS: Recovery; arrestment; unmanned aerial vehicle; UAV; aircraft; attritable; affordable mass

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N242-084 TITLE: Modular Open Architecture Assured Positioning, Navigation, and Timing (PNT) Hub

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software

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 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 modular device that integrates non-GPS sources of position, velocity, attitude, and time to enable operations in GPS-denied environments. The device should align with Modular Open Systems Approach principles and support open architecture technologies (e.g., SOSA, OpenVPX, pntOS, ASPN, etc.)

DESCRIPTION: Assured PNT capability provides continuous access to position, velocity, attitude, and time (PVAT) information of confirmed integrity and of sufficient accuracy to complete the mission in the complete spectrum of GPS threats. Currently, there is no common scalable and reconfigurable solution that delivers continuous access to PVAT information in GPS denied environments. Developing a modular device to integrate non-GPS source PVAT information enables easy reconfiguration to platform specific needs, avoids unnecessary development cost by reusing the same device, and removes intellectual property limitations.

This SBIR topic seeks to leverage commercial off-the-shelf technologies, and government-owned or open interfaces to produce a device with the following capabilities:
1. Platform I/O:
Configurable hardware/software module(s) to interface with aircraft avionics interfaces such as MIL-STD-1553 [Ref 1], ARINC-429 []Ref 2], Ethernet, and so forth.
2. Sensor I/O:
Configurable hardware/software module(s) to interface with non-GPS sources of PVAT.
3. PNT Application Space:
A configurable software hosting environment and software development kit (SDK) using non-proprietary application programming interfaces (APIs) to deploy the following functionality:

* Input / output abstraction:
Conversion of platform/sensor specific data structures to a common application data structure (e.g., ASPN2023.)
* Integrity Module:
Logical or statistical input/output validity test of PVAT and time information. Depending on the non-GPS input modality, this module(s) should conduct fault detection, exclusion, and alerting.
* Sensor Fusion:
Configurable state estimation algorithms to compute GPS- and non-GPS-based navigation solutions (e.g., Extended Kalman Filter, Particle Filter, etc.).
* Logging:
Log of system status, system performance, and alerts for performance evaluation, system maintenance, and troubleshooting.

PHASE I: Develop, design, and demonstrate feasibility of a Functional Architecture design of the proposed approach. Deliver a Physical Architecture design of the proposed approach. For proposed non-GPS PNT sources:
deliver performance prediction via modeling and simulation. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Deliver a working device prototype with necessary operation documentation. Support technology demonstration. Conduct limited-scope environmental qualification tests.

PHASE III DUAL USE APPLICATIONS: Collaborate with other defense agencies and prime contractor to determine transition opportunity. Verify and validate the performance of the technology developed under Phase II to enhance its TRL.

This topic will benefit defense contractors and navigation-based platforms. This technology will align with SOSA principles and allow private sectors to interchangeably and interoperably integrate their technologies without intellectual property limitations.

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KEYWORDS: SOSA; OpenVPX; pntOS; ASPN; GPS-denied; Kalman filter

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N242-085 TITLE: High-Power Digital Fiber Optic Transmitter Laser

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): FutureG; Integrated Sensing and Cyber

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 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 package a high-power vertical cavity surface emitting laser (VCSEL) and VCSEL transmitter optical subassembly capable of operating at up to 50 Giga Bits per Second (Gbps) non-return-to-zero (NRZ) in the wavelength range of 850 nm to 1000 nm.

DESCRIPTION: Current airborne military (mil-aero) core avionics, electro-optic (EO) communications, and electronic warfare (EW) systems require ever-increasing bandwidths while simultaneously demanding reductions in space, weight, and power (SWaP). The replacement of shielded twisted pair wire and coaxial cable with earlier generation, bandwidth-length product, multimode optical fiber has given increased immunity to electromagnetic interference, bandwidth, throughput, and a reduction in size and weight on aircraft. The effectiveness of these systems hinges on optical communication components that realize high-per-lane throughput, low latency, large-link budget, and are compatible with the harsh avionic environment.

In the future, data transmission rates of 100 Gbps and higher will be required. Substantial work has been done to realize data rates approaching this goal based on the use of multilevel signal coding, but multilevel signal encoding techniques trade off link budget and latency to achieve high-digital bandwidth. To be successful in the avionic application, existing NRZ signal coding with large-link budget and low latency must be maintained. Advances in optical transmitter designs are required that leverage novel laser technology, semiconductor process technology, circuit designs, architectures, and packaging and integration techniques. In particular, the avionic passive loss link budgets would benefit from higher power laser transmitters that are compatible with the current fiber infrastructure. Vertical Cavity Lasers have been widely deployed in the systems, but have limited optical power output. There are several approaches to increasing the available optical power, including multi aperture VCSELs and multijunction VCSELs. The focus of this SBIR topic is to increase the available power from a VCSEL to +10 dBm, while simultaneously operating across all of the environmental requirements.

The proposed avionic transmitter must operate across a -40°C to +95°C temperature range, and maintain performance upon exposure to typical naval air platform vibration, humidity, temperature, altitude, thermal shock, mechanical shock, and temperature cycling environments. The transmitter must support at minimum a 12 dB link loss power budget when paired with a receiver meeting similar environmental requirements, as well as applicable electro-optic performance restrictions. The transmitter must be compatible with receivers in the 850 nm–1000 nm band operating at greater than 50 Gbps NRZ and capable of operating with multimode 50 µm multimode optical fiber while maintaining a bit error rate less than 1x10-12.

The electrical input of the transmitter must be differential current mode logic with an equalization mechanism to allow transmission of the electrical output across at least 2 in. (5.08 cm) of board-level interconnect. The proposed transmitter design must be capable of being demonstrated to perform reliably over the stated environmental, functional, and performance requirements with an Objective aggregate data rate of 50 Gbps. A Threshold performance level of 25 Gbps would represent an attractive option for near-term system deployment in concert with available digital fiber optic transmitter technology.

PHASE I: Design and develop a high-speed and high-power VCSEL with optical output power of +10 dBm and bandwidth compatible with 50 Gbps NRZ signaling. Identify laser driver requirements for 50 Gbps NRZ operation. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Optimize the VCSEL, transmitter optical subassembly, and package designs. Build and test the transmitter circuit and packaged prototype to meet performance requirements. Characterize the transmitter over temperature, and perform highly accelerated life testing. If necessary, perform root cause analysis and remediate circuit and/or packaged transmitter failures. Deliver two packaged transmitter prototypes for 50 Gbps digital fiber optic communication link application.

PHASE III DUAL USE APPLICATIONS: Finalize the prototype transmitter laser design. Verify and validate the laser performance in an uncooled 50 Gbps fiber optic transmitter that operates from -40 °C to +95 °C. Perform environmental testing to increase technology readiness. Demonstrate additional laser wavelength options for the 850 nm to 1000 nm wavelength band. Develop manufacturing tooling and supply chain infrastructure to increase manufacturing readiness. Transition to applicable naval platforms. Dual use applications include telecommunication systems, data centers, and campus networks.

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KEYWORDS: Laser; Transmitter; 50 Gb/sec; Multimode Fiber; Loss Budget; Non-Return-to-Zero Signaling

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N242-086 TITLE: All-Aspect Maritime Automatic Target Recognition

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Network Systems-of-Systems; Integrated Sensing and Cyber

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 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 method to exploit the unique characteristics of large shipboard radar antenna systems to classify combatants at long range regardless of the aspect angle.

DESCRIPTION: Inverse Synthetic Aperture Radar (ISAR) is the primary means to classify ships from airborne platforms from hundreds of kilometers away. ISAR images are generated by the ship's rotation around any of the three principal axes. In order to form an ISAR image the Navy requires that any relative motion between the airborne radar and the ship be compensated for, with only the rotation of the ship on the ocean remaining. This is generally done by tracking a point, or multiple points, on the ship that provides a consistent, strong radar return. The resulting range-Doppler image is most informative when the viewing angle is along the length of the ship since features that inform classification are separated in range. If the ship is broadside relative to the radar, then there will be very little range extent, and a mostly range-unresolved range-Doppler image will be produced making classification more difficult or impossible. Reorienting the aircraft to obtain a more favorable viewing geometry can be time consuming, or given airspace restrictions, impossible. However, ISAR has the ability to detect a rotating object and estimate its physical properties regardless of the view geometry (within reason), as long as the rotating structure is observable. Typically, these rotating objects observed on ships are radar antennas. For commercial and non-combatant ships these radar antennas are almost exclusively marine navigation radar such as those produced by Furuno. While combatants also utilize similar navigation radars with comparable antennas, the mission demands of combatants require much larger antennas to service powerful surface or air search radar systems. Some combatants utilize fixed active electronically scanned arrays (AESAs). However, a significant percentage of combatants have large rotating reflector antennas or rotating AESAs. Exploitation of the ISAR return from a rotating antenna can provide information on its position on the ship, its rotation rate, the width of the antenna structure that is rotating and in many instances information on the detailed configuration of the antenna system and pedestal.

ISAR capable radar systems on U.S. Navy aircraft may have many hundreds to several thousand ships under track when operating in dense operational environments such as areas of the western Pacific Ocean. Classifying those ships, particularly when full trust cannot be placed on ship Automatic Identification System (AIS) broadcasts, requires high levels of automation, advanced radar techniques, and operator aids. Still, all of this works best when favorable near-bow or near-stern viewing geometry exists. This SBIR topics seeks to open the viewing geometry to enable probable combatant level classification, or if the antenna structure ISAR signature is sufficiently unique to a ship class, to achieve fine naval-level classification. Aspect independent classification, even at the probable combatant level is extremely valuable as it informs mission execution priorities and planning for ISAR imaging when more favorable viewing geometry exists.

Three critical issues must be addressed in this research. The first is demonstrating the level of ship type separability that rotator exploitation information will provide. Second, identifying additional ISAR-based features in rotator and fixed hard-body returns that supplement the features described in the preceding paragraphs at near-broadside viewing geometries. Finally, sourcing and cataloging a feature database to support classification.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVAIR 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Develop, design, and evaluate ship separability using ISAR-based rotator exploitation in both general terms, and for the range of combatants of the Pacific Rim nations. Assess additional features, which might supplement primary rotator features and other hard-body features at near-broadside view geometries. Develop plans to complete the exploitation tool set in Phase II that will address the exploitation chain from feature database development through exploitation and classification support. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Develop the complete near-broadside exploitation tool set whose general approach was defined in Phase I. Work with the Navy to conduct a comprehensive evaluation using existing ISAR image libraries.

Work in Phase II may become classified. Please see note in Description paragraph.

PHASE III DUAL USE APPLICATIONS: Integrate the near-broadside exploitation tool set with an ISAR capable radar and demonstrate its effectiveness using live data.

Identification of maritime traffic is also important to civilian and private organizations that are responsible for scheduling and monitoring that traffic, especially in heavily congested areas. Expanding the fields of view from which quality images can be collected simplifies the problem. Another scientifically interesting and compelling application of ISAR is deep space imaging of asteroids.

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KEYWORDS: Inverse Synthetic Aperture Radar; ISAR; Radar; Doppler; Maritime; Identification; Classification

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N242-087 TITLE: Theater Naval Wargame for Strategy Refinement

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Human-Machine Interfaces; Integrated Network Systems-of-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 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 embedded capability that enables realistic Theater-level Naval wargaming within tactical and strategic systems used by Theater commands and combatants.

DESCRIPTION: A wargame is a strategy game in which two or more players command opposing armed forces in a realistic simulation of an armed conflict. Prussia's victory over France in 1870 was broadly attributed to Prussia's wargaming culture rather than any superiority in actual numbers or armaments. Wargaming has subsequently become an important element of military strategy development and refinement.

Future conflicts with peer competitors may involve Naval forces to a greater degree than at any time since World War II. Naval wargames are often conducted as multi-day events where teams "command" so-called blue (friendly) and red (hostile) forces. The conflicts are typically overseen by an umpire who determines the probabilistic outcome of individual encounters. Some such wargames are computer-based while others are conducted using physical markers and dice.

Given the significant changes to warfighting capabilities since the 1940s, there is a need for a wargaming capability to become more accessible. Ideally, such a wargaming capability could reside within tactical and strategic systems. There is also a need for a wargaming framework that can easily be updated to reflect the most accurate information available to support wargame realism. There is nothing commercially available to do this.

In addition to modeling the probabilistic nature of warfighting capabilities (e.g., the probability that a torpedo will hit and damage an opponent [probability of kill (Pkill)]), the wargame should also reflect the proficiency of crews and the improvements associated with improved human capability. The wargame framework should keep track of deployed munitions and the status of individual combatants. The wargaming framework should allow future capabilities to be imported or created for both red and blue forces. The wargaming framework should also be extensible to political or media outcomes that may be associated with military encounters.

The wargaming framework should support self-guided proficiency development, multi-player wargames, single-player wargames versus artificial-intelligence opponents, and management for in-person wargaming (also referred to as computer-assisted wargames). Modes for the wargame should include open gaming where players can see the location of opposing forces, and closed gaming where players are only aware of what their sensors and intelligence sources tell them about opposing forces. The wargame should include a debriefing mode where full information about both blue and red forces can be seen across the course of the completed campaign.

The initial transition target for the gaming Theater Naval Wargame would focus on Undersea Warfare and be included in future builds of AN/UYQ-100 (Undersea Decision Support System) used for Theater Undersea Warfare (TUSW) and AN/SQQ-89 (Undersea Warfare / Anti-Submarine Warfare Combat System) used aboard over 100 ASW-capable combatants between the US and various allies.
Factors that affect undersea warfare campaigns include sailor proficiency, the characteristics of surface and submarine combatants (to include sensors, countermeasures, and weapons), satellite surveillance, land-based anti-ship and anti-submarine weapons, and environmental factors.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVSEA 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations. Reference: National Industrial Security Program Executive Agent and Operating Manual (NISP), 32 U.S.C. § 2004.20 et seq. (1993). https://www.ecfr.gov/current/title-32/subtitle-B/chapter-XX/part-2004

PHASE I: Develop a concept for a TUSW Wargame and demonstrate the feasibility of that concept using unclassified data obtained or created by the proposer. Demonstrate the concept meets the parameters in the Description. Feasibility will be through modeling, simulation, and analysis.
Demonstrate the flexibility, extensibility, and utility of the wargaming framework using unclassified data sets the proposer has created or obtained. (Note: Wikipedia and publications such as Jane's Fighting Ships would be appropriate sources for Phase I.)

The Phase I Option, if exercised, will include the initial design specifications and capabilities description to build a prototype solution in Phase II.

PHASE II: Based on Phase I results, develop and deliver the prototype TUSW Wargame and demonstrate the prototype meets the required range of desired performance attributes given in the Description. Deliver a minimum viable product (MVP) version of the gaming framework for evaluation as a stand-alone module mid-way through the Phase II effort.

(Note: During Phase II, the Navy would provide the company access to classified data associated with actual and future military capabilities relevant to Undersea Warfare.)

Demonstrate the technology in a Moodle environment - a cloud-based learning management system environment. Facilitate in-person computer-aided wargame events to increase campaign coverage by a factor of 10 compared to un-aided in-person wargames. Present an MVP variant of the wargame to gain approval for proposed expansion over the remainder of the Phase II effort. (Note: This presentation of an MVP variant is referred to as "Step 1" of the ASW Advanced Capability Build technology evaluation process. Upon successful completion of Step 1, nominally a year after award of Phase II, the government will invest in independent evaluation of the MVP, referred to as "Step 2." The MVP Step 2 should complete around 24 months after award of the Phase II.)

If exercised, the Phase II Option will include development of a final prototype of the wargame that is appropriate for initial deployment to Navy customers.

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: The TUSW Wargame will be transitioned to Phase III via either subcontract to an existing Prime Contractor or a Phase III award to the company. Planning for this transition will be based on success of the Step 2 evaluation of the Minimum Viable Product of the technology planned to occur around the end of the Phase II Base. The company will be expected to support the Navy in transitioning the technology for Navy use in on-board trainers for both the AN/UYQ-100 Undersea Warfare Decision Support System and the AN/SQQ-89 Surface Ship Undersea Warfare Combat System. The technology will provide warfighters the ability to become conversant with what it takes to win at the theater level in the context of modern technologies available to both allied and enemy combatants.

In addition to validation, testing, qualification, and certification via the Advanced Capability Build process in the description, the performer will be expected to follow the Continuous Integration/ Continuous Delivery (CI/ CD) cycle as mandated by the Navy's DevSecOps processes and the transition Program Office (IWS 5).

It is anticipated that the company will be able to leverage the innovative technologies associated with this topic to provide compelling strategic gaming products for the commercial market. Commercial opportunities would include entertainment as well as serious games to serve strategy refinement in the areas of military and security sectors and any other sectors in which high stakes are involved if naïve strategies would lead to systemic failure, such as the financial sector and sectors involved with disaster response.

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KEYWORDS: Theater Undersea Warfare (TUSW); Naval wargames; proficiency development; probabilistic nature of warfighting; probability of kill (Pkill); computer-assisted wargames


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N242-088 TITLE: Low-cost Floats for Observing Interior Ocean Flows

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Network Systems-of-Systems; Integrated Sensing and Cyber; Microelectronics

OBJECTIVE: Develop and demonstrate a low-cost, expendable ocean float that can be deployed in large numbers along with a concept to track the floats to observe interior ocean velocities through the reconstruction of Lagrangian pathways.

DESCRIPTION: Velocities in the interior of the ocean are difficult to observe, with Acoustic Doppler Current Profilers (ADCPs) and current meters representing the primary sources of observation. These techniques largely provide ocean velocities in an Eulerian reference frame. From the perspective of constraining numerical ocean models via observations, trajectories of interior ocean flow in a Lagrangian reference frame provide a more stringent measure of the fluid streamfunction, and data assimilation techniques that use Lagrangian information have proven to be very effective in ocean prediction. However, most Lagrangian information in the ocean comes only at the surface from drifting buoys. Observing the interior trajectories of the ocean has traditionally been more difficult, though there is a history of success using acoustic tracking to follow floats in the water column (see SOFAR, RAFOS, or COOL floats as examples). Modern manufacturing techniques, acoustic modem technologies, and advancements in low-power electronics and sensing may enable significant advancements in Lagrangian float design, tracking, and sensing capability. These Lagrangian sensing techniques may be particularly useful in regions where surface operations are difficult, such as the Arctic Ocean where sea ice cover impedes the use of oceanographic vessels to collect subsurface ocean velocity using traditional ADCP techniques.

The proposed observing capability would enable the characterization of the interior ocean streamfunction by deploying a large number of neutrally-buoyant in situ floats that would follow the ocean currents in the upper water column (from the surface to perhaps 500 meters deep), along with a concept to track the floats for up to a month to reveal submesoscale ocean flow features in a regional area (up to 105 square kilometers). Disposable Floats should be designed to have a specific reconfigurable density, without a requirement for active buoyancy control due to the expected significant increase in cost and complexity this would require. Additional oceanographic sensors (e.g., temperature, salinity) could be integrated into the floats, depending on float complexity, the overall tracking concept proposed, and cost of integration. It is up to the proposer to determine which options to include, providing cost considerations.

The Phase II effort will require an at sea demonstration of at least five prototype floats along with the proposed tracking system.

PHASE I: Design and develop a concept for a distributed sensing network of modular low-cost drifting floats that can be used to reconstruct flow trajectories for the interior ocean, including prototype float development and analysis of the predicted sensing performance of a full deployment of 100 floats over a representative ocean region. Develop a Phase II Plan.

PHASE II: Produce initial prototypes of floats along with the proposed sensing system, and test them at sea in a sufficiently complex maritime environment to demonstrate the capability of the system to characterize interior ocean streamfunction. Include the assimilation of data collected by the proposed system into numerical ocean models as part of the demonstration, with improved ocean characterization and prediction by the models as a critical metric.

PHASE III DUAL USE APPLICATIONS: Finalize float design and incorporate additional sensor payloads, if achievable. Commercial applications include oceanographic research (physical, chemical, and biological), effluent management and water quality monitoring, and use in coastal and open-ocean observing systems.

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KEYWORDS: Oceanographic Sensing; Lagrangian Data Assimilation; Trajectory Analysis; Dynamical Systems Theory; Ocean Velocity; Interior Ocean Observing; Acoustic Tracking; Ocean Floats; Isopycnal



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N242-089 TITLE: Alternative Fabrication Pathways for Complex Alloys

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Hypersonics;Sustainment

OBJECTIVE: Develop a solid state processing pathway to fabricate refractory high entropy alloys that avoids partitioning (in multi-phase Alloys) seen in melting/solidification processes.

DESCRIPTION: Refractory high-entropy alloys (RHEAs) are considered a new kind of high-temperature materials with great application prospects due to their excellent mechanical properties and have the potential to replace nickel-based superalloy as the next generation of high-temperature materials for gas turbine and hypersonic applications. Currently, the majority of methods for processing of Cantor (3d transition) HEAs and metallic RHEAs are melt derived. This process can be challenging due to the disparate and extremely high melting points of the constituent metals. Moreover, elemental segregation often occurs during the solidification process, resulting in compositional inhomogeneity. In multi-phase alloys, portioning of elements into different phases occurs. This elemental partitioning promotes diverse properties in the different phases of the alloys such differing passivity properties. This SBIR topic seeks to develop a method for Cantor and RHEA production based on the reduction of a mixture of metal oxides, or a mixture of oxides and metallic powders. Processes utilizing non-flammable gas mixtures would be advantageous. The process could be aimed at obtaining (1) RHEA metallic powders (for subsequent solid-state processing) or (2) RHEA bodies (via additive processing of ceramic powders and subsequent reduction heat-treatment). Examples of target RHEAs compositions include MoNbTaW and HfNbTaTiZr.

PHASE I: Explore the literature to determine the relationship of processing versus complex alloy properties. Among the properties, what processes avoid partitioning of elements in multi-phase alloys. In addition, the offeror needs to utilize computational methods to ascertain non-additive manufacturing (AM) processes that minimize the energies to process these complex alloys. Develop model/algorithms that link alloy properties to the fabricating process and resulting microstructure and subsequent mechanical properties. The processes selected need to avoid elemental partitioning among multi-phase alloys. Determine the temperature at which elemental partitioning initiates. Focus on Cantor (3d transition) high entropy alloys. Analysis of defects and inhomogeneities is suggested to be done by non-destructive characterization methods. ICME (integrated computational materials engineering) should link the fabrication process with materials chemistry to prove the extent of feasibility of the selected process to avoid partitioning.

PHASE II: Apply ICME tolls to optimize processing to predict materials chemistry and processing parameter limits for complex alloys. Focus on employing lessons learned on RHEAs during Phase I. (Example: How do the thermodynamics and kinetics for producing RHEAs compare to the processing of Cantor HEAs?) Develop and/or modify model/algorithms that link alloy properties to the fabricating process and resulting microstructure and subsequent mechanical properties. (Note: As in Phase I, the process needs to avoid elemental partitioning among multi-phase alloys and needs to determine the temperature at which diffusional activities initiates elemental partitioning.) Analysis of defects and inhomogeneities is also suggested to be done by non-destructive characterization methods. With computational and experimental research for both Cantor and RHEAs, comprehensive models and algorithms should link optimized processing parameters with alloy chemistries that avoid elemental segregation often occurs during the solidification process after alloy melting, resulting in compositional inhomogeneities.

PHASE III DUAL USE APPLICATIONS: Continue to use the comprehensive models and algorithms to link optimized processing parameters with alloy chemistries that avoid elemental segregation and compositional inhomogeneities.

The developed process offers the opportunity of more uniform properties among phases. For instance, avoiding elemental partitioning will simplify strategies to form passive films on complex alloys due to more consistent materials chemistries among phases. Proven process optimization leading to a minimization of process - and materials - derived defects and inhomogeneities would improve acceptance of this process for producing components for the Navy and for private industry. Processing of components that are qualified for Navy use could also be applied to commercial use. Processing of components that are qualified for Navy use could also be applied to commercial use more quickly and less costly with parts are needed.

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KEYWORDS: Processing; RHEAs; refractory high entropy alloys; RMPEAs; arc-melting; partitioning; microstructure; Segregation; multi-phase

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N242-090 TITLE: Low-Cost, High-Power Microwave Switches for Radar and Electronic Warfare (EW) Applications

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Microelectronics

OBJECTIVE: Design, optimize, and fabricate prototypes for a low-cost, low-loss, high-power microwave switch with fast-switching speeds over large instantaneous bandwidths for radio frequency (RF) surveillance and Electronic Warfare (EW) applications.

DESCRIPTION: While phased array systems with analog or digital phase control at each element provide a highly flexible means of shaping transmit or receive antenna patterns, the per-element cost remains high for these systems, especially when tailored toward stringent Naval requirements. These requirements range from demanding radiated power levels, high system efficiency, coexistence with other emitters and receivers, operation over very wide bandwidths, and multi-function capabilities. On top of this, there is a growing need for adaptive array systems with low SWAP-C for surveillance, electronic warfare, and modern communication systems. To meet these objectives, some phased array approaches are looking toward tunable circuitry solutions that are applied after the high-power microwave source, rather than before.

Some of these solutions are implementing high-power handling output tuners that actively control the scan impedance of an array, improving overall system efficiency [Refs 1, 2], and investigating “reflectarrays” or “intelligent reconfigurable surfaces” [Ref 3]. Phased array systems employ a corporate feed for RF power distribution over small subarrays also have a need for high-power phase shifters. Ferrite phase shifters have historically had a role in this area, but the high losses have made these architectures undesirable.

Several types of RF switches, such as solid state switches (PIN diode, FETs), electromechanical switches (waveguide, coaxial, MEMS), semiconductor switches with new materials (GaN, SiC), photoconductive semiconductor switches (PCSS), and plasma switches (Gas Discharge Tube), have been investigated, each with various strengths and weaknesses with respect to insertion loss, isolation, linearity, switching speed, power handling, or wideband performance [Refs 4, 5, 6, 7]. Compromises between these metrics are limiting the uptake of high-power RF switches.

To that end, the Navy is seeking novel methods of designing and producing low-cost, high-power microwave switches with minimal compromises in other key performance parameters for radar and electronic warfare applications. The proposed approach shall provide significant performance improvement with respect to power handling, tuning speed, efficiency, and linearity, while reducing unit cost to enable low-cost phased array solutions for the Navy.

PHASE I: Develop a preliminary design of hardware for a novel, low-cost, high-power microwave switch that significantly exceeds the current state-of-the-art and improves the performance of current switches. Develop a design approach and produce simulated results of a high-power, fast microwave switch that meets or exceeds the following metrics:
• Operating frequency: Any one octave over 2-12 GHz (Threshold), entire 2-18 GHz band (Objective)
• Power handling (1-dB compression point) - Operative above a curve defined by the following frequency & power points:
Threshold Power: 250 W @ 3GHz // 50 W @ 10 GHz
Objective Power 750 W @ 3GHz // 150 W @ 10 GHz
• Targeted unit costs: $50/device (Threshold), $5/device (Objective)
• Insertion loss: < 1dB (Threshold), < 0.3 dB (Objective)
• Isolation: > 20 dB (Threshold), > 40 dB (Objective)

• Switching speed: 500us (Threshold), 50 ns (Objective)
• Cycles: > 3e9 (Threshold), > 30e9 (Objective)
• Linearity: Input third order intercept approximately 10dB above P1dB point.
• Duty cycle: Greater than 20% (Threshold), to CW (Objective)
Note – As with other research programs, proposed solutions may have sub-threshold performance in an area if it excels in other areas.

Prototypes and experimental testing that reduce technical or manufacturing risk are encouraged. However, the Government understands some fabrication processes are not feasible within Phase I funding, so modeling and simulation approaches are also acceptable. Lastly, provide a Phase II plan that includes the estimated performance of prototype switches to be fabricated in Phase II.

PHASE II: Produce a prototype or set of prototypes of the Phase I switch design. Laboratory based testing shall be completed under the Phase II effort to demonstrate that the technology meets performance metrics set at the end of Phase I. Efforts should characterize devices against metrics set forth in Phase I, identify and iterate on designs to improve performance, and provide a recommended path for higher-volume production.

PHASE III DUAL USE APPLICATIONS: Design, build, and deliver higher level subassemblies including the new switching technology, with assistance from the Navy. Possible subassemblies may include high-power phase shifters, low-loss antenna tuners, or switch-tuned filters. These efforts will target components and subassemblies that support both DoD applications (e.g., phased array radar or electronic warfare systems), and commercial applications (e.g., adaptive arrays for high power 5G/6G cellular base stations).

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KEYWORDS: Microwave switches, antennas, phased arrays, phase shifters

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N242-091 TITLE: An Open-Source Academic Publication Platform Tailored Toward Future Open Science Communications

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software

OBJECTIVE: Develop an open software infrastructure to support modernized scientific and technical communication. The end product will support a variety of publishing goals, including flexible options to edit, review, comment, and compare related written works and be able to curate publications, proposals, abstracts, presentations, data, algorithms, and other communications.

DESCRIPTION: The current peer-review model for scientific literature publication is outdated. The review process is opaque to a fault, and the floor for what constitutes publishable content grows higher by the day. Many people and topics get lost in this mire; including good research hindered by incompatible, overly demanding or biased reviewers. At the same, platforms like Slack and Teams provide teaming tools; yet they are over developed for information distribution and lack an organized peer review process. A middle ground needs attention for dynamic content below journals but above more stovepiped information systems. While the proliferation of new open-source journals provide a simulacra of legacy journals, there exists a vacuum in open best practices and software methods to improve science communications at large. For example, how does one distribute well-reasoned but ultimately doomed research that tells a compelling and cautionary tale? Not only is the future of open science expanding via government mandate (OSTP 2022), there exists a need to track, catalog, archive, and otherwise compare technical work that would otherwise fall victim to the publish-or-perish mentality and have their contributions lost to the sands of time. The academic publication process seems ripe for disruption.
This SBIR topic seeks commercial innovations that can take advantage of new technologies in open software development cycle, version controlling, living documentation, continuous integration/continuous delivery, and others that have the potential to vastly change the paradigm of science/technical publication and communication to allow creation, curation, and distribution of knowledge in innovative ways. This may be achievable via development of a new software platform with a document and data store that better accounts for the variety of new communication methods, archival standards, and machine learning of key words/content to better serve all scientific work of relevance to the academic and government community, not just the flashiest success papers. Ultimately, this topic, seeks the development of both an open publication, open review platform and series of editorial standards that could be applied to a new journal-like medium for accepting a broader array of scientific communication such as null results in the geosciences.

PHASE I: The majority of this effort should focus on a survey of current geoscience publication methods and configurations, an assessment of expected future US government open science standards and procedures, and a proof-of-concept system level architecture of software components and processes for a modernized engine to support new science communication publication methods.

In the survey of current geoscience publications, the performer is expected to examine a series of editorial standards and protocol following popular journals and organizations such as from Nature/Springer, Elsevier, Wiley, the American Geophysical Union (AGU) or American Meteorological Society (AMS). Standards include document formatting, citation style, determining what constitutes a publishable unit, and a process for assigning peer-reviewers to topics (e.g., author-suggested reviewers, a roster of volunteer reviewers, etc.) that encourages repeat participation and ensures proper assignment of Subject Matter Experts (SMEs).) Reviewing open science mandates by the White House Office of Science and Technology and planned implementation strategies such as from NASA Open Science and NOAA will be compared to the previous publishing paradigms and used to contrast new needed publication functionality.

Outline front- and backend infrastructures for an open access hosting and open peer-review system with modern UI/UX for both desktop and mobile experiences. Considerations should be made for long term retention of content and scalability. Emphasis on lightweight, open-source and cloud-oriented solutions are preferred. The peer review system should include options for single-, double- and triple-blind reviews as well as fully open. Provide an open review option using a GitHub or Jira-like interface. For frontend planning, accessibility, including colorblind considerations and compatibility with popular mobile and desktop screen reading software (e.g., JAWS, VOX, TalkBack, etc.) are a priority. The design should also incorporate functionality for continued review/dialog as a living document, citation management and interoperability, and machine learning methods to suggest related work via key word and journal content analysis.

An outcome of the six-month Base effort should be a final report of background, anticipated functionality, technical challenges for software development and implementation, and recommendations for prototype development.

PHASE II: Develop, iterate, and prototype the software outlined in Phase I with an option period expanding the functionality and/or interacting with Naval research, university, and science publication partners for demonstration. End-to-end tests need to be conducted of multiple submission, review, and communication processes to ensure seamless operation for users. Emphasis should be on 1) replication of current journal publication standards, 2) demonstration of functionality that conforms to open science standards (such as tracking of review comments, replies, data, algorithms, and discussion toward living document type updates), and 3) extensibility to broader technical and science communication use cases, such as proposal reviews, special collection and discussion boards, public comment solicitations, and curation of historical documents (abstracts, preprints, conference proceedings, oral/poster presentations, etc.). Of particular interest is leveraging the developed infrastructure and metadata creation for advanced machine learning methods to better find and serve specialized related articles. Demonstrate such a capability using a large publication sample to find multiple, specific select groups of related topics.

PHASE III DUAL USE APPLICATIONS: Participate in local demonstrations for Office of Naval Research proposal tracking and review, special publications of technical reporting at a controlled level, and partnership with a geoscience publication entity (profit or non-profit) to demonstrate functionality via a new journal solicitation. Provide technical and editorial support to submitting authors and reviewers; stress testing of the system with metadata and other associations; and ingesting archived/historical publications for database indexing and analysis. Beyond Naval research use, dual-use commercialization is expected to be similar with other governmental entities with varying needs for software capabilities and data archival/analysis. Given the goal of open source architecture, it is anticipated that the cost model will involve varying degrees of user support, new functionality development, and other SaaS sustainment to align with vendor monetization goals.

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KEYWORDS: Open science; open source, publishing; science writing; technical writing; curation; machine learning; archival; peer review

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N242-092 TITLE: GigEVision-compliant Event-based Cameras

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Space Technology; Trusted AI and Autonomy

OBJECTIVE: Develop camera interface hardware and software, which allows commercial off the shelf (COTS) event based sensors to utilize standard machine vision interfaces such as Ethernet hardware connections and GigEVision or GenICam/GenTL software.

DESCRIPTION: Event based sensing is a novel modality for capturing transient data objects in a scene. Born of the desire to mimic the way biological sensing apparatus operate (i.e., the human eye), event based cameras (EBCs) are fundamentally different than standard frame cameras, and therefore the resulting data stream is unique. EBC data must be read out, processed, and interpreted differently than how standard imagery is done today. To date, there does not exist a standard interface, in either hardware or software, by which the data stream is extracted from the EBC. This causes great difficulty for government researchers in operating, testing, and utilizing EBC capabilities.

The objective of this SBIR topic is to develop a new EBC with the hardware and software needed to accept and connect the EBC and its data to other government imaging and data processing apparatus. The prototype EBC is required to use COTS sensor components. The electronics, boards, physical connections, and software will be developed within this effort. Having standard hardware and software interfaces that can be appended to available COTS event based sensor components will enable this unique technology to be tested, integrated, and used at government facilities, empowering government development and unlocking the capability for the warfighter. Other manufacturing applications to this technology is for manufacturing capabilities in the DoD industrial base such as Shipyards and other locations for material prep, inventory, etc.

General Requirements and Specifications:
1) The software interface must comply with Motion Imagery Standards Board requirements.
2) The software interface must operate with low latency (< 2ms per payload).
3) The software interface must comply with GigEVision or GenICam/GenTL software standards.
4) The new EBC must be configurable via the GenICam interface.
5) The hardware interface must utilize 10 Gigabit Ethernet (10GbE/10GigE) technology for transmitting data and configuring the EBC.
6) The new EBC core must leverage COTS event-based sensor components.
7) The new EBC should have a small form factor (~4”x4”x4”) and have integrated digital-to-analog converters (DACs)/references for the on-chip event based sensor component biases.
8) The new EBC should have an external general purpose input/output (GPIO) interface which can be used for synchronization and timing.
9) The new EBC should utilize a field-programmable gate array (FPGA) or similar as the intermediary between the event based sensor components and the 10GigE interface. This device should be comparable to the specification of an Advanced Micro Devices (AMD) Kintex-7 and leverage 2MB of external memory for potential frame buffer.

PHASE I: Develop concepts and schematics for electrical and mechanical components of a new EBC and 10GigE physical interface which is based upon COTS event based sensor components and will allow data transfer via Ethernet cables. Develop concepts and a block diagram of a software package which can read in data streams from this new EBC, configures the EBC biasing/readout modes and complies with GigEVision or GenICam/GenTL software standards. Demonstrate the feasibility of the concepts in meeting Navy and Naval Enterprise needs and establish the concepts for development into a useful product. Establish feasibility through material testing and analytical modeling, as appropriate. Provide a

Phase II development plan with performance goals and key technical milestones and that addresses technical risk reduction.

PHASE II: Develop a prototype for evaluation. Evaluate the prototype to determine its capability in meeting the performance goals defined in the Phase II development plan and the Navy requirements for the hardware and software interfaces. Support Navy requirements for any testing, such as submittal of Navy Cybersecurity Waiver Board interaction, submissions and approvals and development of a system security plan. Demonstrate system performance through prototype evaluation and modeling or analytical methods over the required range of parameters. Use evaluation results to refine the prototype into an initial design that will meet the Naval Enterprise requirements. Prepare a Phase III development plan to transition the technology to Navy enterprise use.

PHASE III DUAL USE APPLICATIONS: Support the Navy with putting this product into useful service in government facilities. This product could be leveraged by commercial camera producers who develop, manufacture, and sell EBCs. Possible transition to Tech candidate or Future Naval Capabilities (FNC) or Innovative Naval Prototype (INP) for a Program of Record.

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KEYWORDS: Event based cameras; camera interface; software interface; Motion Imagery Standards Board; MISB standard; Ethernet; hardware interface; automation; machine learning


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N242-093 TITLE: Distributed Acceleration Sensor for Integrated Flight and Structural Control

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Space Technology; Sustainment

OBJECTIVE: Develop distributed sensors and associated electronics to measure real-time structural acceleration of an airborne platform's mode shapes. The low-cost, low-SWAP, embeddable measurement system will enable tightly integrated flight and aeroelastic control on future platforms with an otherwise unachievable combination of speed, endurance, and agility.

DESCRIPTION: The distributed sensor must directly measure acceleration of an airframe's mode shape in real-time. Currently, accelerations at distinct points can be measured using a collection of conventional accelerometers, and these sensors can all be sampled and processed to estimate a mode shape. The effectiveness of this approach is dependent on accelerometer location relative to the mode shape, and therefore, depends on a priori knowledge of the mode shapes. Alternatively, fiber optic sensors can provide distributed measurements of structural displacement. The fiber optic sensor's capability for distributed measurements is compelling, but the fact that these sensors generally measure displacement means that the signals lag acceleration by 180 degrees. In terms of control of an agile yet flexible aircraft, 180 degrees of phase lag poses significant stability challenges. Simply differentiating the displacement signal is not a solution because differentiation would amplify noise. Accelerometers can be installed at various locations, but the measurements must be individually sampled and collectively processed to estimate the acceleration of a mode shape. This SBIR topic seeks sensors and electronics that will have the utility of a single, distributed measurement device, such as a fiber optic displacement sensor, and produce real-time acceleration measurements of airframe structural modes. This approach practically eliminates the need for a priori knowledge of the mode shapes. Many state-of-the-art accelerometers use a small, calibrated mass attached to a piezo-electric or piezo-resistive crystal. As the calibrated mass accelerates along with the sensor, a corresponding force on the crystal produces a proportional voltage or resistance change depending on the mode of operation. These sensors have the advantage of being robust and compact, but they produce measurements at a point. On the other hand, fiber optic sensors leverage light scattering phenomena correlated to changes in temperature or displacement of the fiber itself. Measurements of light scattered from throughout the fiber can be correlated to displacement and/or temperature variations along the length of the fiber. Thus, fiber optic sensors have the advantage of measuring transverse displacement along the length of fiber. These sensors can be attached to large structures under observation, such as aircraft or bridges. However, fiber optic sensors do not intrinsically measure acceleration, which would be more suitable for integrated flight and structural control due to the phase advantages. The focus of this SBIR topic is to create a sensor that intrinsically measures structural acceleration for spans greater than 40 feet in length, e.g., the span of a large, tailless sensor platform. Sensor measurements will exploit material phenomena that correlate to structural accelerations. Double differentiation of a displacement signal, which would serve to amplify high frequency noise, is not an acceptable solution for measuring acceleration.

PHASE I: Produce a conceptual design for the objective sensor. First order modeling and simulation (M&S) of the underlying phenomena should support the merit of the design. Provide a baseline for the materials, electronics, and software needed to produce a prototype as well as an estimated cost to build and test the prototype. Model potential test conditions and sensor output for a prototype sensor as well as the predicted output for a sensor installed on an operational aircraft.

PHASE II: Fabricate and test the prototype sensor designed in Phase I. Test the sensor in a controlled laboratory environment. Refine the M&S tools from Phase I and use them to predict the sensor response under the test conditions. Test measurements should be compared with predictions. Conventional accelerometers should be used to spot check distributed measurements from the sensor. Conduct experiments to quantify the precision, accuracy, range, drift, noise, and bandwidth of the sensor. Work with government, industry, and/or academia to identify potential air platforms to test the sensor in an operational environment. Estimate the cost of operational test and validation.

PHASE III DUAL USE APPLICATIONS: Work with DoD air platform providers to assess the potential of using the sensor in a structural and flight dynamic closed-loop feedback system to enable future tailless air platforms capable of high-speed dash, long-endurance loiter, and agile maneuvering. Work with commercial civil and aerospace engineering firms to assess potential sensor use in structural monitoring and condition based maintenance.

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KEYWORDS: Distributed Accelerometer; Fiber Optic Sensor; Structural Control; Aeroelastic Control; Aeroservoelastic Control; Structural Modes; Structural Acceleration; Flight Control

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N242-094 TITLE: Anti-Corrosion Coating for Gas Turbine Compressor Components Operating in Marine Environments

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Sustainment

OBJECTIVE: Develop and demonstrate a chemically and mechanically robust coating system or other surface treatment for sustained protection of engine compressor components, such as mating compressor stages, cases, and vane tracks, from corrosion in naval aero engine operation.

DESCRIPTION: In naval aviation, aircraft operate in and around marine atmospheric environments often with high humidity and salt content, which accelerates corrosion degradation of aircraft components. High compressor operation temperatures relative to ambient conditions create a cyclic environment within the engine, in which water can evaporate and cool between flight and ground time cycles, leading to the accumulation of salts and other contaminants. This cyclic environment further accelerates corrosion mechanisms. As a consequence of this cyclic, marine atmospheric environment, multiple components throughout military aircraft propulsion systems require frequent repair and/or replacement due to severe corrosion and pitting, which leads to high maintenance costs, increased engine removals, and reduced aircraft readiness.

The Department of the Navy is seeking the development and/or demonstration of a coating system or other surface treatment for sustained protection of compressor components from corrosion in naval aero engine operation. Such a proposed solution must have the mechanical durability to provide corrosion protection along surfaces in contact and under some loading from other components. Specific components of concern are low-pressure and high-pressure compressor stages and cases and are typically composed of martensitic stainless steels (17-4PH and Jethete M152), titanium (Ti-6Al-4V), and Inconels (IN600, IN718, IN909) [Note: specific alloys will be identified upon project award]. Proposed solutions may constitute either the development of a new solution or a demonstration leveraging an existing solution in naval aviation application.

A brief description of the target application of this solution is provided below:
1. Low Pressure Compressor Stage or Case Flanges: Individual stages of the low pressure compressor casing are joined together in a flange configuration, where one stage is bolted to another along a mating rim or collar on each stage. This flange joint can link dissimilar materials of the stages, bolts, and other supporting structures within the engine. Typically, these flanges can involve material combinations of stainless steel and titanium mating surfaces bolted together with Inconel hardware. In most cases, corrosion and pitting occurs on the stainless steel flange surface. In addition to potential galvanic interactions, the flange joint may be susceptible to crevice corrosion. Vibration of the engine can also generate fretting between the bolted surfaces. Greases or lubricants are generally not used along the mating faces to maintain a high coefficient of friction. Temperatures in the low pressure compressor stage vary with specific engine platform but may reach as high as 180°C in operation.
2. High Pressure Compressor Stage or Case Flanges: Similar to the low pressure compressor, individual stages of the high pressure compressor casing are joined together in a flange configuration. This flange joint can link dissimilar materials of the stages, bolts, and other supporting structures within the engine. Typically, these flanges can involve material combinations of stainless steel, Inconel, and titanium mating surfaces bolted together with Inconel hardware. In most cases, corrosion and pitting occurs on the stainless steel or Inconel flange surface. Again, similar to the low pressure flanges, the high pressure compressor flanges may be susceptible to galvanic corrosion, crevice corrosion, and to vibration and fretting damage. Temperatures in the high pressure compressor stage vary with specific engine platform but may reach as high as 500°C in operation.
3. High Pressure Compressor Vane Tracks: Along sections of the high pressure compressor case, there are grooves or vane tracks into which stator vane sections slide into place. Shims are used to ensure a tight fit

between the vane sections and the vane tracks. Again, the conditions at this contact point may establish conditions for galvanic corrosion, crevice corrosion, and fretting-related degradation. Pitting and other corrosion products form within the vane tracks, at times degrading the contact with the vane section and other times locking the vane section in place.
4. Compressor Stage or Case Free Surfaces: In addition to the contact and connection points between compressor stages, both low and high pressure, there is pitting occurring on exposed free surfaces along the interior-facing (gas pathway) and exterior-facing surfaces. This pitting may be observed adjacent to areas of contact with dissimilar materials (flange or other bolted connections) and far from areas with other material contact. Corrosion and pitting are also observed around the full circumference of the compressor.

Common among these applications are exposure to elevated temperature, exposure to salt water (sea spray, atmospheric, water wash, etc.), exposure to cyclic engine conditions (cycle on, take-off, land, etc.), exposure to mechanical contact conditions (wear, fretting, vibration, etc.) with potentially dissimilar materials, among others. Thus, solutions are desired which address multiple key challenges associated with these conditions. Each challenge is discussed briefly below and is listed in order of descending priority:
1. Environmental Corrosion Protection within a Naval Aviation Engine Operation Environment: Compressor environmental conditions cycle between ambient conditions when the aircraft is at rest on the ground and the elevated temperature conditions of take-off and in-flight operations. Ambient conditions vary globally but primary areas of operation are sub-tropical, maritime, or coastal environments with moderate to high humidity, high salt content, and exposure to other marine atmospheric contaminants. Take-off or in-flight operation conditions can see temperatures rise as high as 180°C in the low-pressure compressor and 500°C in the high pressure compressor. The environment is further complicated by the design of the compressor, which creates distinct local environments for corrosion. First, water tends to drain from the upper section of the compressor and pool in the lower section. Second, corrosion occurs both on open, exposed surfaces and along mating or contacting surfaces (i.e., stage flanges and vane tracks), which may trap water, salts, or other contaminants. The differences in local environment across the compressor are reflected by the multiple corrosion mechanisms observed: uniform corrosion, oxidation/rust, pitting, crevice corrosion, and galvanic corrosion.
2. Galvanic Corrosion Protection: As mentioned, corrosion is being observed at mating or contacting surfaces, including across the bolted flange interface of connecting compressor stages. In addition to the environmental factors, the engine design may introduce galvanic coupling of dissimilar materials. The stainless steel and Inconel cases are bolted to each other and to other components, like titanium support structures, within the engine, often with Inconel hardware. Changing the material design may not be possible, so coating or surface treatments should be capable of addressing both galvanic and environmental corrosion. (Note: Specific layering combinations of materials and dimensions can be provided upon project award.)
3. Mechanical Durability and Resistance to Flaking and Delamination: Solutions may be applied to mating surfaces (i.e., flanges and vane tracks) where durability to fretting or mechanical contact loading may be required. Solutions applied to mating surfaces may also be required to maintain equivalent coefficient of friction with the underlying substrate material to maintain consistent wear and load transfer performance. Solutions may also be applied to exposed surfaces along the gas flow pathway where resistance to flaking and impact damage may be required.
4. Minimal Coating or Surface Treatment Thickness: Solutions may be applied to mating surfaces and, in such instances, solution thickness may be constrained by allowable tolerances in component and/or engine system design. Solutions of an applied material thickness of less than 300 microns may be required.
5. Environmental Health and Safety Conscious: Current and forthcoming aviation regulations may restrict the use of hexavalent chromium and other hazardous materials in material systems used either in engine manufacture or repair. Chromate-based coatings have long been the standard for corrosion coatings, but

the coating itself, or volatilization of the coating into its by-products, may contain hazardous materials like hexavalent chromium. Solutions may be required to comply with these health and safety regulations and be free of, or seek to minimize, hexavalent chromium and other hazardous materials.
6. Suitability for Different Compressor Applications: The proposed solution should seek to target application across the different identified compressor stages and vane tracks listed previously and across the multiple alloys used in those compressor stages and vane tracks. Severe pitting is currently being experienced across the low-pressure and high-pressure compressor cases and vane tracks made of various stainless steel and Inconel alloys. While it may be possible, even optimal, to tailor a specific solution to each individual application, solutions which address multiple applications and materials may receive greater priority. (Note: Component dimensions, flange configurations, material heat treatments, and other information can be provided upon project award.)
7. Coating Removal: Ease of coating removal by chemical stripping, grinding, or other common process will assist inspection, repair of engine components, and minimize maintenance costs.

PHASE I: Develop an initial design of a new solution or refine the design of an existing solution by identifying an approach to evaluate the technical design and feasibility to accomplish long-term resistance to corrosion damage of compressor stages, flanges, and vane tracks in a naval aero-engine propulsion system. Perform some preliminary evaluation of the proposed solution concept with the aim to demonstrate the potential benefits of the solution if granted Phase II and Phase III support. Conduct the following analyses:
1. Technical Challenges Assessment: Perform a thorough review of the technical challenges facing a proposed solution. Consider what technical data about the engine operation environment, the application components, the materials, etc. may be necessary to complete an evaluation of any solution. Consider what technical data may or may not be available and how limited availability of that data may affect the project success. (Note: It is the nature of some military platforms that certain technical information may not be disclosed, but available technical data (material, heat treatment, basic dimensions, etc.) may be shared upon project award.) Identify and assess the different challenges posed by the specific engine applications (compressor case, flange, vane tracks) and environment conditions, material contact conditions, and external environment (local climate, sea spray, etc.). Identify and assess the most promising solutions, coatings, or surface treatments to address these technical challenges. Consider if one or multiple solutions may be necessary to address these challenges, different applications, and different materials. Based on the assessment of technical challenges and coating/surface treatment options, propose one or more solutions for that specific application(s) to evaluate and characterize further.
2. Solution Feasibility Assessment: Identify a strategy or method to evaluate the proposed solution(s), which best accommodate the breadth of technical challenges, compressor applications, and materials previously discussed. (Note: The methodology may incorporate all experimentation or a coupled experimentation-computation approach, but some experimental characterization (coupon-level testing) of solution performance is requested. The methodology should suitably capture the complex environmental factors (cyclic exposure to salt and/or other contaminants, humidity, and temperature) and contact mechanics (flange joints, fretting, etc.) of the compressor applications and proposed solution(s). Identify a test and performance matrix, which will be used to score or evaluate the solution(s).) The solution(s) should be evaluated based on quantifiable metrics or a combination of quantifiable and qualitative metrics identified on the basis of the technical challenges posed by the environment and contact conditions, capture corrosion resistance, wear resistance, and friction properties. The feasibility assessment should identify work and tasking to be completed both in Phase I as part of a preliminary evaluation and in subsequent Phases of work, if awarded. (Note: OEM participation, while not required in Phase I, may benefit the development of the feasibility assessment and may help align the feasibility assessment with the Transition Plan developed if Phase III is awarded.)
3. Preliminary Feasibility Evaluation: Include a preliminary evaluation of the proposed solution(s) based on the feasibility assessment. (Note: While the scope of this evaluation may not be as broad as work identified for Phase II or Phase III, the objective of the preliminary evaluation should be to demonstrate

the potential of the proposed solution(s), to identify the further benefits and improvements that may be achieved with subsequent phases of work, and to identify the potential risks. This preliminary evaluation may incorporate experimental or computational methods and should serve both as an evaluation of the solution(s) and of the proposed methods for the solution feasibility assessment.)
4. Risk Assessment: Identify potential risks with the proposed solution(s) and the evaluation strategy or method based on both the preliminary evaluation and other proposed solution assessment methodologies. Account for programmatic and technical risks to the development and evaluation of the proposed solution(s) and identify and describe the operational risks to the implementation of the proposed solution(s) in naval aero-engines. Develop a risk mitigation plan that outlines specific strategies and measures that will be employed to address those risks throughout the course of this project.
5. Project Schedule: Develop a detailed project plan and schedule for the tasks and activities for subsequent phases of the project, including Phase II (Prototype Development and Testing) and Phase III (Full-Scale Validation and Transition). Outline specific tasks, milestones, and objectives to be completed in each phase, including any decision points or milestones that may inform how or when the previously identified risk mitigation plan should be consulted. Identify the resources and expertise required for successful completion of each phase. Develop an anticipated timeline of each phase tasks and activities.
6. Program Cost Analysis: Conduct a preliminary cost analysis for the development and evaluation of the proposed solution(s). Include estimates for any required research and development, prototyping, and testing costs. Estimate the costs associated with identified risk mitigation activities.
Upon completion of Phase I, the feasibility assessment and project schedule for the proposed solution(s) will serve as the foundation for subsequent phases of this project, providing a clear roadmap for development and evaluation of the proposed solution(s) in a naval aero-engine environment.

PHASE II: Develop a prototype of the proposed solution(s) and conduct a feasibility evaluation to assess performance with respect to the seven technical challenges listed in the Description and to other technical challenges identified in Phase I as well as adaptability to multiple compressor applications. Perform either an experimentation or coupled computation/experimentation approach to refine, test, and optimize the proposed solution(s) based on the feasibility assessment prepared under Phase I. A scrap component validation of the downselected or refined solution(s) shall be performed to confirm the corrosion and mechanical durability performance of the proposed solution(s). OEM participation is recommended to facilitate the evaluation and solution design optimization. This approach should include the following:
1. Detailed Solution Design: Develop a detailed design of the proposed solution(s) to address the corrosion, mechanical durability, and other technical challenges presented by the compressor applications. This design should describe the application process and finishing steps for the solution(s), e.g., if the solution is a coating, identify the surface preparation, application method, and number of layers required. Identify all details of the solution design necessary to fully describe its preparation, application, and form. This design is expected to be identified over the course of Phase II via multiple iterations and refinements.
2. Design Optimization: The solution feasibility assessment and approach should incorporate an experimentation or computation based strategy for solution design refinement and optimization. This strategy should specifically include design refinement based on solution performance addressing the technical challenges identified in Phase I and suitability to multiple compressor applications. Analyze the available data and/or performance of the design to iterative refine and improve the design. Periodically, evaluate the design progression against the project milestones and pursue risk mitigation activities as appropriate to address any identified issues or to maximize potential benefits.
3. Prototype Fabrication: Based on the design optimization, fabricate a prototype solution on material coupons. Coupons should be manufactured to replicate the compressor materials, including alloy and heat treatment (this information will be provided upon project award). Prepare the coupons in accordance with the detailed solution design as if preparing the actual compressor components. Sufficient quantities of coupons should be prepared at minimum to experimentally evaluate the prototype via coupon-level testing. Once the proposed solution is refined or downselected to its final iteration, scrap component

sections may be provided for prototype demonstration of the solution(s) in the same evaluation procedure as the test coupons.
4. Coupon and Scrap Component Testing and Characterization: The solution feasibility assessment is required to include at minimum, coupon-level experimental testing and characterization of the prototype design. Experimental testing may also be part of the design refinement and optimization; however, for experimental evaluation of the prototype design, coupon-level testing should carefully simulate exposure of the solution(s) to the complicated compressor environment, including, but not limited to, characterization of the impact of cyclic environmental (humidity, salt, water, temperature, etc.) exposure, galvanic pair with other compressor alloys, and mechanical loading and/or fretting from bolted flanges and vane tracks. OEM participation is encouraged to provide assistance with details of the engine operation environment and evaluation of the test results. Evaluate the coupon performance in accordance with the feasibility assessment prepared in Phase I. Once coupon-level testing has satisfied the conditions of the solution feasibility assessment, sectioned pieces of scrapped compressor components may be supplied for subsequent validation on actual component hardware. The components should be subjected to any surface preparation, including any surface grinding to remove pre-existing damage, prior to applying the solution. The performance of the solution(s) on the scrapped component should be evaluated according to the same solution feasibility assessment and with OEM engagement.
5. Updated Risk Assessment: Revisit and update the risk assessment and mitigation plan developed in Phase I based on the solution design and prototype development undertaken in Phase II. Identify any new risks and mitigation strategies that may have arisen.
6. Phase III Planning: Develop a detailed plan for Phase III (Full-Scale Validation and Transition), outlining specific tasks, milestones, and resources that will be required. Scrapped compressor components will be made available for full-scale testing and validation. Identify any testing requirements or validation of the solution necessary for operation on naval aero-engines not performed under this program, and develop a plan for transition to the Navy. OEM participation is highly encouraged to identify OEM-specific testing requirements.

PHASE III DUAL USE APPLICATIONS: Collaborate with engine OEMs to develop and implement a transition plan for the proposed solution(s) to the Navy and OEMs and to confirm the corrosion and mechanical durability performance of the proposed solution(s). This work should include:
1. Transition Plan: Develop a plan to transition the proposed solution(s) to the Navy, including documentation of how the material surface should be prepared prior to application, how the solution(s) are to be applied, and any post-application finishing steps. Collaborate with engine OEMs to identify all test and characterization requirements to validate and transition the proposed solution(s) to engine compressor components for in-flight operation, including any coupon level testing and/or field service evaluation. Identify any transition pathways to any non-aviation or non-military applications. The proposed corrosion solution(s) may be applicable across multiple industries, including commercial aviation and propulsion, automotive, and marine propulsion, OEM involvement in prior phases of work was specifically encouraged to capture broad commercial and military requirements in the solution feasibility assessment for coupon testing to smartly tailor the evaluation process to maximize benefits to multiple applications. The transition plan should build off this prior work and include any other test requirements as appropriate. Identify any solution-specific health and safety precautions. Identify a solution inspection plan, including how Navy fleet maintainers should inspect the solution for deposition defects, damage in use, corrosion, or other degradation.
2. Transition Test Matrix: Based on the transition plan, collaborate with the OEM to identify a test matrix for evaluation of the proposed solution(s). This test matrix may consist of an updated solution feasibility assessment developed and applied in Phases I and II based on OEM input, but it should reflect the updated test requirements identified in the transition plan. The objective of the test matrix is to specify the experimental methods and success criteria of the requirements laid out in the transition plan, e.g., if the transition plan should identify the requirement to perform an accelerated environmental engine test, the

test matrix should specify the target environmental conditions, mission operation cycle, and other test parameters as recommended by the OEM.
3. Solution Validation: Based on the transition plan and test matrix, some of the identified transition requirements may be satisfied by the coupon or scrapped component testing; however, some requirements may remain unsatisfied. Any unsatisfied transition requirements should be addressed according to the transition test matrix pending available funding, component supply, and other test hardware.

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KEYWORDS: Naval Aviation Propulsion; Compressor; Turbine; Marine Atmosphere Corrosion; Stainless Steels; Nickel Superalloys; Corrosion Protective Coatings; Cyclic Environment Conditions

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N242-095 TITLE: Directional Wave Spectra Sensing Module for Autonomous Underwater Vehicle Gliders

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Sensing and Cyber; Trusted AI and Autonomy

OBJECTIVE: Develop and integrate a directional spectra sensor for ocean surface waves on low-power, long-duration autonomous underwater vehicle gliders.

DESCRIPTION: Autonomous underwater vehicle gliders are buoyancy-propelled, ocean-going robots that serve as platforms for a variety of environmental sensors. Gliders surface regularly to communicate with a base station via satellite communications. During this period, the glider floats at the ocean surface under the action of the surface waves. The goal of this SBIR topic is to develop a sensor to measure the directional wave spectra from low-powered, long-duration ocean gliders [Ref 1].

Measuring the strength, direction, and period of ocean surface waves is the primary component of sea state – an essential ocean variable. Measuring sea state is critically important for predicting ocean conditions that affect the safety of all maritime operations. Typically, directional wave spectra are measured from ocean buoys equipped with accelerometers. Recently, free-drifting floats [Ref 2] and autonomous surface vehicles [Ref 3] have been used to sense directional wave spectra using electromagnetic velocity sensors and Global Positioning System (GPS) velocity information. Measuring surface wave conditions has not been regularly achieved on ocean-going, autonomous gliders.

The Navy seeks development of a fully integrated, low-power, directional waves spectra sensor for ocean surface waves on ocean gliders. While all components – glider platforms, motion sensors (accelerometers, GPS, electromagnetic, etc.), and compression analysis software – are available in commercial, off-the-shelf components, integrated systems that allow for real-time sensing, onboard computation of directional spectra, and delivery of information via satellite communications are still in their infancy. Partnering with academic research groups utilizing autonomous gliders as sensor platforms will simplify integration efforts. The glider-based surface wave directional wave spectra should align with wave measurement standards outlined by the Coastal Data Information Program [Ref 4].

PHASE I: Identify hardware components that can meet the necessary motion sensing requirements. Develop a concept for onboard processing and data transfer of directional wave spectra [Ref 4]. 3.) Plan for integration of hardware and software components with glider platform, including transfer function for platform motion to wave action. Analyze the strengths and weaknesses of the proposed design. Prepare a Phase II plan that will include a design review.

PHASE II: Develop and test a prototype system. Perform an analysis of an integrated system, including in situ validation of directional wave spectra measurements. Report results. Perform multi-stage testing allowing for redesign between tests with initial tests in a surrogate ocean environment (e.g., lake or tank), interim tests in the ocean under controlled conditions (e.g., coastal bay), and final tests in the open ocean under environmental conditions. Both hardware and software systems should be developed and tested during Phase II. The final prototype should include a fully integrated sensing package capable of reporting directional wave spectra parameters via glider satellite communications. Analyze and report on the strengths and weaknesses of the final design based on results of the field tests.

PHASE III DUAL USE APPLICATIONS: The developed technology has use in the DoD's operational glider fleet. The Naval Oceanographic Office (NAVOCEANO) utilizes numerous gliders within the Glider Lab and Glider Operations Center. Directional spectra of surface waves can be integrated into Navy models implemented by the Fleet Numerical Meteorology and Oceanography Center, improving forecast accuracy and improving safety of navigation and operations. Similarly, NOAA can utilize the wave monitoring capabilities to improve forecasts of wave conditions for commercial fishing operations and public safety.

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KEYWORDS: Surface waves; autonomous glider; directional spectra


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N242-096 TITLE: Context Aware Data Stream Pre-processor for Time-Sensitive Applications

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Sensing and Cyber; Trusted AI and Autonomy

OBJECTIVE: Develop a general context aware, self-learning pre-processing solution to systematically resolve a high throughput Radio Frequency (RF) data stream across distributed systems with resource limitations for time-sensitive applications.

DESCRIPTION: Domain specific data sources generate increasing amounts of information that require ultrafast processing for time-sensitive applications. This is particularly true for ultra-wideband signal processing across the RF spectrum where bandwidths are considerably wide (e.g., several GHz). As data streams continue to expand in throughput, however, the volume of inputs for such applications can quickly overwhelm and exceed a system's storage and processing capacities. Technology advancements are required to distinguish the most significant inputs relative to an application from within high throughput RF data streams, and to efficiently allocate limited resources (e.g., storage, compute, power) for further analysis of the highest value data as part of a larger processing chain. More simply stated, systems supporting data-heavy, time-sensitive applications require a pre-processing capability to determine what data should be stored (both short term and long term), what data needs to be processed immediately, and how to efficiently allocate resources accordingly.

This SBIR topic seeks a general context aware, self-learning pre-processing solution to systematically resolve a high throughput RF data stream across distributed systems with resource limitations for time-sensitive applications. For any given application the pre-processor should be context aware in order to value input data as appropriate, presumably in part by extracting features and matching inputs against elements in a library of prioritized items and/or by detecting anomalous inputs within the data stream, while continually learning and improving its ability to prioritize inputs for processing. Distributed, networked heterogeneous systems supporting the same application should be able to benefit from diffused learning updates of individual nodes. Innovative approaches to determining high value data are also encouraged. Once the data of greatest importance to a time-sensitive application is identified, the pre-processing solution must determine how to allocate system resources and efficiently make the data available for processing subject to any limitations on storage, compute, power, and latency. The pre-processor resulting from this effort should be generalizable and scalable across distributed, heterogeneous systems to maximize the potential applications and broad utility of this solution in the RF domain.

PHASE I: Define and develop a concept framework for a context aware, self-learning pre-processor that distinguishes high value inputs from a voluminous RF data stream at the point of ingest. Conceive and mature a scheme for resource allocation to support ultrafast processing with consideration to constraints on storage, compute, power, and latency. Provide measures of effectiveness, as well as attainable performance characteristics. The framework will need to be generalizable and extensible across a distributed set of heterogeneous hardware systems, with a proposed design for the hardware and software architectures that supports tip and cue of heterogeneous systems to augment processing-related capacities of any individual system as necessary. The design should include a summary of any storage, computing, and power requirements for administering this pre-processor relative to latency requirements. The feasibility of the concept will be established through modeling and simulation. Include, in a Phase II plan, the initial design specifications and capabilities description to build a prototype in Phase II.

PHASE II: Fully develop, verify, and validate a prototype pre-processing solution that demonstrates context awareness, self-learning, and an ability to perform the desired functionality on high throughput RF data streams. Design the prototype to distinguish high value data and then allocate storage and compute resources as part of a larger RF processing chain. Demonstrate the design performance through modeling and physical testing over a range of voluminous RF data streams devised to test processing capacities with and without the pre-processor in place. Use evaluation criteria and results to refine the prototype for an initial, generalizable, scalable design that supports domain specific, time-sensitive applications. Develop a Phase III plan to transition the technology to a system that can be acquired by the Navy.

PHASE III DUAL USE APPLICATIONS: Support Navy system integration of the pre-processor, hardware, and software to include validation testing of a demonstration on RF data streams in a relevant environment, employing any lessons learned from the Phase II evaluation. Incorporate the pre-processor into multiple domain specific, time-sensitive applications for exhibition of generalizability (e.g., signal processing for wireless networks, indications of new spectrum activity, sensing on autonomous vehicles). The pre-processor from this SBIR effort would support data triage with high throughput streams for time-sensitive applications across the automotive industry, infrastructure, energy, health care, and other domains.

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KEYWORDS: Pre-processor; Context aware; Self-learning; Radio Frequency (RF); Data stream; Distributed signal processing; Resource allocation

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N242-097 TITLE: Unmanned Aerial System for Tag Deployment in Marine Mammal Monitoring

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Biotechnology

OBJECTIVE: Technologies and techniques for marine mammal monitoring are growing rapidly but many barriers remain. This SBIR topic seeks to adapt a compact, National Defense Authorization Act (NDAA)-compliant, commercial-off-the-shelf (COTS), unmanned aerial system (UAS), and develop the payloads to facilitate accurate deployment of Type A anchored biologging tags from small boats to improve marine mammal monitoring, health measurements, behavioral sequencing, and understanding of the effects of Navy sources of sound on marine mammals.

DESCRIPTION: Advances in both biologging tag technology and UAS present unprecedented opportunities to improve our capacity to collect robust data with minimal disturbance to marine mammal species. In particular, percutaneous tags can collect data over extended periods and are integral to understanding cetacean ecology. Compared to other less invasive tag types, these percutaneous tags are capable of collecting datasets on the order of weeks to months, which are critical in providing information on marine mammal distribution, migration, and behavior. Such data are necessary to support the Navy's environmental compliance requirements.

However, as these tags require both significant force and accurate placement to attach to the individual properly, current methods of tag deployments via a long pole from a small boat are challenging, as they require close boat approaches, thereby increasing the risk to both the cetacean and tagging personnel. Further, cetaceans often respond evasively to close boat approaches, which increases chances of harassment, reduces deployment opportunities, and extends the time it takes to deploy each tag.
As such, the use of UAS in tag deployment can help reduce these risks while also increasing tag deployment rates by enabling remote deployment of percutaneous tags. While UAS methods have led to the successful deployments of suction-cup attached tags on cetaceans, to date these available systems rely only on gravitational force and are therefore inadequate for Type A anchored tag deployments that require accurate tag placement.

This SBIR topic seeks to adapt a compact, NDAA-compliant, COTS UAS and develop payloads capable of carrying both the biologging tag and propulsive source to facilitate accurate deployment of Type A anchored tags. In particular, this prototype device should include the ability to launch and recover from small boats, have sufficient propulsive force to launch the tags at a sufficient speed for anchored attachment, accurately hit small targets when taking into account winds and motion of the UAS and animal, and minimize operator training and workload. Further, this COTS UAS device should utilize predictive systems to model the ballistic trajectory of the irregularly shaped tags and take into account onboard measured environmental factors such as true wind speed that affect the tag trajectory. Further development leveraging AI and computer vision could additionally enable assisted targeting where the UAS could automatically track specific features on an individual. In addition to this deployment capability, the UAS should additionally include the ability to collect high-resolution imagery of marine mammals with associated range and geo-spatial information.

Note: Phase I performers should review appropriate guidance required for animal research protocols at Animal Use Research Requirements | Office of Naval Research (navy.mil) so they have the information to use while preparing their Phase II Initial Proposal [Ref 6]. Institutional Review Board (IRB) determination as well as processing, submission, and review of all paperwork required for animal use can be a lengthy process and should be started in the Phase I Option period. Animal research will not be allowed until Phase II and work will not be authorized until approval has been obtained, typically as an Option to be exercised during Phase II.

PHASE I: Develop concepts and determine feasibility of adapting COTS UAS technologies with payloads and technology suitable for percutaneous tag deployment in a compact, efficient, and cost-effective design, including the identification of components to increase propulsive force and accuracy. Develop key component technology milestones and conceptual designs for hardware. Prepare a Phase II plan.

Note: Please refer to the statement included in the Description above regarding animal research protocol for Phase II.

PHASE II: Develop prototype payloads and technology hardware based on the Phase I effort. Establish hardware performance and develop a conceptual plan for integration into a COTS compact UAS system. A prototype should be delivered at the end of Phase II, ready for integration and testing by the Government.

Note: Please refer to the statement included in the Description above regarding animal research protocol for Phase II.

PHASE III DUAL USE APPLICATIONS: Successful adaptation of a COTS compact UAS and development of payload suitable for percutaneous tag deployment will open tremendous opportunities for small businesses to provide marine mammal monitoring capabilities to a wide range of government agencies having equities in marine life issues. For example, NOAA National Marine Fisheries, National Ocean Service, Office of National Marine Sanctuaries, Bureau of Ocean Energy Management, U.S. Geological Survey, and the U.S. Fish and Wildlife Service, among others would benefit from this capability. A key goal of this phase will be making the technology available to the broader research and Navy communities.

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KEYWORDS: Unmanned aerial systems; drone; tag attachment; tag deployment; marine mammals; monitoring; percutaneous tag; anchored tag

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N242-098 TITLE: Signal Cueing in Complex Environments

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Sensing and Cyber; Trusted AI and Autonomy

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 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: Design and develop a parallel system of adaptive machine learning (ML) cue generators that ensures multi-signal and multi-function electromagnetic spectrum monitoring (ESM) systems with the parallel system will properly respond to signal classes with different probabilities of occurrence and importance.

DESCRIPTION: In designing future ESM systems, it is recognized that adaptation to the current signals environment is critical to achieve high functionality. Patterns of life recognition systems are being developed that can keep track of the array of signal types observed and their characteristics including, but potentially not limited to, their pulse descriptor word entries and signal inter-relationships/clusters. An important question for ML systems is whether to allow adaptation to the actual electromagnetic (EM) environment by allowing automated retraining of the algorithms, and if yes, how and how often. It is unclear how long the ability to recognize rare but important signals would last if such retraining is allowed to occur.

Today most systems use a single cue generator to locate all the signals defined by some criterion present in the current EM environment. What appears to be needed in the future is a system of ¬¬N such cue generators, all fed by the same wideband data stream and delivering their conclusions to the same prioritizer/scheduler. That unit would then decide how the system’s finite local digital signal processing (DSP) resources will be used to best reduce the current data to actionable information. This SBIR topic is designed to begin prototyping such a system of cue generators operating in parallel, first in Phase I by developing the data movement system required, and then in Phase II demonstrating its functionality in a simple setting and begin the integration of a pattern of life system.

Phase I proposals need to include evidence that the proposer already has access to an ML implemented cue generator and an understanding of the complexities inherent in building a scaled up to N=4 or more system using only currently available commercial off-the-shelf (COTS) processor cards of CPU, FPGA, or GPU character and 1 server. Systems requiring use of a single class of COTS components or a proprietary ASIC are less desirable but can be considered if a strong case is made for their functional benefit. The proposals should describe a potential architecture for the system, including how to get the signal data in and out without losing accurate track of the time of arrival and dealing with the fact different cue generators may take different times to complete their analysis of the same Vita 49 packeted signal data stream. An experimental lab demonstration for the N=2 case during the Phase I Base is highly desirable as it would inform future Phases proposal.

PHASE I: Flesh out the architecture as described in the proposal. Execute a demonstration, at least by simulation, of an N=2 system using 2 copies of the identified ML cue generator trained to recognize different classes of signals. Proposals should describe this demonstration in detail. At most a minority of the proposed Phase I tasking should go toward improving the function of said cue generator. Generate a proposed Phase II plan, emphasizing issues to be addressed in realizing the ultimately large N system case; how the work would evolve; and what to do in the case of a severely limited SWaP system. The Phase I Option, if exercised, should select the hardware required to implement the proposed Phase II plan and begin to work integration issues.

PHASE II: Perform an experimental demonstration of an N=2 system fed by a government off-the-shelf (GOTS) or COTS digitizer and complex environment signal generator or a digitally delivered predefined set of digitized signal environments that include both the trained to signals and others that are used as background. Include verification that the cue generators performance does not decay as the number of background signals increases and that abrupt shifts in the signal content does not stall operation. Identify and implement delivery of what information the patterns of life units need to supply to this cue generator unit, e.g., for retraining purposes, as opposed to supplied to the cue prioritizer. Work to include feeding the results from a GOTS pattern of life generator into the prioritizer and integration of the prioritizer with the cueing system in the Phase II Option if it is exercised.

PHASE III DUAL USE APPLICATIONS: Expected government use is in systems that are at least reconfigurable for multiple functions. The most likely phase III is hence to do and demonstrate this integration of the parallelized cueing subsystem into an already multi-functional system. Economics is expected to increase the fraction of systems which are built that way in the future. A commercial application is most likely in the tele-com domain in systems to suppress pirate applications operating on commercial infrastructure by links with signals at amplitudes below the legitimate traffic or above the noise floor but with widely different waveforms. They must be detected first if the bad behavior is to be suppressed. Here the N=2, simplified prioritizer case might be sufficient where the first cue generator is for the expected traffic. The second is then for the pirate signals and the latter are routed to a specialized identifier and logging of incidents tracker.

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KEYWORDS: Signals of interest; machine learning; adaptive digital signal processing; resource management; software defined radios; situational awareness

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N242-099 TITLE: Wireless Power Transfer

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Directed Energy (DE); Renewable Energy Generation and Storage; Sustainment

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 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 Navy shipboard relevant wireless power transfer (WPT) methods for enabling new technologies such as Unmanned Vehicles (UxVs), providing new recoverability methods, providing shore power supply, and increasing energy resilience.

DESCRIPTION: Current industry standards, such as SAE J2954, address uni-directional WPT to stationary receivers on the order of tens of kilowatt (kW). SAE J2954/2 provides guidance on extending this standard to 500kW at approximately 10 inches.

United States Navy (USN) applications require distances greater than 10 inches for shore power supply and recharge of UxVs while at sea applications. The increased distance avoids risk of damage to ships or UxVs. In several applications the Navy requires power levels extending beyond 500kW. Increasing the power above the currently available solutions allows the technology to be applicable to larger platforms and higher recharge rates of UxVs. Additionally, placement of the WPT sending/receiving units is a challenge in a shipboard environment. The Navy requires WPT to pass through inclement weather, water layers, and ideally through various metals such as steel and aluminum. This SBIR topic aims at providing the USN benefit of WPT for application to damage recovery (casualty power connection), remote vehicle charging, shore power connection, and off-board power sharing. Metrics for WPT include distance, power magnitude, transmitting and receiver size, position alignment flexibility (static and dynamic), impact of different media in the WPT gap, safety, efficiency, and bi-directionality. These metrics will be compared against commercially available wireless power transfer solutions.

PHASE I: Identify challenges to utilization of WPT to USN applications. Model and simulate wireless power transfer capabilities across air, steel, aluminum, and salt water gaps. Analysis will demonstration how the WPT solution provides improvements over the J2954 standards and other WPT solutions in terms of the metrics provided in the Description.

PHASE II: Develop prototype WPT hardware solutions. Prototypes shall be capable of interfacing with at least one side of the WPT system operating at or electrically connected to a MIL-STD-1399-300-1 or -2 defined interface. Validate and verify the model outputs using prototype hardware in the loop (HIL) testing at a USN accredited test site at a relevant power level/scale.

PHASE III DUAL USE APPLICATIONS: Support transition to Navy use. Any development in this space can build upon currently available industry standards and therefore help enable a system supporting higher power wireless power transfer systems required for ubiquitous unmanned, electric vehicle societies.

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KEYWORDS: Wireless Power Transfer; WPT; Near Field Power Transfer; Autonomous Vehicles; Wireless Charging; Casualty Power; Recoverability

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N242-100 TITLE: Photonics-Based Optical Frequency Shifter in the Near-Infrared (NIR)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Quantum Science; Space Technology

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 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 technology that shifts the frequency of near-infrared (NIR) light in a waveguide while suppressing undesirable sidebands.

DESCRIPTION: Atomic accelerometers and clocks are important elements of advanced inertial navigation and timing systems. In recent years, there has been significant effort to reduce the size, weight and power (SWaP) of various subsystems. For the laser subsystem in particular, this is typically anticipated to be accomplished by a transition from bulk optics to photonic integrated circuits (PICs). One of the challenging aspects of this transition is redesigning the laser architecture to be compatible with PICs. Some capabilities that are straightforward to achieve in a bulk system either do not have a direct analog in PICs or do not have a proven solution for the NIR wavelengths that are relevant for atomic sensors (e.g., rubidium at 780 nm and cesium at 852 nm).

Here we focus on acousto-optic modulation as a component that is often found in atomic system architectures. A bulk-crystal acousto-optic modulator can serve multiple functions:
1. A pure frequency shift, typically in the 10MHz-1GHz range
2. Optical pulse generation with sub-microsecond rise/fall time
3. Optical switching capability with low cross-talk between spatially-separated channels
4. Variable optical attenuation capability exceeding 20 dB

The goal of this SBIR topic is focused on the first function: the development a high-quality frequency shifter (i.e., one where spurious frequency contributions are highly suppressed) that is compatible with on-chip photonics integration. Current approaches include In-Phase/Quadrature (IQ) modulation [Ref 1] and acousto-optic modulation [Ref 2], among others [Ref 3]. All these components, however, are fabricated for primarily C-band laser systems. Although it is possible to frequency double a 1560 nm laser to produce 780 nm to satisfy a rubidium-based system, a natively NIR solution would be a valuable addition to PIC capability for multiple atomic species.

Technical requirements for the frequency shifter are below:
• Operating wavelength: 780 nm [threshold], devices compatible (not necessarily tunable) with 400-900 nm [objective]
• Optical power handling (at waveguide input): > 50 mW [threshold], > 300 mW [objective]
• Electrical power draw: < 1 W [threshold], < 100 mW [objective]
• Modulation 3dB bandwidth (without regard to modulation center frequency): > 1 MHz [threshold], > 5 GHz [objective]
• Spurious sideband suppression: < 20 dB [threshold], < 30 dB [objective]

Proposed technologies do not need to provide any of the additional capabilities 2-4 listed above. If the proposed approach happens to enable any of those functions, this fact should be described with enough detail to provide a sense for the scale of the changes required to achieve that functionality. The capability does not need to be proven experimentally.

PHASE I: Perform a design and materials study to assess the feasibility of the selected technology and its ability to meet the goals above. The final report will include:
• A discussion of how the technological approach will satisfy the requirements of the frequency shift function.
• An evaluation of the technology's SWaP for the component that would be built in Phase II.
• A discussion of the fabrication process including an assessment of risks and risk mitigation strategies.
• A discussion of the technology's compatibility with photonic integrated circuits.
• If applicable, a brief discussion of alternate capabilities enabled by the technological approach.
The Phase I Option, if exercised, will include the initial design specifications and description to build a prototype solution in Phase II.

PHASE II: Fabricate, test, and deliver three (3) prototypes of the design developed in Phase I. The completed prototypes shall be tested against the performance goals listed above. The final report shall include an assessment of potential near-term and long-term development efforts that would improve the technology's technical performance, SWaP, and ease of fabrication. It shall also include an evaluation of the cost of fabrication and how that might be reduced in the future. The prototypes shall be delivered by the end of Phase II.

PHASE III DUAL USE APPLICATIONS: Based on the prototypes developed in Phase II, continue development to assist the Government in integrating the technology with other PIC components.
In addition to advancing a quantum sensing capability for military/strategic applications, this technology will improve the SWaP and lower the cost of hyperspectral imagers and near infrared spectrometers useful for environmental monitoring, biomedical imaging, and film/coating characterization.

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KEYWORDS: Photonic integrated circuits; optical frequency control; inertial sensors; atomic clocks; atomic accelerometers



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N242-101 TITLE: Reentry Plasma Onset and Emergence Sensor

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Hypersonics; Nuclear; Space Technology

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 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 sensor that can determine the onset of, and emergence from, a plasma environment which precludes the send and receipt of telemetry signals during ballistic reentry.

DESCRIPTION: Plasma environments generated by ballistic reentry conditions prevent the transmission of signals between the test article and ground receiving sites. To mitigate this, pre-flight analysis is conducted using empirical data and previous flight test observations to predict onset and emergence times, and these delays are programmed into the test article with margin on each side of the blackout window. This process artificially restricts the amount of telemetry data that can be transmitted from the test article, and is difficult to adapt to new conditions that do not match previous test conditions or otherwise violate the empirical data assumptions.

Maximizing the time telemetry is transmitted before onset of the blackout period and after emergence will have a significant impact on the total value of the test event and ability to leverage the data collected to improve the next experiment. This sensor will not only need to characterize the environments in real time, but also be capable of communicating with the existing telemetry infrastructure and surviving both space and ballistic reentry environments. Market research has not discovered a package that currently meets all of these requirements, so development will be required to fulfill the technical requirements while meeting packaging, communication, and survivability constraints. A final, test-ready product at the conclusion of Phase III should be capable of withstanding the proton environment of the South Atlantic Anomaly, shock environments of 3000 G, acceleration environments of ±80 G, and pressure environments of 75 PSIA.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain at least a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and SSP 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Demonstrate capability to characterize a plasma environment in real time, and the ability to communicate with an external controller at defined set points representative of blackout conditions. The concept should show a path to meeting final size, weight, and power requirements necessary for integration into a Navy flight test vehicle. Feasibility should be communicated by a combination of research white papers, bills of materials, drawings, and simulations. The Phase I Option, if exercised, will include the initial design specifications and capabilities description to build a prototype solution in Phase II.

PHASE II: Build and evaluate a prototype sensor for compatibility with Navy reentry flight test architecture. Demonstration in a relevant plasma environment is preferred, but in the case that a test facility cannot be identified during the Phase II period of performance, surrogate testing which demonstrates the proof of concept while identifying the areas where results are not representative is acceptable. The prototype will be required to measure the environment, demonstrate communication with an external controller, and send a signal to stop and restart a signal at the proper times correlated with the ability to send and receive a signal. If representative testing cannot be accomplished by the end of the Phase II period of performance, two prototype sensors will be required at the conclusion of the effort for future test opportunities.

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: The final product should meet size, weight, and power requirements such that it is fully capable of integrating with a Navy ballistic flight test body. It will be capable of surviving launch, space, and reentry environmental requirements. In addition to fully performing the real-time plasma characterization mission, it should also fully integrate with the telemetry architecture to provide usable inputs for starting the delay process. This will be used on both developmental and surveillance Navy test reentry bodies undergoing end-to-end ballistic testing, and will greatly enhance the ability to transmit the data characterized by each test event for use in further development or in-service assessment. Once integrated into the final test capsule, the full flight test body will undergo environmental and functional testing to ensure all components are performing together as expected.

Plasma blackout conditions exist in any high temperature environment where communication between a vehicle and ground receiving sites is required. Examples of this include the reentry of crewed space missions as well as any future hypersonic aircraft exceeding Mach 10, where the rapid reacquisition of communication can play an important role.

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KEYWORDS: Plasma Blackout; Communications Blackout; Ballistic Reentry; Plasma Sheath; Atmospheric Reentry; Radio Blackouts; Ionization Blackouts

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N242-102 TITLE: Radiation-Hardened Super High Frequency (SHF) Electronics

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Quantum Science; Space Technology

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 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: Extend the bandwidth of radiation-hardened electronics into the SHF (3 to 30 GHz) regime. This will enable sensing modalities (e.g., low-Size, Weight, and Power (SWaP) atomic clocks for precision timing) that require higher bandwidth signals than have been achieved in prior rad-hard-designs.

DESCRIPTION: The capabilities of modern electronic systems are enabled in large part by their ability to operate at much higher speeds than their obsolete predecessors. Innovations such as high-speed clocking, input/output (I/O), and data storage and high-bandwidth communication have been made possible as feature sizes on integrated circuits have decreased and operating frequencies have pushed into the GHz radio frequency (RF) range. Reduction to state-of-the-art feature sizes is not possible due to the risk of radiation-induced damage. As a result, rad-hard electronics designs have lagged in their capabilities relative to commercial systems. This has limited the adoption of advanced sensing technologies in strategic applications. As a specific example, low-SWaP atomic clocks, which offer better long-term stability and inherent radiation insensitivity than free-running oscillators, require GHz-modulation of the current driving the clock’s Vertical-cavity Surface-emitting Laser (VCSEL) source [Refs 1, 2]. Until the bandwidth of rad-hard designs is increased, important technologies such as this cannot be leveraged to meet the position, navigation, and timing requirements of the mission.

The purpose of this SBIR topic is to bridge at least a portion of the performance gap between state-of-the-art electronics and rad-hard electronics designs. As a demonstration testbed, performers will design and fabricate a system that includes custom electronics that drive a VCSEL. The system must be capable of modulating the current of a VCSEL at 5 GHz and demonstrate that the system is capable of fully suppressing the carrier frequency. Proposers must provide a detailed justification for why their approach is a viable rad-hard design. It is anticipated that proposed designs will leverage widely-adopted rad-hard application-specific integrated circuit (ASIC) design kits such as the Honeywell HX5000 Standard Cell ASIC Platform (a complementary metal oxide semiconductor (CMOS) silicon-on-insulator technology which is limited to 150 nm feature sizes [Ref 3]), but alternative approaches are welcome if their rad-hardness can be justified.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain at least a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and SSP 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Deliver a design concept of rad-hard electronics that can drive a VCSEL suitable for D1 spectroscopy of atomic cesium (single-frequency tunable to 894.6 nm) to produce single-mode output and fully suppress its carrier frequency via current modulation. The feasibility must be demonstrated via detailed analysis, modeling, and simulation. This must include the predicted operating parameters that fully suppress the VCSEL carrier with modulation frequencies from 1 to 10 GHz. In addition, a detailed justification must be provided of why the design is expected to demonstrate radiation tolerance up to 300 krad total ionizing dose, which is a specification achieved for advanced timing components (e.g., quartz oscillators) designed for space applications [Ref 4]. The Phase I Option, if exercised, will include the initial design specifications and capabilities description to build a prototype solution in Phase II.

PHASE II: Develop and deliver one (1) prototype system to demonstrate the viability of the Phase 1 rad-hard electronics concept. The design must include the ability to tune the laser temperature, bias current, RF modulation frequency, and RF modulation power. Performers will build a prototype test bed that includes the fabricated electronics and a VCSEL suitable for D1 spectroscopy of atomic cesium (single-frequency, tunable to 894.6 nm). The prototype system must demonstrate full suppression of the VCSEL carrier from 1 to 10 GHz. If this proves unfeasible, a detailed explanation of the limitations and mitigations to ensure future success must be provided. The prototype test bed volume goal of no larger than 10 cm x 10 cm x 3 cm, tight integration of the prototype into a low-SWaP package is not required, but desired. If tight integration is not feasible a detailed path to Phase III integration must be provided. The prototype shall be delivered by the end of Phase II.

PHASE III DUAL USE APPLICATIONS: Integrate the Phase II test bed prototype into a compact unit that provides the ability for a future user to leverage the asset in an atomic clock configuration that is converted for fabrication. It must include the required controls (e.g., connectors, knobs, interfaces) that to allow the user the ability to electronically tune the laser temperature, bias current, RF modulation frequency, and RF modulation power. It must also provide the VCSEL light on an optical output. The integrated unit must retain the 10 cm x 10 cm x 3 cm volume. The integrated system must demonstrate full suppression of the VCSEL carrier from 1 to 10 GHz prior to delivery.
This unit provides an asset that is useful not only for strategic applications, but also for commercial space-based missions requiring radiation hardness.

REFERENCES:

1. Lutwak, Robert. “The Chip-scale Atomic Clock – Prototype Evaluation.” Proceedings of the 39th Annual Precise Time and Time Interval Meeting, Long Beach, California, November 2007, pp.269-290. https://www.ion.org/publications/abstract.cfm?articleID=10588
2. “SA.45s CSAC and RoHS CSAC Options 001 and 003.” Microchip, 2019. https://ww1.microchip.com/downloads/en/DeviceDoc/00002985.pdf
3. “HX5000 Standard Cell ASIC Platform.” Honeywell, May 2015. https://aerospace.honeywell.com/content/dam/aerobt/en/documents/learn/products/microelectronics/datasheet/HX5000-Datasheet.pdf
4. “OX-249 Space Qualified Oven Controlled Crystal Oscillator (OCXO).” Microchip, 4/6/2023. https://www.microchip.com/bin/mchp/product-ds.OX-249.pdf


KEYWORDS: Radiation-hardened Electronics; Super High Frequency; Radio Frequency; RF; Chip-scale Atomic Clock; Precision Timing; RF Modulation

TPOC-1: SSP SBIR POC

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N242-103 TITLE: Radiation-Hardened Quartz Oscillators

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Nuclear; Space Technology

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 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: Strategic Systems Programs (SSP) seeks to develop a radiation-hardened ultra-stable quartz oscillator.

DESCRIPTION: Ultra-stable, radiation-hardened (rad-hard) reference clocks have provided a stable and reliable clock signal for integrating system sensor data and calculating position with high accuracy. Quartz crystal oscillators have been shown to offer exceptional stability performance. Commercially-available, space-qualified quartz crystal oscillators demonstrate short-term fractional frequency drifts as low as 1E-12 at 1 second and sub-ppb drifts over short times. Additionally, they have been shown to be tolerant of radiation levels encountered in space applications, demonstrating sub-ppm fractional frequency shifts for 100 kRad total ionizing doses (TID).

The purpose of this SBIR topic is to develop quartz oscillators with radiation hardness sufficient for strategic applications. The strategic environment is harsher than the space environment, so designs must have decreased sensitivity to radiation effects. This will require higher purity quartz and new electronics designs specific to the target applications.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain at least a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and SSP 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: Conduct an initial study to understand radiation environments, the impact of this environment on quartz crystal oscillators, and production methods that mitigate this impact [Refs 1,2]. Production considerations include, but are not limited to, high-purity crystal growth, crystal purification by sweeping, crystal cut, overtone selection, pre-aging irradiation, and plating. The Phase I Option, if exercised, will include the initial design specifications and description to build a prototype solution in Phase II.

PHASE II: Grow and/or acquire high-purity quartz. Process the quartz and the oscillator. Deliver five (5) prototypes based on the design developed in Phase I. Evaluate oscillator performance against specifications defined in Phase I. The testing will include, but is not limited to, frequency instability, drift, and aging. Radiation testing and evaluation will be performed by a third party arranged by SSP. The prototypes shall be delivered by the end of Phase II.

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: Many military, commercial, and scientific systems that operate in harsh environments depend critically on timing stability. Space radiation effects impact systems such as communication and navigation satellites. Systems operating in adverse environments in and around nuclear reactors and particle accelerators also require a degree of radiation hardness. Improving radiation hardness of crystal oscillators for strategic applications will also benefit these non-military applications through improved reliability and lifetime of timing components and may reduce size, weight, and power (SWaP) and system costs through relaxation of radiation shielding requirements. Package the rad-hard quartz crystal oscillator to meet additional requirements for environmental tolerance, including insensitivity to temperature changes and mechanical stresses.

REFERENCES:

1. Snowden, D.P., et al. “Study of Radiation-Hardened Quartz Production Processes.” Internal report, IRT Corporation in support of RADCDNA Program, Defense Technical Information Center Accession Number ADA048264, 1977. https://apps.dtic.mil/sti/citations/tr/ADA048264
2. Bahadur, H. and Parshad, R. “Some New Results on Irradiation Characteristics of Synthetic Quartz Crystals and their Application to Radiation Hardening.” NASA. Goddard Space Flight Center Proc. Of the 14th Ann. Precise Time and Time Interval Appl. Planning Meeting. 1983. https://ntrs.nasa.gov/citations/19830027108


KEYWORDS: Quartz oscillator; crystal oscillator; radiation-hardening; red-hard; ultra-pure quartz; synthetic quartz; swept quartz


TPOC-1: SSP SBIR POC
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N242-104 TITLE: Fast 1-to-N Polarization Maintaining Fiber Optical Switches for the Near Infrared (NIR)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Quantum Science; Space Technology

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 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 technology that allows for near-infrared (NIR) light in a fiber waveguide to be rapidly and efficiently directed along one of many fiber waveguides in nanosecond scale time periods.

DESCRIPTION: Atomic accelerometers are important elements of advanced inertial navigation and timing systems. In recent years, there has been significant effort to reduce the size, weight, and power (SWaP) of various subsystems. One challenge of miniaturizing these sensors is precisely delivering the pulse sequence emanating from a single optical source to the multiple optical axes of a sensor.

Appropriate pulse shapes require nanosecond switching speeds, and avoiding unwanted atomic transitions requires high extinction ratios. These are currently achievable in bulk acousto-optic crystals. Currently, fiber switches can be found based on mechanical, Micro-Electromechanical Systems (MEMS), and solid-state approaches [Refs 1, 2]; however, none meet all requirements simultaneously.

The objective of this SBIR topic is to develop a compact NIR 1-N port fiber optic switch suitable for pulse shaping and switchyard roles in an atomic interferometer. This will replace the bulk acousto-optics or multiple laser sources currently used to achieve the same result, resulting in drastically reduced size and complexity. To meet the pulse shape role the switch must have rise and fall times on the order of nanoseconds and be capable of MHz repetition rates. To meet the switchyard role it must have high reliability, low insertion loss, ultra-low crosstalk, and at least four ports.

Technical requirements for 1-N port switch are:
• Operating wavelength: 780 nm [threshold], devices compatible (not necessarily tunable) with 400-900 nm [objective]
• Fiber type: Polarization maintaining
• Crosstalk / extinction ratio: > 20 dB [threshold], > 30 dB [objective]
• Rise and fall time: < 50 ns [threshold], < 20 ns [objective]
• Insertion loss: < 6 dB [threshold], < 3 dB [objective]
• Switching time: < 1 µs [threshold], < 0.1 µs [objective]
• Number of ports: 4 [threshold], 6 [objective]
• Optical power handling (at device input): > 100 mW [threshold], > 500 mW [objective]
• Electrical power draw: < 1 W [threshold], < 100 mW [objective]

PHASE I: Perform a design and materials study to assess the feasibility of the selected technology and its ability to meet the goals above. The final report will include
• A discussion of how the technological approach will satisfy the requirements of the ultra-fast NIR optical switch.

• An evaluation of the technology's SWaP for the component that would be built in Phase II.
• A discussion of the fabrication process including an assessment of risks and risk mitigation strategies.
• A discussion of whether the proposed technology is compatible with integration onto a photonic integrated circuit (this is not a requirement).
The Phase I Option, if exercised, will include the initial design specifications and description to build a prototype solution in Phase II.

PHASE II: Fabricate, test, and deliver three (3) prototypes of the design developed in Phase I. The completed prototypes shall be tested against the performance goals listed above. The final report shall include an assessment of potential near-term and long-term development efforts that would improve the technology's technical performance, SWaP, and ease of fabrication. It shall also include an evaluation of the cost of fabrication and how that might be reduced in the future. The prototypes shall be delivered by the end of Phase II.

PHASE III DUAL USE APPLICATIONS: Based on the prototypes developed in Phase II, continue development towards a production run of the 1-N port fiber switch.

In addition to advancing a quantum sensing capability for military/strategic applications, this technology has applications in the telecom industry, Light Detection and Ranging (LIDAR) systems, and future quantum network infrastructure.

REFERENCES:

1. Templier, S., et al. "Carrier-suppressed multiple-single-sideband laser source for atom cooling and interferometry." Physical Review Applied 16.4 (2021): 044018. https://journals.aps.org/prapplied/abstract/10.1103/PhysRevApplied.16.044018
2. K. F. Lee and G. S. Kanter. "Low-Loss High-Speed C-Band Fiber-Optic Switch Suitable for Quantum Signals." IEEE Photonics Technology Letters, vol. 31, no. 9, 1 May 2019, pp. 705-708,. doi: 10.1109/LPT.2019.2905593. https://ieeexplore.ieee.org/abstract/document/8668492


KEYWORDS: fiber optic, switch; near infrared; NIR; inertial sensors; atomic clocks; atomic accelerometers

TPOC-1: SSP SBIR POC
Email: ssp.sbir@ssp.navy.mil

# DEPARTMENT OF THE NAVY (DoN)
# 24.2 Small Business Innovation Research (SBIR)
# Direct to Phase II (DP2) Announcement and Proposal Submission Instructions

## IMPORTANT

- **The following instructions apply to Direct to Phase II (DP2) SBIR topic only:**
  - **N242-D05 through N242-D12**

- Submitting small business concerns are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic changes.
  - The DoD Program BAA is located at: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements. Select the tab for the appropriate BAA cycle.
  - Review the Attachments of the DoD Program BAA and ensure the correct versions of the following MANDATORY items are uploaded to the Supporting Documents, Volume 5:
    - Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Attachment 1)
    - Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Attachment 2)
  - Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

- The information provided in the DoN Proposal Submission Instruction document takes precedence over the DoD Instructions posted for this Broad Agency Announcement (BAA).

- A submitting small business concern **MUST** use the DP2 Phase I Feasibility proposal template for Volume 2. This template is specific to DoN DP2 topics and meets DP2 submission requirements. The DP2 Phase I Feasibility proposal template can be found at https://navysbir.com/links_forms.htm.

- Proposing small business concerns 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 proposing small business concerns are detailed in the section titled ADDITIONAL SUBMISSION CONSIDERATIONS.

- DoN provides notice that Basic Ordering Agreements (BOAs) or Other Transaction Agreements (OTAs) may be used for Phase II awards.

- This BAA is issued under regulations set forth in Federal Acquisition Regulation (FAR) 35.016 and awards will be made under “other competitive procedures”. The policies and procedures of FAR Subpart 15.3 shall not apply to this BAA, except as specifically referenced in it. All procedures are at the sole discretion of the Government as set forth in this BAA. Submission of a proposal in response to this BAA constitutes the express acknowledgement to that effect by the proposing small business concern.

## 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 Department of Defense (DoD), including the Department of the Navy (DoN), may issue an SBIR award to a small business concern under Phase II , without regard to whether the small business concern received a Phase I award for such project. Prior to such an award, the head of the agency, or their designee, must issue a written determination that the small business concern has demonstrated the scientific and technical merit and feasibility of the technology solution that appears to have commercial potential (for use by the government or in the public sector). The determination must be submitted to the Small Business Administration (SBA) prior to issuing the Phase II award. As such, DoN issues this portion of the BAA in accordance with the requirements of the Direct to Phase II (DP2) authority. Only those proposing small business concerns that are capable of meeting the DP2 proposal requirements may participate in this DP2 BAA. No Phase I awards will be issued to the designated DP2 topic.

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 | DoN SBIR/STTR Program Management Office usn.pentagon.cnr-arlington-va.mbx.navy-sbir-sttr@us.navy.mil or appropriate Program Manager listed 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)<br>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 | DSIP Support via email at dodsbirsupport@reisystems.com |
| Navy-specific BAA instructions and forms | Always | DoN SBIR/STTR Program Management Office usn.pentagon.cnr-arlington-va.mbx.navy-sbir-sttr@us.navy.mil |

**TABLE 2: DoN SYSTEMS COMMAND (SYSCOM) SBIR PROGRAM MANAGERS**

| Topic Numbers | Point of Contact | SYSCOM | Email |
|---|---|---|---|
| N242-D05 to N242-D10 | Ms. Kristi DePriest | Naval Air Systems Command (NAVAIR) | navair-sbir@us.navy.mil |
| N242-D11 | Mr. Jason Schroepfer | Naval Sea Systems Command (NAVSEA) | NSSC_SBIR.fct@navy.mil |
| N242-D12 | Mr. Jon M. Aspinwall III (Acting) | Strategic Systems Programs (SSP) | ssp.sbir@ssp.navy.mil |

Each DoN SBIR DP2 topic requires documentation to determine that Phase I feasibility, described in the Phase I section of the topic, has been met.

The DoN SBIR DP2 is a two-step process:

STEP ONE: Prepare and Submit a Phase I Feasibility Proposal (instructions and link to template provided below). The purpose of the Phase I Feasibility Proposal is for the proposing small business concern to provide documentation to substantiate that both Phase I feasibility and the scientific and technical merit described in the topic have been met. The Phase I Feasibility Proposal must: demonstrate that the proposing small business concern performed Phase I-type research and development (R&D) and provide a concise summary of Phase II objectives, work plan, related research, key personnel, transition/commercialization plan, and estimated costs. Feasibility documentation MUST NOT be solely based on work performed under prior or ongoing federally funded SBIR/STTR work. The government will evaluate Phase I Feasibility Proposals and select small business concerns to submit a Full DP2 Proposal. Demonstrating proof of feasibility is a requirement for a DP2 award. The small business concern must submit a Phase I Feasibility Proposal to be considered for selection to submit a Full DP2 Proposal.

STEP TWO: If selected, the cognizant SYSCOM Program Office will contact the small business concern directly to provide instructions on how to submit a Full DP2 Proposal.

DoN SBIR reserves the right to make no awards under this DP2 BAA. All awards are subject to availability of funds and successful negotiations. Proposing small business concerns must read the topic requirements carefully. The Government is not responsible for expenditures by the proposing small business concern prior to award of a contract. For 24.2 topics designated as DP2, DoN will accept only Phase I Feasibility Proposals (described below).

## DP2 PROPOSAL SUBMISSION REQUIREMENTS

The following section details requirements for submitting a compliant DoN SBIR DP2 Proposal to the DoD SBIR/STTR Programs.

(NOTE: Proposing small business concerns 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).** Proposing small business concerns 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. Proposing small business concerns submitting through DSIP for the first time will be asked to register. It is recommended that proposing small business concerns 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. Proposals that are encrypted, password protected, or otherwise locked in any portion of the submission will be REJECTED unless specifically directed within the text of the topic to which you are submitting. Please refer to the DoD SBIR/STTR Program BAA for further information.

**Eligibility.** Each proposing small business concern must:

- Have demonstrated feasibility of Phase I-type R&D work
- Have submitted a Phase I Feasibility Proposal for evaluation
- Meet Offeror Eligibility and Performance Requirements as defined in the Proposal Fundamentals section of the DoD SBIR/STTR Program BAA
- Comply with primary employment requirements of the principal investigator (PI) during the Phase II award including, employment with the small business concern at the time of award and during the conduct of the proposed project. Primary employment means that more than one-half of the PI's time is spent in the employ of the small business concern
- Register in the System for Award Management (SAM) as defined in the Proposal Fundamentals section of the DoD SBIR/STTR Program BAA. To register, visit https://sam.gov/

**Proposal Volumes.** The following six volumes are required.

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

- **Technical Volume (Volume 2).**
  - Technical Proposal (Volume 2) must meet the following requirements or the proposal will be REJECTED:
    - — A submitting small business concern MUST use the DP2 Phase I Feasibility proposal template for Volume 2. The DP2 Phase I Feasibility proposal template can be found at https://navysbir.com/links_forms.htm.
      This template is specific to DoN DP2 topics and meets DP2 submission requirements:
      - ☐ Not to exceed 30 pages, regardless of page content; Phase I Proof of Feasibility portion not to exceed 20 pages, Snapshot of Proposed Phase II Effort portion not to exceed 10 pages
      - ☐ 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

  - Additional information:
    - — A font size smaller than 10-point is allowable for headers, footers, imbedded tables, figures, images, or graphics that include text. However, proposing small business concerns are cautioned that if the text is too small to be legible it will not be evaluated.

- **Cost Volume (Volume 3).** The text fields related to costs for the proposed effort must be answered in the Cost Volume of the DoD Submission system (at https://www.dodsbirsttr.mil/submissions/), however, proposing small business concerns DO NOT need to download and complete the separate cost volume template when submitting the DoN SBIR Phase I Feasibility Proposal. Proposing small business concerns are to include a cost estimate in the Order of Magnitude Cost Estimate Table (example below) within the Snapshot of Proposed Phase II Effort portion of the Technical Volume (Volume 2). Please refer to Table 3 below for guidance on cost and period of performance. Costs for the Base and Option are to be separate and identified on the Proposal Cover Sheet and in the Order of Magnitude Cost Estimate Table in the Technical Volume (Volume 2).

| **Order of Magnitude Cost Estimate Table** | | | |
|---|---|---|---|
| **Line Item – Details** | **Estimated Base Amount** | **Estimated Option Amount** | **Total Estimated Amount Base + Option** |
| Direct Labor (fully burdened) – Prime | | | |
| Subcontractors/Consultants | | | |
| Material | | | |
| Travel & ODC | | | |
| G&A | | | |
| FCCM | | | |
| Fee/Profit | | | |
| TABA (NTE $25K, included in total amount) | | | |
| Total Estimated Costs | | | |

**TABLE 3: COST & PERIOD OF PERFORMANCE**

| **Topic Number** | **Base** | | **Option** | | **Total (NTE)** |
|---|---|---|---|---|---|
| | **Cost (NTE)** | **POP (NTE)** | **Cost (NTE)** | **POP (NTE)** | |
| N242-D05 to N242-D10 | $1,000,000 | 30 mos. | $300,000 | 12 mos. | $1,300,000 |
| N242-D11 | $700,000 | 12 mos. | $1,300,000* | 24 mos.* | $2,000,000* |
| N242-D12 | $900,000 | 18 mos. | $300,000 | 6 mos. | $1,200,000 |

***** Step Two: for the Full Phase II submission, if selected, N242-D11 will require the Phase II Option 1 and Phase II Option 2 to be detailed separately:

- Phase II Option 1: Cost $700,000, Period of Performance 12 months
- Phase II Option 2: Cost $600,000, Period of Performance 12 months

- Additional information:

  For Phase II a minimum of 50% of the work is performed by the proposing small business concern. The percentage of work requirement must be met in the Base costs as well as in the Option costs. The percentage of work is measured by both direct and indirect costs. To calculate the minimum percentage of work for the proposing small business concern the sum of all direct and indirect costs attributable to the proposing small business concern represent the numerator and the total cost of the proposal (i.e., Total Cost before Profit Rate is applied) is the denominator. The subcontractor percentage is calculated by taking

the sum of all costs attributable to the subcontractor as the numerator and the total cost of the proposal (i.e., Total Cost before Profit Rate is applied) as the denominator. **NOTE:** G&A, if proposed, will only be attributed to the proposing small business concern.
- 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.

- **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 proposing small business concerns must review and submit the following items, as applicable:
  - **Telecommunications Equipment Certification.** Required for all proposing small business concerns. 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 proposing small business concerns 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.
  - **Disclosures of Foreign Affiliations or Relationships to Foreign Countries.** Each proposing small business concern is required to complete Attachment 2 of this BAA, "Disclosures of Foreign Affiliations or Relationships to Foreign Countries" and upload the form to Volume 5, Supporting Documents. Please refer to the following sections of the DoD SBIR/STTR Program BAA for details:
    - Program Description
    - Proposal Fundamentals
    - Phase I Proposal
    - Attachment 2
  - **Majority Ownership in Part.** Proposing small business concerns 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:
  - Proposing small business concerns 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 proposing small business concern 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
  - Details of Request for Discretionary Technical and Business Assistance (TABA), if proposed, is to be included under the Additional Cost Information section if using the DoN Supporting Documents template.
  - 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, proposing small business concerns 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.

## DP2 EVALUATION AND SELECTION

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

Proposals meeting DSIP submission requirements will be forwarded to the DoN SBIR/STTR Programs. Prior to evaluation, all proposals will undergo a compliance review to verify compliance with DoD and DoN SBIR/STTR proposal eligibility requirements. Proposals not meeting submission requirements will be REJECTED and not evaluated.

- **Proposal Cover Sheet (Volume 1).** The Proposal Cover Sheet (Volume 1) will undergo a compliance review to verify the proposing small business concern has met eligibility requirements and followed the instructions for Proposal Cover Sheet as specified in the DoD SBIR/STTR Program BAA.

- **Technical Volume (Volume 2).** The DoN will evaluate and select Phase I Feasibility 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. The information considered for this decision will come from Volume 2. This is not a FAR Part 15 evaluation and proposals will not be compared to one another. Cost is not an evaluation criterion and will not be considered during the evaluation process; the DoN will only do a compliance review of Volume 3. 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 (prior to evaluation) to verify the proposing small business concern has met the following requirements or the proposal will be REJECTED:

- A submitting small business concern MUST use the DP2 Phase I Feasibility proposal template for Volume 2. The DP2 Phase I Feasibility proposal template can be found at https://navysbir.com/links_forms.htm.
  This template is specific to DoN DP2 topics and meets DP2 submission requirements:
  - Not to exceed 30 pages, regardless of page content; Phase I Proof of Feasibility portion not to exceed 20 pages, Snapshot of Proposed Phase II Effort portion not to exceed 10 pages
  - 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.

- **Cost Volume (Volume 3).** The Cost Volume (Volume 3) will not be considered in the selection process and will undergo a compliance review to verify the proposing small business concern has met the following requirements or the proposal will be REJECTED:
  - Must not exceed values for the Base and Option (refer to Table 3).
  - Must meet minimum percentage of work; a minimum of 50% of the work is performed by the proposing small business concern. The percentage of work requirement must be met in the Base costs as well as in the Option costs.

- **Company Commercialization Report (Volume 4).** The CCR (Volume 4) will not be evaluated by the Navy nor will it be considered in the Navy’s award decision. However, all proposing small business concerns must refer to the DoD SBIR/STTR Program BAA to ensure compliance with DSIP Volume 4 requirements.

- **Supporting Documents (Volume 5).** Supporting Documents (Volume 5) will not be considered in the selection process and will only undergo a compliance review to ensure the proposing small business concern has included items in accordance with the DP2 SUBMISSION INSTRUCTIONS section above.

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

## ADDITIONAL SUBMISSION CONSIDERATIONS

This section details additional items for proposing small business concerns to consider during proposal preparation and submission process.

**Due Diligence Program to Assess Security Risks.** The SBIR and STTR Extension Act of 2022 (Pub. L. 117-183) requires the Department of Defense, in coordination with the Small Business Administration, to establish and implement a due diligence program to assess security risks presented by small business concerns seeking a Federally funded award. Please review the Program Description section of the DoD SBIR/STTR Program BAA for details on how DoD will assess security risks presented by small business concerns. The Due Diligence Program to Assess Security Risks will be implemented for all Phases.

**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. Proposing small business concerns may request, in their Cost Volume (Volume 3), to contract these services themselves through one or more TABA providers in an amount not to exceed the values specified below. 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 $2,000,000 or lower limit specified by the SYSCOM). The amount proposed for TABA cannot include any profit/fee by the proposing small business concern and must be inclusive of all applicable indirect costs. TABA cannot be used in the calculation of general and administrative expenses (G&A) for the SBIR proposing small business concern. 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 (to include the purpose and objective of the assistance)
- Total TABA provider(s) cost, number of hours, and labor rates (average/blended rate is acceptable)

TABA must <u>NOT</u>:
- Be subject to any indirect costs, profit, or fee by the SBIR proposing small business concern
- Propose a TABA provider that is the SBIR proposing small business concern
- Propose a TABA provider that is an affiliate of the SBIR proposing small business concern
- Propose a TABA provider that is an investor of the SBIR proposing small business concern
- Propose a TABA provider that is a subcontractor or consultant of the requesting small business concern 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 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 “TABA” in the section titled Additional Cost Information when using the DoN Supporting Documents template.

Proposed values for TABA must <u>NOT</u> exceed:
- Phase II: A total of $25,000 per award, not to exceed $50,000 per Phase II project

If a proposing small business concern requests and is awarded TABA in a Phase II contract, the proposing small business concern 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 participate in the virtual Navy STP Kickoff during the first or second year of the Phase II contract. While there are no travel costs associated with this virtual event, Phase II awardees should budget time of up to a full day to participate. STP information can be obtained at: https://navystp.com. Phase II awardees will be contacted separately regarding this program.

**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 proposing small business concern 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 small business concern 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 as a separate PDF file to the Supporting Documents (Volume 5) in DSIP 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.** Proposing small business concerns 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 proposing small business concerns 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, proposing small business concerns must register with the SBA Company Registry Database.
b. The proposing small business concern 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 proposing small business concern become a member of this ownership class after submitting its proposal and prior to any receipt of a funding agreement, the proposing small business concern 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 proposing small business concerns 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, proposing small business concerns should confirm that they are registered to receive contracts (not just grants) and the address in SAM matches the address on the proposal. A small business concern selected for an award MUST have an active SAM registration at the time of award or they will be considered ineligible.

**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 small business concern 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.** If the use of human, animal, and recombinant DNA is included under a DP2 proposal, please carefully review the requirements at: https://www.nre.navy.mil/work-with-us/how-to-apply/compliance-and-protections/research-protections. This webpage provides guidance and lists approvals that may be required before contract/work can begin.

**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 proposal of the proposing small business concerns 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.** Interested parties have the right to protest in accordance with the procedures in FAR Subpart 33.1.

Pre-award agency protests related to the terms of the BAA must be served to: osd.ncr.ousd-r-e.mbx.SBIR-STTR-Protest@mail.mil. A copy of a pre-award Government Accountability Office (GAO) protest must also be filed with the aforementioned email address within one day of filing with the GAO.

Protests related to a selection or award decision should be filed with the appropriate Contracting Officer for an Agency Level Protest or with the GAO. Contracting Officer contact information for specific DoN Topics may be obtained from the DoN SYSCOM Program Managers listed in Table 2 above. For protests filed with the GAO, a copy of the protest must be submitted to the appropriate DoN SYSCOM Program Manager and the appropriate Contracting Officer within one day of filing with the GAO.

**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 the proposing small business concern, and to take other relevant steps necessary prior to making an award.

**Contract Types**. 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.

**Contract Deliverables.** Contract deliverables are typically progress reports and final reports. Required contract deliverables must be uploaded to https://www.navysbirprogram.com/navydeliverables/.

**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 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.

## Navy SBIR 24.2 Direct to Phase II Topic Index

N242-D05 TITLE: DIRECT TO PHASE II: F7-Wideband Acoustic Receiver and Source (F7-WARS) Sonobuoy

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Network Systems-of-Systems; Integrated Sensing and Cyber

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 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 an updated, evolved air-deployable receiver with a compatible source that can characterize the acoustic ocean environment in the F7 Low Frequency range and builds upon previous successful designs. The system will be deployed from Navy Maritime Patrol and Reconnaissance Aircraft, have capability across multiple operational environments, and utilize the necessarily varied hardware configurations, active and passive processing, and frequency characteristics to consistently attain key anti-submarine warfare (ASW) measurements.

DESCRIPTION: The capabilities of current Low Frequency F7 receiver/source sensors do not provide calibrated coherent receiver/source combination tailored for environmental characterization or advanced passive processing. Innovative sensor technologies are sought with enhanced electromechanical property ceramics that fill frequency, bandwidth, and responsiveness gaps for the transmitter and receiver elements that are capable of transmitting, collecting, and processing surveillance information. Enhanced signal processing techniques for both active and passive processing can enable improvements in capabilities within the entire Low Frequency acoustics band. There is a need within the Navy, and other DoD agencies, to characterize the ocean environment for pre-mission planning, environmental analysis, and marine mammal mitigation during training and operational trials, as well as achieve key ASW measurement capabilities at Low Frequency. Variations in acoustic frequencies necessitate changes in hardware configurations, acoustic propagation, and advanced signal processing capabilities. Advanced passive and active processing capabilities will need to be developed to achieve these measurements. Tactical needs and munition transport capabilities make it difficult to meet all intelligence and mission planning requirements with existing hardware. Additionally, scenario characteristics such as transmission loss, bottom loss, reverberation, geo-acoustic characterization, obscuration, clutter, multipath, signal detection, and signal type vary with changes in acoustic frequency and may limit the performance of current intelligence gathering systems without the capability to gather and exfiltrate the information. System solutions should include both single unit concepts, paired source and receivers, as well as analysis into the feasibility of combined units and mission planning considerations.

The unit should be capable of both shallow and deep-water operations deploying the active and passive sensing elements through 500 ft (152.4 m) with both mission operating life and extended duration capability. Enhancements in passive processing should provide for significantly improved minimal detection levels. Coherent signals of interest are in the Low Frequency range, to include but not be limited to continuous waveforms (CW) and frequency modulation (FM) waveforms, with associated active processing improvements. The unit will also take advantage of the communication between the aircraft and sensor unit. This should be compliant with the NATO digital uplink format, STANAG 4718.

This expendable sensor solution should be low power and sized to fit within an A-size sonobuoy. A-size sonobuoy standards are as follows: dimensions of 4.875 in. (12.38 cm) diameter x 36 in. (91.44 cm) length and weight of 40 lb (18.14 kg) or less.

PHASE I: For a Direct to Phase II topic, the Government expects that the small business would have accomplished the following in a Phase I-type effort and developed a concept for a workable prototype or design to address, at a minimum, the basic requirements of the stated objective above. The below actions would be required to satisfy the requirements of Phase I:
1. Provide evidence of prior successful development, testing, or deployment in a relevant domain. The system should clearly demonstrate readiness for integration with Navy Maritime Patrol and Reconnaissance Aircraft. Furthermore, the proposal must emphasize the system's capability for uninterrupted operation across varied oceanic environments, underpinned by documented results or prototypes, which have effectively captured essential ASW measurements. Prior success in addressing similar challenges will be heavily weighted in evaluation.
2. Provide an intelligible forward plan that minimizes risk and redesign efforts by identifying and incorporating existing ASW technologies. While a combined source and receiver is ideal, solutions separating the source from the F7 receiver will be considered so long as the tradeoffs are clear.
3. Modeling and/or results of risk reduction experiments that validate the existing concept along with the expected application at a new frequency to be provided.

FEASIBILITY DOCUMENTATION: Offerors interested in participating in Direct to Phase II must include in their response 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 Phase I-type research and development related to the topic NOT solely based on work performed under prior or ongoing federally funded SBIR/STTR work) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology as stated in the Phase I above.

PHASE II: Develop and fabricate an over-the-side prototype unit(s) operating in the F7 Low Frequency range and demonstrate in both acoustic facilities and the ocean environment. Prototype demonstrations will demonstrate successful completion of classified objectives (how the objectives are defined). Throughout this development phase, emphasize a comprehensive evaluation of the prototype’s performance under high-ambient and low-source level conditions, ensuring its adaptability and resilience in diverse acoustic settings. Collaborate with similarly focused domain experts and utilize feedback from preliminary tests to further refine and optimize the system at Low Frequency. Finalize the concept design and make recommendations for Phase III production-oriented designs, detailing potential challenges and solutions for scalable manufacturing. Explore integration pathways with existing Navy Maritime Patrol and Reconnaissance infrastructure to maximize system collaboration. Demonstrate the prototype’s ability to attain desirable ASW measurement capabilities at Low Frequency and provide a roadmap for iterative improvements and integration based on feedback.

PHASE III DUAL USE APPLICATIONS: Transition over-the-side prototype unit(s) into an air deployable sonobuoy system. Sensor must meet A-size packaging requirements specified in the PMA-264 Production Sonobuoy Specification. Testing will be required which verifies the sensor passes all required environmental, structural, and operational tests. These tests include but not limited to Environmental Exposure, Air Certification, Hazards of Electromagnetic Radiation to Ordnance (HERO), and Office of Naval Intelligence (ONI) certification.

Upon successful testing, Low Rate Initial Production (LRIP) will need to be successful for transition to the platform.

This technology/topic can benefit any entity that requires calibrated active target strength measurements within the underwater environment.

REFERENCES:

1. Urick, R. J. "Principles of underwater sound for engineers (3rd ed.)." Peninsula Publishing, 1983. https://www.worldcat.org/title/8688952
2. Holler, R. A.; Horbach, A. W. and McEachern, J. F. "The ears of air ASW: a history of US Navy sonobuoys." Navmar Applied Sciences Corporation, 2008. https://www.worldcat.org/title/720627294
3. "Standardization agreement: STANAG 4718: Sonobuoy digital telemetry (Ed. 1)." North Atlantic Treaty Organization, The NATO Standardization Office (NSO), 4 November 2020. https://nso.nato.int/nso/nsdd/main/standards?search=471

KEYWORDS: Anti-Submarine Warfare; Sonobuoy; Low Frequency; Navy Underwater Active Multiple Ping; NUAMP; Acoustics; Intelligence

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N242-D06 TITLE: DIRECT TO PHASE II: Low-Cost Ground Testing for Rotating Detonation Concepts

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Hypersonics; Space Technology

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 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: Demonstrate a rapid, repeatable, low-cost ground testing solution for rotating detonation engines and combustors to mature candidate propellants and fuels from TRL 2–5.

DESCRIPTION: Hypersonic operating environments are particularly challenging environments to simulate. Often testing approaches are limited to a subset of the representative environment for short durations, and extrapolation is challenging [Ref 1]. Expense and access to current testing facilities limit capacity to capture relevant data and increase schedule timelines for development. This further exacerbates the challenge of predicting design behavior for materials, components, and system performance. The Navy requires a solution to meet the growing cadence of investment in hypersonic weapons technology by near-peers [Refs 2–4]. A low-cost ground testing solution will spark a leap forward by enabling engineers and scientists to quickly verify and validate assumptions.

The Rotating Detonation Engine (RDE), a specific implementation of the detonation process, appears as a promising candidate to replace current constant-pressure combustion systems, due to its high-thermal efficiency, wide-operating Mach range, short combustion time, and small volume. There has been a significant increase in laboratory demonstrators with different fuels, injection techniques, operating conditions, dimensions, and geometric configurations. Rocket RDEs have been reported and demonstrated in Japan and Poland [Ref 5]. Understanding the fundamentals of detonation dynamics and interrelated optimizations of device components are critical to demonstrating a promising system.

The Navy requires a rapid, repeatable setup/instrumentation, including standard interface architecture. The flowfield in the hypersonic regime is dominated by certain physical phenomena. Accurate modeling of hypersonic flow requires challenging test campaigns that may not capture the entire flight regime. The complex aerodynamic and aerothermal requirements make adequate test-section size and duration essential for reliable results and model validation [Ref 6]. There is a desire to allow for efficient combination of test data between other facilities, including large test and evaluation facilities currently being constructed [Ref 7]. This Direct to Phase II effort will consist of a 12 month design and prototype fabrication. The Phase II option, if exercised, will install and commission the ground test capability at Naval Air Warfare Center Weapons Division (NAWCWD).

Related S&T efforts in this area are measurement techniques to characterize detonation structure, injection dynamics, mixing characterization, flowfield velocity, and so forth. Additionally, research into surrogate models making use of sparse experimental data sets to predict performance over the system operational map explore the gap this solution is expected to fill by providing additional data to these sparse models. Some of these efforts include [Refs 8–11].

This rapid low-cost ground test solution will:
1. demonstrate test durations of 0.5–3 s (threshold) after achieving steady-state:
   (a) at this time, it is believed that a realistic time to reach operating conditions will take 5–20 s with a vitiated heater (using a hot-gas divert valve) prior to combustion initiation. An electric heater may be used. The vitiated heater time to reach operating conditions is included as an example of current understanding and,
   (b) a threshold of 30 min between each change in system configuration is expected. It is desired to reach an objective of 15 min from test stop, system change (including air-supply or oxidizer changes, a different injector installation, etc.), and ready to conduct the next test.
      i. If the fuel lot or fuel composition has changed, a larger duration than 30 min is expected.
2. constrain the test section geometrically to fit within a 10 ft (3.05 m) length by 10 ft (3.05 m) width by 10 ft (3.05 m) height volume. Supporting hardware, including torches, electric heaters, air compressors and surge tanks, are not included within the volume constraint,
   (a) an existing facility has been identified for installation and the volume constraint is intended to protect facility, operators, and transients, and
   (b) plume length is not included in the volume constraint, and
3. additional ability to modify test section geometry during testing would be seen positively.

The test solution will be designed with the experimenter in mind. NAWCWD scientists and engineers should be able to instrument the prototype with sufficient measurement capability to inform validation efforts and future effort expenditures on air-breathing rotating detonation engines. Some of the objective measurement capability desires include:
1. providing high-speed pressure (including dynamic) axially and radially over the combustor at a threshold sampling frequency of 1-MHz,
2. providing temperature profiles axially and radially over the combustor
3. load sensor(s) allowing for uninstalled thrust performance measurements, and
4. high-speed video of an optically accessible chamber. The final frame rate will be dependent upon the optical parameters selected to observe the combustion phenomena,
   (a) Velocimetry measurements of the flowfield are desired. Ref 11 presents an ideal setup allowing validation of CFD predictions of the flowfield measurements.
5. high-speed chemiluminescence, particularly of OH* for hydrogen, is widely used because it allows for flowfield investigation, detonation height, wave number, and their associated effects on detonation, including entrainment of hot gasses or saturation,
6. shadowgraph/schlieren capability, and
7. laser absorption spectroscopy and/or FTIR at the injection sites and adjustable to capture a representative area in the combustor.
   (a) Time-resolved measurements of at least $H_2O$, $CO_2$, and CO concentrations.

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Cost-savings (i.e., low cost) is expected from the rapid cadence this system will provide, including its long duration.

PHASE I: For a Direct to Phase II topic, the Government expects that the small business would have accomplished the following in a Phase I-type effort and developed a concept for a workable prototype or design to address, at a minimum, the basic requirements of the stated objective above. The below actions would be required to satisfy the requirements of Phase I:
Design, development, and demonstration of a Preliminary Design of the ground-testing solution will provide solutions for different injection methods, different states (solid, liquid, or gaseous) propellants and fuels, along with associated calculations for safe operation, thrust measurement, and instrumentation.

The solution must be designed for interoperability and low life-cycle costs. Subcomponent testing is encouraged. Prototype design and manufacturing plans with estimated cost, including options, should be presented.

FEASIBILITY DOCUMENTATION: Offerors interested in participating in Direct to Phase II must include in their response 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 Phase I-type research and development related to the topic NOT solely based on work performed under prior or ongoing federally funded SBIR/STTR 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.

PHASE II: Development, fabrication, and verification of a prototype will be demonstrated during the 12 month period for Direct to Phase II. Instrument integration of government-furnished equipment (GFE) will occur prior to testing. Verification testing and prototype acceptance will occur at NAWCWD. Verification will occur via demonstrating retrofit/modification not to exceed one working day to test a solid and liquid fuel and two different injectors (i.e., four tests, two per fuel, in one working day). This verification is not to include data analysis from the test. The system must be fabricated with diagnostic data capture and performance data in mind. The system will be validated by demonstrating sufficient measurement capability to prove and/or disprove computational models of the performed tests.

PHASE III DUAL USE APPLICATIONS: If the Phase II option was not exercised, install and commission the ground test capability at NAWCWD. Additional instrumentation integration of GFE will be a consideration.

The commercial potential of this device lies in the component fabrication and potential secondary applications. The awardee selected contractor will be able to manufacture rotating detonation combustor hardware, and use lessons learned in combustion diagnostic system integration for future advanced propulsion efforts. This system could be used across a broad range of aerospace applications. The low-cost ground-testing system is a product that will be desirable not only for propulsion, but energy production research and development efforts ongoing in RDEs by industry and government agencies, including NASA and Department of Energy.

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KEYWORDS: rotating detonation; detonation cells; injector design; propulsion; fuel; ground testing

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N242-D07 TITLE: DIRECT TO PHASE II: Development of Full Polarimetric Radar for Sea Surface Effects and Phenomenology

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Microelectronics; Space Technology

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 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 design concepts for full polarimetric (Horizontal, HH; Vertical, VV; Cross-Poles, HV/VH) Active Electronically Scanned Array (AESA) Software Defined Radio (SDR) Radar to span P-Band thru Ku-Band Spectrum (200 MHz-18 GHz).

DESCRIPTION: A specific Anti-Submarine Warfare (ASW) capability deficiency, plus parts obsolescence is recognized for the existing P-8A X-Band Radar as documented within the POM-25 Naval Aviation Requirements Group (NARG) report that lists the need to replace this system. Other mission and safety impacts have also been cited for this radar by the fleet. An element of the capability deficiency is because the existing radar has a single polarization that is not optimal for a specific type of target detection. The fleet needs full polarimetric radar (HH, VV, HV, VH) that will be optimal for a greater variety of target types and features. The fleet requires the development of an AESA SDR Radar made from state-of-the-art components that will be available for parts replacement long into the 21st Century. Beyond X-Band, the fleet needs an improved understanding of fundamental sea surface effects and phenomenology for all Radar Bands for Ku (~16 GHz), X (~9 GHz), L (~1.1 GHz), and P-Bands (~400 MHz). The plan will begin with the design, development, test, and evaluation of Ku and X-Band Radars as these are smaller, lighter, and lower cost than longer wavelength systems; followed by L-Band, and P-Band systems. This Direct to Phase II SBIR topic will develop a long-range development plan that will serve as a roadmap for naval aircraft radar systems for the next few decades.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVAIR 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: For a Direct to Phase II topic, the Government expects that the small business would be able to demonstrate experience in the development, test, processing, and/or analysis of full polarimetric Radar. Offerors should respond with documentation that verifies they have experience with understanding the science of full polarimetric effects and phenomenology plus engineering analysis to understand form factor impacts as system designs move through the radar spectrum.

FEASIBILITY DOCUMENTATION: Offerors interested in participating in Direct to Phase II must include in their response 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 Phase I-type research and development related to the topic NOT solely based on work performed under prior or ongoing federally funded SBIR/STTR 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.

PHASE II: Phase II design elements shall include Size, Weight, and Power, Cost factors (SWaPC) for airborne systems integrated to aircraft radomes, or pods. The large frequency range is likely to require separate amplifiers and antennas for the frequency ranges: Ku (~16 GHz), X (~9 GHz), L (~1.1 GHz), and P (~400 MHz). The X-Band Radar shall have weather, Plot Position Indicators (PPI) search, and Synthetic Aperture Radar (SAR) modes as this system may serve as a replacement for the existing P-8A Radar. Essential design elements shall include agile waveforms, and bi-static and interferometric collection and processing capabilities. A modular, plug-and-play hardware and software approach is favored. AESA technology will remove the need for waveguides and transmitters as 20th Century Radar technology components are getting very difficult to replace due to obsolescence issues. SDR technology will allow for agile waveforms from a range of center frequencies that will reduce ESM threat detection. Open-source hardware and SDR concepts will allow future vendors to modify or augment system capabilities without hardware changes. Provide practical concepts for flying a radar built to the concepts described above with a development and test plan to be utilized for the platforms. AESA SDR Radars may not exist for initial test flight operations. If this is the case, the developer shall perform test flights using full polarimetric radar systems as they exist at the time of initial test flight operations. Test flights shall include sea surface effects characterization, surface target object detection, Automated Target Detection (ATD), Moving Target Focus (MOTAR), and interferometric collection and processing for surface and undersea targets. Work in Phase II may become classified. Please see note in Description paragraph.

PHASE III DUAL USE APPLICATIONS: Deliver prototype radar systems to be integrated to naval surveillance air platforms with test and evaluation flights over relevant maritime environments. Full polarimetric radar has potential as an airborne, land use, and crop analysis sensor tool to support commercial industry to include agriculture, forestry, and urban planning.

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KEYWORDS: Synthetic; Aperture; Radar; Active Electronically Scanned Array; AESA; Software Defined Radio; SDR; surveillance

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N242-D08 TITLE: DIRECT TO PHASE II: Fiber-Optic Filter Integration

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Microelectronics; Sustainment

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 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: Design, fabricate, test, and integrate dichroic filters for use in digital avionics fiber-optic communication-link hardware and software in order to reduce the time and complexity for a properly trained maintainer to detect and isolate a failure and affect repair.

DESCRIPTION: The use of optical fiber on air, surface ship, and undersea platforms is pervasive, and is an enabling technology. Current military electronics, electro-optic, communications, radar, and electronic warfare systems require ever-increasing bandwidths, while simultaneously demanding reductions in space, weight, and power (SWAP). The effectiveness of these systems hinges on optical communication components that realize sufficient link budget, dynamic range, and compatibility with military surface ship, undersea platform, and aircraft maintenance environments. Future digital and analog/radio frequency (RF) signal transmission rates and frequencies have increased to the point where fiber optics is the only medium with the capacity and low loss for maintaining communication signal integrity. Key fiber-optic systems engineering design considerations include architecture (i.e., openness, modularity, scalability, and upgradeability), reliability, maintainability, and supportability. Maintainability and supportability are well-known operational availability drivers for fiber-optics technology deployment on military platforms.

Fiber-optics supportability cuts across reliability, maintainability, and the supply chain to facilitate detection, isolation, and timely repair/replacement of system anomalies. Typical supportability features include prognostics, diagnostics, skill levels, support equipment footprint, training, maintenance data collection, compatibility, packaging and handling, and other factors that contribute to an optimum environment for sustaining a fiber-optic system. The ability to sustain the operation of a fiber-optic system on aircraft is established by the inherent supportability of the system and the processes used to sustain the functions and capabilities of the system in the context of the end user. Supportability infrastructure is difficult to add on after the design is established, and therefore should be included in the systems engineering design process. The focus of sustainment planning is to influence the inherent supportability of the system, and to plan the sustainment capabilities and processes used to sustain system operations.

Fiber-optics maintainability considerations encompass modularity, interoperability, physical accessibility, training, testing, and human systems integration. Maintainability generally requires balancing the maintenance requirement over the life cycle with minimal user workload. The emphasis on maintainability is to reduce the maintenance burden and supply chain by reducing time, personnel, tools, test equipment, training, facilities, and cost to maintain the system. Maintainability engineering includes the activities, methods, and practice to design minimal system maintenance requirements and associated costs for preventative and corrective maintenance, as well as servicing and calibration activities. Maintainability should be a designed-in capability and not an add-on option, because good maintenance procedures cannot overcome poor system and equipment maintainability design. The primary objective is to reduce the time and complexity for a properly trained maintainer to detect and isolate a failure and affect repair.

Integrating the disparate interfaces associated with digital and analog/RF fiber-optic systems require innovation. Although the Navy has complete knowledge of the required connections and interfaces for digital and analog/RF fiber optics, there is no approach to selecting and qualifying dichroic filter-based components, and implementing new support equipment (maintenance sets), training, and the required supportability and maintainability modernization concepts to enable single ended optical loss measurement based on dichroic filter technology. Dichroic filters transmit light in one wavelength band in one direction while reflecting light at other wavelengths. Inserting dichroic filters in aircraft fiber-optic links enables the fleet maintainer to measure optical loss from one end of the fiber-optic cable. The application of dichroic filter technology will modernize single-ended fiber-optic link loss measurement and fiber-optic built-in test (BIT) concept of operations on aircraft platforms. This SBIR topic seeks a component research effort that develops dichroic filters compatible with avionics fiber optics. This research effort should also develop models that include all of the platform considerations for multimode fiber-optic links operating at 1, 10, 25 and 50 Gbps, link components, support equipment, associated fleet maintainer training, and digital fiber-optic system design engineering principles.

Research is needed to design and assemble dichroic fiber prototypes for use for the following: (a) inside avionics weapon replaceable assemblies, (b) in fiber-optic test equipment, (c) in fiber-optic adapters, and (d) other optical interface circuitry. Research is also needed to design and demonstrate light source and optical power meter prototypes that enable single ended optical loss measurement in single and multi-wavelength multimode fiber-optic links on airborne platforms.

PHASE I: For a Direct to Phase II topic, the Government expects that the small business would have accomplished the following in a Phase I-type effort and developed a concept for a workable prototype or design to address, at a minimum, the basic requirements of the stated objective above. The below actions would be required to satisfy the requirements of Phase I:
Demonstrate feasibility of a dichroic filter transmission in digital vertical cavity surface emitting laser-based fiber-optic links operating in-band at no less than 25 Gbps. Demonstrate single-ended fiber-optic link loss measurement at out-of-band optical wavelengths that do not interfere with the in-band fiber-optic communications link wavelengths. Design a portable maintenance support equipment prototype for performing single-ended optical loss measurement on airborne platforms.

FEASIBILITY DOCUMENTATION: Offerors interested in participating in Direct to Phase II must include in their response 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 Phase I-type research and development related to the topic NOT solely based on work performed under prior or ongoing federally funded SBIR/STTR 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.

PHASE II: Design, build, and test dichroic filters for in-band signal transmission and out-of-band, single-ended loss measurement. Integrate dichroic filters in weapon replaceable assembly fiber-optics systems. Integrate dichroic filters in fiber-optic support equipment to facilitate single-ended, optical-loss measurement of legacy fiber-optic links where integration within the weapons replaceable assembly is not practical. Perform environmental testing of the dichroic filter devices to verify the qualifiability of dichroic filters for avionics and avionics support equipment.

PHASE III DUAL USE APPLICATIONS: Finalize the prototype portable support equipment design for single-ended fiber-optic loss measurement on airborne platforms. Implement integration hardware and software in avionics representative use cases. Verify and validate the portable support equipment performance. Perform environmental testing to increase technology readiness. Develop manufacturing tooling and supply chain infrastructure to increase manufacturing readiness of portable support equipment. Transition to applicable naval avionics use cases and platforms.

Dual-use applications include telecommunication systems, data centers, and campus networks.

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KEYWORDS: Dichroic filter; fiber optics; light source; power meter; avionics integration; support equipment

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N242-D09 TITLE: DIRECT TO PHASE II: F2-Wideband Acoustic Receiver and Source (F2-WARS) Sonobuoy

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Network Systems-of-Systems; Integrated Sensing and Cyber

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 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 an updated, evolved air-deployable source and receiver combination (F2 WARS) that can characterize the acoustic ocean environment in the F2 Mid-Frequency range and builds upon previous successful designs. The system will be deployed from Navy Maritime Patrol and Reconnaissance Aircraft, have capability across multiple operational environments, and will utilize the necessarily varied hardware configurations, active and passive processing, and frequency characteristics to consistently attain key Anti-Submarine Warfare (ASW) measurements.

DESCRIPTION: The capabilities of current Mid-Frequency transmitter/receiver sensors do not provide calibrated coherent source/receiver combinations tailored for environmental characterization or advanced passive processing. The Navy requires innovative sensor technologies with enhanced electromechanical property ceramics that fill frequency, bandwidth, and responsiveness gaps for the transmitter and receiver elements that are capable of transmitting, collecting, and processing surveillance information. Enhanced signal processing techniques for both active and passive processing can enable improvements in capabilities at the F2 Mid Frequency. The Navy, and other DoD Agencies, require the ability to characterize the ocean environment for pre-mission planning, environmental analysis, and marine mammal mitigation during training and operational trials, as well as achieve key ASW measurement capabilities at Mid Frequency. Variations in acoustic frequencies necessitate changes in hardware configurations, acoustic propagation, and advanced signal processing capabilities. Advanced passive and active processing capabilities need to be developed to achieve these measurements.

Tactical needs and munition transport capabilities make it difficult to meet all intelligence and mission planning requirements with existing hardware. Additionally, scenario characteristics such as transmission loss, bottom loss, reverberation, geo-acoustic characterization, obscuration, clutter, multipath, signal detection, and signal type vary with changes in acoustic frequency, and may limit the performance of current intelligence gathering systems without the capability to gather and exfiltrate the information. System solutions should include both single-unit concepts, as well as analysis into the feasibility of combined units with varying frequency bands.

The unit should be capable of both shallow and deep-water operations deploying the active and passive sensing elements through 500 ft (152.4 m) with both mission operating life and extended duration capability. Enhancements in passive processing should provide for improved minimal detection levels. Coherent signals of interest are in the Mid-Frequency range to include, but not limited to, continuous waveforms (CW) and frequency modulation (FM) waveforms, with associated active processing improvements. The unit will also take advantage of the communication between the aircraft and sensor unit. This should be compliant with the NATO digital uplink format, STANAG 4718.

This expendable sensor solution should be low power and sized to fit within an A-size sonobuoy. A-size sonobuoy standards are as follows: dimensions of 4.875 in. (12.38 cm) diameter x 36 in. (91.44 cm) length and weight of 40 lb. (18.14 kg) or less.

PHASE I: For a Direct to Phase II topic, the Government expects that the small business would have accomplished the following in a Phase I-type effort and developed a concept for a workable prototype or design to address, at a minimum, the basic requirements of the stated objective above. The below actions would be required to satisfy the requirements of Phase I:
1. Provide evidence of prior successful development, testing, or deployment in a relevant domain. The system should clearly demonstrate readiness for integration with Navy Maritime Patrol and Reconnaissance Aircraft. Furthermore, the proposal must emphasize the system's capability for uninterrupted operation across varied oceanic environments, underpinned by documented results or prototypes which have effectively captured essential ASW measurements. Prior success in addressing similar challenges will be heavily weighted in evaluation.
2. Provide evidence of advanced signal processing techniques applied on similar sensors and frequencies. Develop and document the expected processing improvements available in ideal hardware configurations based on existing real-sensor data.
3. Modeling and/or results of risk reduction experiments that validate the existing concept along with the expected application at a new frequency to be provided.

FEASIBILITY DOCUMENTATION: Offerors interested in participating in Direct to Phase II must include in their response 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 Phase I-type research and development related to the topic NOT solely based on work performed under prior or ongoing federally funded SBIR/STTR 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.

PHASE II: Develop and fabricate an over-the-side prototype unit(s) required to span the F2 Mid-Frequency range and demonstrate in both acoustic facilities and the ocean environment. Prototype demonstrations will demonstrate successful completion of classified objectives . Throughout this development phase, emphasize a comprehensive evaluation of the prototype's performance under high-ambient and low-source level conditions, ensuring its adaptability and resilience in diverse acoustic settings. Collaborate with similarly focused domain experts and utilize feedback from preliminary tests to further refine and optimize the system at Mid Frequency. Finalize the concept design and make recommendations for Phase III production-oriented designs, detailing potential challenges and solutions for scalable manufacturing. Explore integration pathways with existing Navy Maritime Patrol and Reconnaissance infrastructure to maximize system collaboration. Demonstrate the prototype's ability to attain desirable ASW measurement capabilities at Mid Frequency and provide a roadmap for iterative improvements and integration based on and feedback.

PHASE III DUAL USE APPLICATIONS: Transition over-the-side prototype unit(s) into an air deployable sonobuoy system. Sensor must meet A-size packaging requirements specified in the PMA-264 Production Sonobuoy Specification. Testing will be required which verifies the sensor passes all required environmental, structural, and operational tests. These tests include, but are not limited to, Environmental Exposure, Air Certification, Hazards of Electromagnetic Radiation to Ordnance (HERO), and Office of Naval Intelligence (ONI) certification.

Upon successful testing, Low Rate Initial Production (LRIP) will need to be successful for transition to the platform.

This technology/topic can benefit any entity that requires calibrated active target strength measurements within the underwater environment.

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KEYWORDS: Anti-Submarine Warfare; Sonobuoy; Mid Frequency; NUAMP; Acoustics; Intelligence

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N242-D10 TITLE: DIRECT TO PHASE II: Radio Frequency Real-Time Modeling and Simulation

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software

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 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: Design, develop, and incorporate realistic environmental responses to radar signals from VHF to X-Band, including free-space propagation, terrain and ocean scattering, multipath signals, and ship targets (physical optics with multibounce dihedral and trihedral reflections) into at least one (threshold) of these threat surrogate testbeds. This will include high-fidelity propagation effects in testing advanced Electronic Warfare (EW) blue weapon systems via the Electronic Support (ES) receiver portion or tactical Electronic Attack (EA) receiver.

DESCRIPTION: The ASIE EW Labs of Naval Air Warfare Center Weapons Division (NAWCWD) at Point Mugu, CA have several Radio Frequency (RF) Hardware-in-the-Loop (HWIL) surrogate threat (red) capabilities for test and evaluation (T & E) of (primarily) airborne EW systems. The surrogate threat (red) capability at NAWCWD is a virtual test suite capable of emulating engagements at RF with incorporating blue and red force radar systems. The current hardware architecture and RF environment generator currently do not produce realistic threat representations and will not meet future requirements of testing advanced radar/EW capabilities. Updated capabilities need to include a wide range of advanced radar and EW threats, densely congested environments, realistic terrain and ocean scattering, multipath, and targets. HWIL testing will greatly reduce the need for open-air or sea range testing. This is especially important in the case of advanced Synthetic Aperture Radar (SAR) imaging platforms, EW platforms performing spatially coherent processing [Ref 1], and cognitive EW systems [Ref 2]. The goal is to incorporate realistic environmental responses to radar signals from Very High Frequency (VHF) to X-Band, including free-space propagation, terrain and ocean scattering, multipath signals, and ship targets (i.e., physical optics with multibounce dihedral and trihedral reflections) into at least one (Threshold) of these threat surrogate testbeds. An additional goal is to include these high-fidelity propagation effects in testing advanced EW blue weapon systems via the Electronic Support (ES) receiver portion or tactical Electronic Attack (EA) receiver. The modeling and simulation (M & S) system should be capable of predicting the wideband (1 GHz) electromagnetic channel for radar pulses from multiple (5) platforms in real time for the HWIL system over a 100 GbE connection.

Computational adjuncts should be proposed. Real-time responses for radar and EW systems will enable dynamic, competitive, and/or adversarial HWIL simulations.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVAIR 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: For a Direct to Phase II topic, the Government expects that the small business would have accomplished the following in a Phase I-type effort and developed a concept for a workable prototype or design to address, at a minimum, the basic requirements of the stated objective above. The below actions would be required to satisfy the requirements of Phase I:
Both the scientific and technical merit, described in the topic have been met. Developed a physics-based, M & S software that can predict the wideband (1 GHz) (site-specific) RF channels for radars and EW systems in ocean or littoral environments. The M & S software exhibits realistic radar scattering versus aspect angle including ocean-ship dihedrals and trihedrals; and that the M & S environment accommodates an unlimited number of targets with unlimited range delay [Refs 3-4] for EW effects, which will allow for demonstration of real-time HWIL tests in the laboratory with dynamic pulse-to-pulse channel adjustments (not using a pre-calculated script), including realistic targets, ocean and terrain clutter, and EW signals.

FEASIBILITY DOCUMENTATION: Proposers interested in participating in Direct to Phase II must include in their response 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 Phase I-type research and development related to the topic NOT solely based on work performed under prior or ongoing federally funded SBIR/STTR 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.

PHASE II: Modify the M & S software so that it can operate in real time. The system should be capable of predicting the wideband (1 GHz) electromagnetic channel for radar pulses from multiple (5) platforms in real time for the HWIL system over a 100 GbE connection.

Computational adjuncts should be proposed. Real-time responses for radar and EW systems will enable dynamic, competitive, and/or adversarial HWIL simulations.

Work in Phase II may become classified. Please see note in the Description paragraph.

PHASE III DUAL USE APPLICATIONS: The final deployment of the HWIL system scales with the T & E requirement dictated by the program of record under which the HWIL system is adapted. This indicates that the real-time signal processing system does not degrade under scaling to meet the appropriate many-v-many requirements of future EW systems.

Many commercial applications employing wireless devices in congested environments benefit directly from the ability to model the setting in which the technology deploys. This includes large-scale cellular infrastructure to support pico-cell networking for access points in 5G and Internet of Things (IoT) applications.

REFERENCES:
1. Guerci, J. R. “Cognitive radar: A knowledge-aided fully adaptive approach.” Artech House, 2020. https://www.worldcat.org/title/1199585736
2. Haigh, K. and Andrusenko, J. “Cognitive electronic warfare: an artificial intelligence approach.” Artech House, 2021. https://www.worldcat.org/title/1262373416

3. Bergin, J.; Kirk, D.; Studer, J.; Guerci, J. and Rangaswamy, M. "A new approach for testing autonomous and fully adaptive radars." 2017 IEEE Radar Conference (RadarConf), May 2017, pp. 1174-1178. https://doi.org/10.1109/RADAR.2017.7944382
4. Huang, H.; Pan, M. and Lu, Z. "Hardware-in-the-loop simulation technology of wide-band radar targets based on scattering center model." Chinese Journal of Aeronautics, 28(5), 2015, pp. 1476-1484. https://doi.org/10.1016/j.cja.2015.07.006
5. "National Industrial Security Program Executive Agent and Operating Manual (NISP), 32 U.S.C. § 2004.20 et seq." Code of Federal Regulations, 1993. https://www.ecfr.gov/current/title-32/subtitle-B/chapter-XX/part-2004

KEYWORDS: Real-Time Signal Processing; Hardware-in-the-Loop; HIWL; Electronic Warfare; EW; Radio Frequency; RF; Clutter; Space-Time Processing

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N242-D11 TITLE: DIRECT TO PHASE II: Modernized Sonar Transmit Electronics

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Microelectronics

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 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 architecture for modernized digital transmit electronics to power future hull-mounted acoustic arrays within the AN/SQQ-89A(V)15 sonar system.

DESCRIPTION: Sonar systems that include active sonar transmissions rely on transmit electronics to provide power to the transducers that produce sound in the ocean. Put simply, a transducer performs the transformation between an electrical signal in volts (V) and a physical quantity such as displacement of the head at the end of a stack of piezo-electric ceramics. Transmitters transform volts into amps (A) and vice versa.

The AN/SQS-53 hull mounted sonar array is a large bulb-like structure built into the bows of ships below the water line. Ships fitted with AN/SQS-53 include U.S. Navy Arleigh Burke-class destroyers, Ticonderoga-class cruisers, and select Japanese Maritime Self-Defense Force destroyers. The AN/SQS-53 hull-mounted sonar has a nominal source level of 235 decibels (dB) re 1 µPa and transmits at a center frequency of approximately 3 kHz. The AN/SQS-53 includes 576 TR-343 transducer tube assemblies arranged in staves of 8 transducers every 5 degrees azimuthally. Each TR-343 transducer assembly is capable of a) active acoustic transmit or creating noise (or sound pressure level) in response to voltage from the transmit electronics and b) passive acoustic detection or detecting incoming pressure changes and transforming that pressure into voltage to be sent to the transmit electronics.

The current transmit electronics for the AN/SQS-53C which perform the transformation between voltage and amps for both active acoustic transmit and passive acoustic detection consists of three racks of analog electronic components to support the 576 transducers in the AN/SQS-53C. These analog electronic components have reached end of life and must be modernized to support ongoing maintenance and future acquisition of new systems.

The Navy desires prototype transmit electronics that can transform the digital waveforms into voltage signals at individual TR-343 transducers to accommodate the requisite displacement of the ceramic assembly associated with active and passive acoustic functionality at the nominal source level and center frequency. There is nothing available commercially that can accomplish the required transformation. The prototype transmit electronics must be scalable to support the entire set of 576 transducers while fitting within the space, weight, and power (SWaP) envelope associated with the existing analog power transmit capability. The SWaP and notional full rate production cost targets are:
• Space: 3 transmit cabinets, each with height of 76”, width of 21” and depth of 22”
• Weight: 2000 lbs. for all three cabinets, not to include cable runs extending beyond the transmit cabinets
• Power: TBD
• Full Rate Product Cost (FY24 dollars): Not To Exceed $2.5M per transmit electronics assembly
Innovation is anticipated to handle the current AN/SQS-53C source levels using digital transmit electronics as well as make the design extensible to future hull arrays with transducers that may utilize

either textured ceramics or single crystal ceramics. Innovation is also anticipated to meet the Grade A shock requirements, which equates to the system remaining functional for any shock conditions where crew would remain alive to continue use of the AN/SQS-53C hull array.

PHASE I: For a Direct to Phase II topic, the Government expects that the small business would have accomplished the following in a Phase I-type effort and developed a concept for a workable prototype or design to address, at a minimum, the basic requirements of the stated objective above. The below actions would be required in order to satisfy the requirements of Phase I:
• A concept for modern digital transmit electronics that is clearly extensible to a TR-343 transducer.
• A notional architecture to support the conclusion that the proposed digital transmit electronics could fit within the SWaP of the current analog transmit electronics associated with the AN/SQS-53C.
• Documentation describing completion of an experimental proof of concept (a manufacturing readiness level (MRL) of 3).
• Explanation of how the company could ramp up production to support acquisition of full transmit electronic units within a year of completion of the Phase II effort (4 years after award of the Phase II base).

FEASIBILITY DOCUMENTATION: Offerors interested in participating in Direct to Phase II must include in their response 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 Phase I-type research and development related to the topic NOT solely based on work performed under prior or ongoing federally funded SBIR/STTR 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. 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 offeror and/or the principal investigator (PI). Read and follow all of the DON SBIR 24.2 Direct to Phase II Broad Agency Announcement (BAA) Instructions. Phase I proposals will NOT be accepted for this topic.

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 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVSEA 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 during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations. Reference: National Industrial Security Program Executive Agent and Operating Manual (NISP), 32 U.S.C. § 2004.20 et seq. (1993). https://www.ecfr.gov/current/title-32/subtitle-B/chapter-XX/part-2004

PHASE II: Develop and deliver prototype transmit electronics that can support a representative segment of an AN/SQS-53C hull array, nominally 7 staves of 6-8 transducers. The government will review the design before the awardee acquires design-specific components. The government will also work with the awardee to conduct tests of appropriate collections of prototype transmit electronics (e.g., examples to demonstrate reliable performance with a single transducer, assemblies that can manage a representative stave of 6-8 transducers, and finally that the full prototype that can handle at least 5-7 staves of transducers (20-30 degrees of azimuthal coverage)).

The final Phase II report shall contain a design for how the prototype can be scaled to accommodate a full AN/SQS-53C transducer set and the associated SWaP plus the full rate production cost estimated for the full transducer set.

Work under Phase II is anticipated to include at least discussion of classified information. A DD254 will be issued approximately 2 months after Phase II award to enable classified discussion between the government and the awardee.

PHASE III DUAL USE APPLICATIONS: Assist the Navy in transitioning the transmit electronics by a) a full engineering demonstration model (EDM) of the modernized transmit electronics for a full AN/SQS-53C array and b) low rate initial production of the company's modernized transmit electronics. Provide services associated with test and evaluation of the EDM and LRIP transmit electronics to include environmental qualification testing (EQT) appropriate for Grade A Shock.

The Navy anticipates that the technology developed under this Phase II effort can also be used to provide acoustic transmit electronics for active sonar systems used for exploration by commercial sectors such as the oil and gas industry.

REFERENCES:

1. Miller, Sarah K. "NSWC Crane Exceeds Significant 50k Transducer-Delivery Milestone, Boosting Undersea Sonar Capabilities for Navy Fleet." NAVSEA News, 9 Dec 2021. https://www.navsea.navy.mil/Media/News/Article/2868463/nswc-crane-exceeds-significant-50k-transducer-delivery-milestone-boosting-under/
2. "AN/SQQ-89(V) Undersea Warfare Anti-Submarine Warfare Combat System." Navy Fact File, 20 Sep 2021.https://www.navy.mil/Resources/Fact-Files/Display-FactFiles/Article/2166784/ansqq-89v-undersea-warfare-anti-submarine-warfare-combat-system/
3. "AN/SQS-53 Sonar." Military Analysis Network, 30 Jun 1999. https://man.fas.org/dod-101/sys/ship/weaps/an-sqs-53.htm
4. "AN/SQS-53C Transmitter Infrastructure, solicitation N00024-18-R-5205." 26 Jul 2018.https://sam.gov/opp/ed0b2f0d6f1bdc2f863f118c1036b9fa/view


KEYWORDS: Transmit Electronics; Active Acoustic Transmit; Passive Acoustic Detection; Hull-Mounted Sonar Array; transform volts into amps; Grade A Shock

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N242-D12 TITLE: DIRECT TO PHASE II: Flexible Integrated Optical Circuit (IOC) Packaging Options for Improved Size Weight and Power (SWaP) in Interferometric Fiber-Optic Gyroscopes (IFOG)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Space Technology

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 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: Address multiple aspects in the design and packaging of current state-of-the-art Y-branch phase modulator integrated optical circuits (IOCs), making them more flexible for integration into reduced form factor sensors.

DESCRIPTION: Sensor technology will always have high performance requirements as a standard, metrics like long-term bias stability, angle random walk, scale factor error and linearity, temperature sensitivity, etc. must remain consistent with or outperform prior generations of sensors. At the same time, reducing sensor Size, Weight, and Power (SWaP) requirements continues to be important to enable technology development for multiple applications. As a critical component of Interferometric Fiber-Optic Gyroscopes (IFOG) technology, the IOC phase modulator package presents a limitation for size reduction of the next higher assembly [Ref 1]. The IOC is typically a Y-branch crystal waveguide (in Lithium Niobate or other materials) with two pairs of electrodes creating dual modulators, which is then attached to optical fiber pigtails at the input and both output ports [Ref 2]. There are multiple possible ways to reduce the overall package volume, but this SBIR topic does not seek to prescribe a single solution. Instead, the goal will be to reduce SWaP (or impact of SWaP on the next higher assembly) of a state-of-the-art IOC with equivalent performance to current devices in the most efficient way possible using one or more techniques.

PHASE I: For a Direct to Phase II topic, the Government expects that the small business would have already demonstrated IOC design capability to address one or more of the packaging improvement options (Phase I-type work).

Possible techniques to reduce SWaP or the impact of SWaP include:
1. Chip design or material choices, including novel waveguide or electrode design, novel composite or combined materials, or Thin-Film Lithium Niobate (TFLN) devices
2. Reducing the space required for either high-precision fiber attachment to the waveguide or protection when exiting the package
3. Reducing connector size, either directly or by closer integration inside the package
4. Providing a means to re-direct fiber input and output ports in a different manner than possible with current straight waveguides
5. Equivalent phase modulator technology integrated into a photonic integrated circuit (PIC) based device (Note: this must still be integrated into a prototype as described in Phase II)
The above actions would be required in order to satisfy the requirements of Phase I.

FEASIBILITY DOCUMENTATION: Offerors interested in participating in Direct to Phase II must include in their response 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 Phase I-type research and development related to the topic NOT solely based on work performed under prior or ongoing federally funded SBIR/STTR 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. 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 offeror and/or the principal investigator (PI). Read and follow all of the DON SBIR 24.2 Direct to Phase II Broad Agency Announcement (BAA) Instructions. Phase I proposals will NOT be accepted for this topic.

PHASE II: Design, fabricate, and characterize six (6) prototype IOCs. These must be fully packaged devices with pigtailed fiber, connectors, and screwed on or sealed lids, which are suitable for individual testing, next higher assembly integration, or sensor prototype testing. Characterization data provided must cover optical measurements for insertion loss, split ratio, chip polarization extinction ratio (PER), fiber lead PER, optical return loss or coherent backscatter, and wavelength dependent loss. It must also cover electrical measurements for frequency response measurement and half-wave voltage (Vpi), as well as residual intensity modulation. An accelerated aging study, equivalent to 5-years real-time, involving these prototype IOCs being heated under vacuum must be performed. A predictive model of long-term (~30 years) environmental stability must be provided as a result of this accelerated aging study. The prototypes should be delivered at the end of Phase II.

PHASE III DUAL USE APPLICATIONS: Based on the prototypes developed in Phase II, continuing development must lead to productization of low SWaP phase modulators.

In addition to military/strategic applications, these improvements will be applicable to multiple commercial technologies. These areas include Light Detection and Ranging (LIDAR), satellite optical communications, and telecommunications.

REFERENCES:

1. Adams, Gary and Gokhale, Michael. “Fiber optic gyro based precision navigation for submarines.” Proceedings of the AIAA Guidance, Navigation and Control Conference, Denver, CO, USA, August 2000, pp. 2-6. https://arc.aiaa.org/doi/pdf/10.2514/6.2000-4384
2. Wooten, Ed L. et al. "A review of lithium niobate modulators for fiber-optic communications systems." IEEE Journal of selected topics in Quantum Electronics 6, January 2000, pp. 69-82. https://ieeexplore.ieee.org/document/826874


KEYWORDS: Integrated Optical Circuit; Phase Modulator; Lithium Niobate; Waveguides; Inertial Sensor; Fiber-optic Gyroscope

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VERSION 2

**DEPARTMENT OF THE AIR FORCE**
**24.2 SMALL BUSINESS INNOVATION RESEARCH (SBIR) PHASE I**
**PROPOSAL SUBMISSION INSTRUCTIONS**

The Air Force intends these Phase I proposal submission instructions to clarify the Department of Defense (DoD) Broad Agency Announcement (BAA) as it applies to the topics solicited herein. **Offerors must ensure proposals meet all requirements of the SBIR 24.2 BAA posted on the Defense SBIR/STTR Innovation Portal (DSIP) at the proposal submission deadline date/time.**

**Applicants are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.**

- The DoD Program BAA is located at: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements. Be sure to select the tab for the appropriate BAA cycle.

Please ensure all e-mail addresses listed in the proposal are current and accurate. The DAF is not responsible for ensuring notifications are received by firms changing mailing address/e-mail address/company points of contact after proposal submission without proper notification to the DAF. **If changes occur to the company mail or email addresses or points of contact after proposal submission, the information must be provided to the AF SBIR/STTR One Help Desk.** The message shall include the subject line, "24.2 Address Change".

Points of Contact:

**General information** related to the AF SBIR/STTR program and proposal preparation instructions, contact the AF SBIR/STTR One Help Desk at usaf.team@afsbirsttr.us. All applicants have ample opportunity to request clarifying information. **The DAF encourages applicants to request clarifying information as early as possible, as delays in such requests constrain the DAF's ability to provide satisfactory resolution to applicant concerns.**

- Questions regarding the DSIP electronic submission system, contact the DoD SBIR/STTR Help Desk at dodsbirsupport@reisystems.com.
- For technical questions about the topics during the pre-announcement and open period, please reference the DoD SBIR 24.2 BAA.
- Air Force SBIR/STTR Contracting Officer (CO):
    - Mr. Daniel J. Brewer, Daniel.Brewer.13@us.af.mil

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

## PHASE I PROPOSAL SUBMISSION

The DoD SBIR 24.2 Broad Agency Announcement, https://www.dodsbirsttr.mil/submissions/login, includes all program requirements. Phase I efforts should address the feasibility of a solution to the selected topic's requirements.

## PHASE I PROPOSAL FORMAT

Complete proposals must include all of the following:
**Volume 1:** DoD Proposal Cover Sheet

Note: If selected for funding, the proposal's technical abstract and discussion of anticipated benefits will be publicly released. Therefore, do not include proprietary information in this section.
**Volume 2:** Technical Volume
**Volume 3:** Cost Volume
**Volume 4:** Company Commercialization Report
**Volume 5:** Supporting Documents
**Volume 6:** Fraud, Waste, and Abuse Training

**DoD PROPOSAL COVER SHEET (VOLUME 1)**
Complete the proposal Cover Sheet in accordance with the instructions provided via DSIP. The technical abstract should include a brief description of the program objective(s), a description of the effort, anticipated benefits and commercial applications of the proposed research, and a list of keywords/terms. The technical abstract of each successful proposal will be submitted to the Office of the Secretary of Defense (OSD) for publication and, therefore, must not contain proprietary or classified information.

**TECHNICAL VOLUME (VOLUME 2):**
The Technical Volume should include all graphics and attachments but should not include the Cover Sheet, which is completed separately as Volume 1. The Phase I technical volume (uploaded in Volume 2) shall contain the required elements found below. Ensure that all graphics are distinguishable in black and white.

The Phase I Technical Volume page/slide limits identified for the topics do not include the Cover Sheet, Cost Volume, Cost Volume Itemized Listing (a-h). The Technical Volume must be no smaller than 10-point on standard 8-1/2" x 11" paper with one-inch margins. Only the Technical Volume and any enclosures or attachments count toward the page limit. In the interest of equity, pages/slides in excess of the stated limits will not be reviewed. The documents required for upload into Volume 5, "Other", do not count toward the specified limits.

These instructions supplement the 24.2 SBIR BAA. In addition to the requirements found in the 24.2 SBIR BAA, applicants are required to provide the following information in Volume 2:

**Key Personnel**: Identify in the Technical Volume all key personnel who will be involved in this project; include information on directly related education, experience, and citizenship.

- A technical resume of the principal investigator, including a list of publications, if any, must be included. Only one principal investigator/project manager can be designated to a proposal at any given time.
- Concise technical resumes for subcontractors and consultants, if any, are also useful.
- Identify all U.S. permanent residents to be involved in the project as direct employees, subcontractors, or consultants.
- Identify all non-U.S. citizens expected to be involved in the project as direct employees, subcontractors, or consultants. For all non-U.S. citizens, in addition to technical resumes, please provide countries of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project, as appropriate. Additional information may be requested during negotiations in order to verify the foreign citizen's eligibility to participate on a contract issued as a result of this announcement. **Note:** Do not upload information such as Permanent Resident Cards (Green Cards), birth certificates, Social Security Numbers, or other PII to the DSIP system.

**Phase I Statement of Work Outline**
NOTE: The DAF uses the work plan outline as the initial draft of the Phase I Statement of Work (SOW). Therefore, **do not include proprietary information in the work plan outline**. To do so will necessitate a request for revision, if selected, and may delay award.

Include a work plan outline in the following format:
**Scope**: List the effort's major requirements and specifications.
**Task Outline**: Provide a brief outline of the work to be accomplished during the Phase I effort.
**Milestone Schedule**
**Deliverables**
**Progress reports**
**Final report with SF 298**

**COST VOLUME (VOLUME 3)**
Cost information should be provided by completing the Cost Volume in DSIP and including the Cost Volume Itemized Listing specified below. The Cost Volume detail must be adequate to enable Air Force personnel to determine the purpose, necessity and reasonability of each cost element. Provide sufficient information (a.-g. below) regarding funds use. The DSIP Cost Volume and Itemized Cost Volume Information will not count against the specified page limit. The itemized listing also may be submitted in Volume 5 under the "Other" dropdown option.

a. **Direct Cost Materials**: Justify costs for materials, parts, and supplies with an itemized list containing types, quantities, prices and where appropriate, purpose. Material costs may include the costs of such items as raw materials, parts, subassemblies, components, and manufacturing supplies.

b. **Other Direct Costs**: This category includes, but is not limited to, specialized services such as machining, milling, special testing or analysis, and costs incurred in temporarily using specialized equipment. Proposals including leased hardware must include an adequate lease v. purchase justification.

c. **Direct Labor**: Identify key personnel by name, if possible, or by labor category, if not. Direct labor hours, labor overhead and/or fringe benefits, and actual hourly rates for each individual are also necessary for the CO to determine whether these hours, fringe rates, and hourly rates are fair and reasonable.

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

e. **Subcontracts**: Involvement of university or other consultants in the project's planning and/or research stages may be appropriate. If so, describe in detail and include information in the Cost Volume. The proposed total of consultant fees, facility lease/usage fees, and other subcontract or purchase agreements may not exceed **one-third of the total contract price** or cost (do not include profit in the calculation), unless otherwise approved in writing by the CO. The SBIR funded work percentage calculation considers both direct and indirect costs after removal of the SBC's proposed profit. Support subcontract costs with copies of executed agreements. The documents must adequately describe the work to be performed. At a minimum, include a Statement of Work (SOW) with a corresponding detailed Cost Volume for each planned subcontract.

f. **Special Tooling, Special Test Equipment, and Material**: The inclusion of equipment and materials will be carefully reviewed relative to need and appropriateness to the work proposed. Special tooling and special test equipment purchases must, in the CO's opinion, be advantageous to the Government and relate directly to the effort. These toolings or equipment should not be of a type that an offeror would otherwise possess in the normal course of business. These may include items such as innovative instrumentation and/or automatic test equipment.

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

NOTE: If no exceptions are taken to an offeror's proposal, the Government may award a contract without negotiations. Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. If there are questions regarding the award document, contact the Phase I CO identified on the cover page. The Government reserves the right to reopen negotiations later if the CO determines doing so to be necessary.

**COMPANY COMMERCIALIZATION REPORT (VOLUME 4)**
Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR 24.2 BAA for full details on this requirement. Information contained in the CCR will not be considered by the Air Force during proposal evaluations.

**SUPPORTING DOCUMENTS VOLUME (VOLUME 5)**

**The following documents may be required if applicable to your proposal:**

1. DD Form 2345: For proposals submitted under export-controlled topics, either International Traffic in Arms or Export Administration Regulations (ITAR/EAR), a copy of the certified DD Form 2345, Militarily Critical Technical Data Agreement, or evidence of application submission must be included. The form, instructions, and FAQs may be found at the United States/Canada Joint Certification Program website, http://www.dla.mil/HQ/InformationOperations/Offers/Products/LogisticsApplications/JCP/DD2345Ins tructions.aspx. DD Form 2345 approval will be required if proposal if selected for award.
    a. Topics AF242-0010, AF242-0011 **ONLY**: the certified and completed DD Form 2345, Military Critical Technical Data Agreement, must be included with the initial proposal submission. Proposals that do not include this document will be disqualified..

2. Verification of Eligibility of Small Business Joint Ventures (Attachment 3 to the DOD SBIR 24.2 BAA)
3. Technical Data Rights Assertions (if asserting data rights restrictions)

**FRAUD, WASTE, AND ABUSE TRAINING (VOLUME 6)**
Note that the FWA Training must be completed prior to proposal submission. When training is complete and certified, DSIP will indicate completion of the Volume 6 requirement. The proposal cannot be submitted until the training is complete.

**DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)**
The Air Force does not participate in the Discretionary Technical and Business Assistance (TABA) Program. Proposals submitted in response to DAF topics shall not include TABA.

**AIR FORCE PROPOSAL EVALUATIONS**
Proposals will be evaluated for overall merit in accordance with the criteria discussed in the 24.2 BAA. DAF is seeking varying technical/scientific approaches and/or varying and new technologies that would be responsive to the problem statement(s) and area(s) of interest in the topic. Multiple procurements are planned and anticipated to be awarded as a result of the topic, each proposal is

considered a separate procurement and will be evaluated on its own merit, and that the Government may award all, some, or none of the proposals. Any per-award or per-topic funding caps are budgetary estimates only, and more or less funding may become available. Funding decisions are made with complete disregard to the other awards under the same topic.

In accordance with Section 4 of the SBIR and STTR Extension Act of 2022, the DAF will review all proposals submitted in response to this BAA to assess security risks presented by small business concerns seeking a Federally funded award. The DAF will use information provided by the small business concern in response to the Disclosure of Foreign Affiliations or Relationships to Foreign Countries and the proposal to conduct a risk-based due diligence review on the cybersecurity practices, patent analysis, employee analysis, and foreign ownership of a small business concern, including the small business concern and employees of the small business concern to a foreign country, foreign person, foreign affiliation, or foreign entity. The DAF will also assess proposals utilizing open-source analysis and analytical tools, for the nondisclosures of the information set forth in 15 U.S.C. 638(g)(13). If DAF assesses that a small business concern has security risk(s), DAF will review the proposal, the evaluation, and the security risks and may decide not to select the proposal for award based upon a totality of the review.

**MAJORITY OWNERSHIP IN PART BY MULTIPLE VENTURE CAPITAL, HEDGE FUND, AND PRIVATE EQUITY FIRMS**

Small business concerns that are owned in majority part by multiple venture capital operating companies (VCOCs), hedge funds, or private equity funds are not eligible to submit applications or receive awards for DAF Topics.

**PERFORMANCE OF WORK REQUIREMENTS AND LOCATION OF WORK**

For Phase I, a minimum of two-thirds of the research or analytical effort must be performed by the Awardee. The DAF measures percentage of work by both direct and indirect costs, not including profit. Occasionally, the DAF will consider deviations from this performance of work requirement. **Requests for Performance of Work deviations must be made twice: prior to submission during the topic open period and as part of the initial proposal submission.** For requests prior to the initial proposal submission, the DAF will consider the request and approve or disapprove requesting applicants to proceed with DSIP submission. Upon proposal receipt, the DAF will again consider such requests for approval for the resultant award.

All R/R&D work must be performed in the United States. Based on a rare and unique circumstance, the DAF may approve a particular portion of the R/R&D work to be performed or obtained in a country outside of the United States. The awarding Funding Agreement officer must approve each specific condition in writing. Applicants seeking this approval must make such a request with their initial proposal submission. The DAF will not consider these requests prior to proposal submission.

**DAF USE OF SUPPORT CONTRACTORS**

Restrictive notices notwithstanding, proposals may be handled for administrative purposes only, by support contractors. These support contractors may include, but are not limited to TEC Solutions, Inc., APEX, Oasis Systems, Riverside Research, Peerless Technologies, HPC-COM, Mile Two, Montech, Wright Brothers Institute, and MacB (an Alion Company). In addition, only Government employees and technical personnel from Federally Funded Research and Development Centers (FFRDCs) MITRE and Aerospace Corporations working under contract to provide technical support to AF Life Cycle Management Center and Space and Missiles Centers may evaluate proposals. All support contractors are bound by appropriate non-disclosure agreements. Contact the AF SBIR/STTR CO Daniel J. Brewer (Daniel.Brewer.13@us.af.mil) with concerns regarding the use of support contractors.

**PROPOSAL STATUS AND FEEDBACK**

The Principal Investigator (PI) and Corporate Official (CO) indicated on the Proposal Cover Sheet will be notified by e-mail regarding proposal selection or non-selection. Small Businesses will receive a notification for each proposal submitted. Please read each notification carefully and note the Proposal Number and Topic Number referenced.

Automated feedback will be provided for Phase I proposals designated Not Selected. Additional feedback may be provided at the sole discretion of the DAF.

**IMPORTANT:** Proposals submitted to the DAF are received and evaluated by different organizations, handled by topic. Each organization operates within its own schedule for proposal evaluation and selection. Updates and notification timeframes will vary. If contacted regarding a proposal submission, it is not necessary to request information regarding additional submissions. Separate notifications are provided for each proposal.

The Air Force anticipates that all proposals will be evaluated and selections finalized within approximately 90 calendar days of solicitation close. Refrain from contacting the BAA CO for proposal status before that time.

Refer to the DoD SBIR Program BAA 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: Air Force SBIR/STTR Contracting Officer Daniel J. Brewer, Daniel.Brewer.13@us.af.mil.

**AIR FORCE SUBMISSION OF FINAL REPORTS**

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

**PHASE II PROPOSAL SUBMISSIONS**

DAF organizations may request Phase II proposals while Phase I technical performance is ongoing or at any time after the conclusion of the period of performance. This decision will be based on the awardee's technical progress, as determined by an DAF Technical Point of Contact review using the Phase II review criteria outlined above.

Phase II is the demonstration of the technology found feasible in Phase I. Only Phase I awardees are eligible to submit a Phase II proposal. All Phase I awardees will be sent a notification with the Phase II proposal submittal date and detailed Phase II proposal preparation instructions. If the physical or email addresses or firm points of contact have changed since submission of the Phase I proposal, correct information shall be sent to the DAF SBIR/STTR One Help Desk. Phase II dollar values, performance periods, and proposal content will be specified in the Phase II request for proposal.

NOTE: The DAF primarily makes SBIR Phase I and II awards as Firm-Fixed-Price contracts. However, awardees are strongly urged to work toward a Defense Contract Audit Agency (DCAA)-approved accounting system. If the company intends to continue work with the DoD, an approved accounting system will allow for competition in a broader array of acquisition opportunities, including award of Cost-Reimbursement types of contracts. Please address questions to the Phase II CO, if selected for award.

**All proposals must be submitted electronically via DSIP** by the date indicated in the Phase II proposal instructions. Note: Only ONE Phase II proposal may be submitted for each Phase I award.

**AIR FORCE SBIR/STTR PROGRAM MANAGEMENT IMPROVEMENTS**

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

**Department of the Air Force SBIR 24.2 Phase I Topic Index**

| Topic Number | Topic Name | Maximum Value* | Maximum Duration** | Technical Volume Page Limit*** |
|---|---|---|---|---|
| AF242-0001 | Creating a digital twin of legacy aircraft | $180,000.00 | 6 | 20 |
| AF242-0002 | Modeling and simulation of large scale deployments of autonomous systems | $180,000.00 | 6 | 20 |
| AF242-0003 | Acoustic Recorders for Persistent High-Altitude Sensing | $180,000.00 | 6 | 20 |
| AF242-0004 | Intelligent Traffic Management System (ITMS) | $180,000.00 | 6 | 20 |
| AF242-0005 | Next Generation Field Calibration Suite for Radiometric Sensors | $180,000.00 | 6 | 20 |
| AF242-0006 | Fast-Response Flow Meters for Onboard Systems (Harsh Chemicals) | $180,000.00 | 6 | 20 |
| AF242-0007 | Rotor High Speed Imaging System | $180,000.00 | 6 | 20 |
| AF242-0008 | Fire Ignition Video Analysis Tool | $180,000.00 | 6 | 20 |
| AF242-0009 | Graphene CBRN Overgarment | $180,000.00 | 6 | 20 |
| AF242-0010 | All-Passive Nonreciprocal Power Limiters | $180,000.00 | 6 | 20 |
| AF242-0011 | Chip scale resonant sensors | $180,000.00 | 6 | 20 |
| AF242-0013 | Outer Mold Line Material Condition Probe | $180,000.00 | 6 | 20 |
| ~~SF242-0014~~ **Topic moved to solicitation 24.B as topic SF24B-T011** | ~~Into the Wild-Transitioning Basic Rsh Algs to Ops~~ **Topic moved to solicitation 24.B as topic SF24B-T011** | ~~$180,000.00~~ **Topic moved to solicitation 24.B as topic SF24B-T011** | ~~6~~ **Topic moved to solicitation 24.B as topic SF24B-T011** | ~~20~~ **Topic moved to solicitation 24.B as topic SF24B-T011** |

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|---|---|---|---|---|
| SF242-0015 | Programmability of Regional and/or Local Multi-Source PNT for Joint All-Domain Operations | $180,000.00 | 6 | 20 |
| SF242-0016 | Neuromorphic Camera for Space Domain Awareness | $180,000.00 | 6 | 20 |
| SF242-0017 | Cover glass solutions | $180,000.00 | 6 | 20 |
| SF242-0018 | Neon recovery and reliquefication for low temperature characterization of infrared focal plane arrays | $180,000.00 | 6 | 20 |
| SF242-0019 | Hydrogenation for defect passivation in (Si)GeSn alloys | $180,000.00 | 6 | 20 |
| SF242-0020 | Exploring Proliferated Warfighter Space Architecture (PWSA) | $180,000.00 | 6 | 20 |

*Proposals that exceed this amount will be disqualified.
**Proposals that exceed this duration will be disqualified.
***Pages/slides in excess of this count will not be considered during evaluations.

VERSION 2

AF242-0001 TITLE: Creating a digital twin of legacy aircraft

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Sensing and Cyber; Trusted AI and Autonomy; Integrated Network System-of-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 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 topic objective is to develop a faster, more cost-effective way to integrate new equipment at the system design/digital engineering level by creating a digital twin of the B-52H legacy aircraft system. This digital twin will include CAD models and SysML models, and be connectable to various models in different systems. The end state of this project is to have a digital engineering environment that is dynamically connected to an accredited simulation environment, enabling seamless integration of digital engineering models with other systems/products.
To achieve this objective, applicants are asked to propose a solution for creating a digital twin of a legacy system.

DESCRIPTION: The end state is to solicit industry for innovative approaches of designing Digital Twin (CAD and SysML files) for the B-52, a legacy aircraft that is planned to continue in service through the 2050's. AFGSC is interested in commercial solutions that develop the CAD and SysML baseline models for the B-52H so that future Non Recurring Engineering costs can be reduced over time as future concepts and systems are developed. This topic is designed to generate demonstrable success with model development, and build momentum with the ultimate success being follow on contract awards to completely develop and integrate these models into digital engineering and accredited digital simulation environments. Any data developed during this project will be government-owned, and that the government will have unlimited rights to use, modify, reproduce, release, perform, display, or disclose such technical data or computer software.

PHASE I: Awardee(s) will define a system concept, perform a feasibility study, and propose an solution for creating a digital twin of the B-52 legacy system. The developed CAD and SysML models developed during this project will be government-owned, and that the government will have unlimited rights to use, modify, reproduce, release, perform, display, or disclose such technical data or computer software.

PHASE II: The objective of the Phase II SBIR will be to further develop the digital twin of a legacy aircraft for equipment integration and testing created in Phase I. The project will focus on refining and improving the digital twin, creating a well-defined deliverable prototype that can be used for commercialization.

The project will involve the following steps:

**Refinement of the 3D Model**
The 3D model of the aircraft created in Phase I will be refined and improved to enhance its accuracy and functionality. This will involve further validation of the model to ensure its accuracy and the addition of new components to improve its functionality.

VERSION 2

**Integration of New Equipment**
The digital twin will be used to simulate the integration of new equipment with the aircraft. The simulation will involve testing the new equipment in different scenarios to identify potential issues and make necessary modifications.

**Testing**
The digital twin will undergo rigorous testing to ensure its accuracy and functionality. The testing will involve simulating a wide range of scenarios, including extreme weather conditions, equipment failures, and system malfunctions.

**Success Criteria**
The success criteria for this project will be the creation of a well-defined deliverable prototype that accurately simulates the installation of new equipment and changes to the aircraft's systems. The prototype should be able to simulate a wide range of scenarios, including equipment integration and testing, extreme weather conditions, equipment failures, and system malfunctions, and be validated through comparison to the actual aircraft.

**Commercialization Plan**
A commercialization plan will be developed to promote the technology and identify potential licensing and partnership opportunities. A marketing strategy will also be developed to reach potential customers and partners. The proposer will have identified potential customers and partners and have a plan to seek additional funding opportunities to continue the development of the digital twin technology and explore other potential applications in the aerospace industry.

**Operating Parameters/Prototyping Expectations**
The digital twin prototype will be able to simulate a wide range of scenarios, including equipment integration and testing, extreme weather conditions, equipment failures, and system malfunctions. The prototype will be validated through comparison to the actual aircraft, and its accuracy and functionality will be tested in a wide range of scenarios. The prototype will also be tested to ensure its compatibility with different equipment and systems. Additionally, the prototype will be tested for ease of use and user-friendliness.

**Conclusion**
The success of the Phase II project will result in a well-defined deliverable prototype of the digital twin of a legacy aircraft for equipment integration and testing. The prototype will be able to simulate a wide range of scenarios and be validated through comparison to the actual aircraft. The prototype will provide a safer, more efficient, and cost-effective way to test and integrate new equipment with legacy aircraft. Finally, the commercialization potential of this project is significant, with a potential market among aerospace companies, government agencies, and military organizations."

PHASE III DUAL USE APPLICATIONS: The objective of the Phase III/Dual Use SBIR project will be to develop and commercialize the digital twin of a legacy aircraft for equipment integration and testing created in Phase II. The project will focus on transitioning the technology to government and commercial applications and achieving a high technology readiness level (TRL).

**Expected Phase III Effort**
The expected Phase III effort will involve developing and commercializing the digital twin technology for government and commercial applications. The technology will be refined and optimized to meet the specific requirements of these applications. The project will involve collaboration with potential customers and partners to identify their specific needs and develop a plan for commercialization. The

project will also involve seeking additional funding opportunities to further develop the technology and explore other potential applications in the aerospace industry.

**Expected TRL at Phase III Entry**
The expected TRL at Phase III entry is 9, which means the technology is fully developed, tested, and validated in relevant environments. The digital twin will have been tested and validated in a wide range of scenarios, and its accuracy and functionality will have been demonstrated through comparison to the actual aircraft. The technology will be ready for commercialization and deployment.

**Additional Transition Planning**
The additional transition planning for this Phase III project will involve identifying the government approvals required for the commercialization of the technology. The project team will work closely with the Department of Defense (DoD) to identify any necessary certifications, approvals, or standards that need to be met for the technology to be deployed in military applications. The project team will also work with potential commercial partners to identify any necessary certifications, approvals, or standards required for commercial deployment.

**Known Government Approvals Required**
The known government approvals required for this project will vary depending on the specific application and customer. However, potential approvals that may be required include certification by the Federal Aviation Administration (FAA) or the Department of Defense (DoD), compliance with relevant military standards, and approval by the appropriate government agencies.

**Additional DAF Customer Opportunities**
The additional DAF customer opportunities for this project include potential applications in military and commercial aviation. The digital twin technology can be used to improve the safety and performance of aircraft, reduce risk, save time and money, and increase efficiency. The technology can also be used for training and maintenance, providing a realistic and accurate representation of the aircraft that can improve safety and reduce errors during actual operations. The project team will work closely with potential customers and partners to identify additional opportunities for deployment and commercialization of the digital twin technology.

REFERENCES:

1. GAO-23-106453;

KEYWORDS: Digital twin; Legacy aircraft; Equipment integration; Testing; Virtual model; Accurate data; Physical dimensions; Risk reduction; Accredited digital simulation; Time and money saving; Realistic representation; Designing CAD; SysML files; B-52; Non Recurring Engineering cost reduction; Digital engineering; Model development

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VERSION 2

AF242-0002 TITLE: Modeling and simulation of large scale deployments of autononomous systems

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Integrated Network System-of-Systems; Human-Machine Interfaces

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic are:

1) To further progress towards the vision for swarms of UAVs outlined in the USAF Small UAS Flight Plan (2016-2036) (reference 1) and the DoD Small UAS Capability Description Document (draft - 2023). Those documents describe the potential mission impact that large numbers of affordable but capable UAVs could have. The Flight Plan also defines key system attributes and technical challenges as well as acquisition strategies that mitigate those challenges.
2) To further progress in this area the focus of this specific topic is on the modeling and simulation of autonomous systems at large scale in activities such as maritime surveillance, base defense, suppressing enemy air defense systems and supporting air operations.

DESCRIPTION: This topic focuses on modeling and simulation (M&S) of large scale deployments of autonomous system in support of military operations. The M&S efforts will use simple models of the platforms and sensors and focus on command and control (C2), communications requirements, collaboration between autonomous systems, tactics, techniques, and procedures (TTPs) and strategies for employment.

The primary driver for these simulations is the development of approaches to decentralized command and control of these systems including collaboration between small groups of autonomous systems with limited communication to higher level controllers.

The decentralized aspect is important because the goal is for autonomous systems to be able to coordinate their activities in small groups while operating under a set of higher level commands.
The initial use cases involve UAVs for maritime surveillance, but the modeling framework should be extensible to other types of autonomous systems. To stress the generality this topic description uses the phrase “drones” to mean any robotic system with some degree of autonomy.

PHASE I: Phase I award(s) will focus on defining architectures and implementation for modeling and simulation of decentralized command and control of autonomous systems at scale. The goals for this effort include defining an approach that aligns with the USAF primary system simulator, AFSIM. Ideally simulations done using the decentralized C2 simulator can be used to guide the higher fidelity simulations done using AFSIM.

Deliverables from this phase would include designs for simulation frameworks with open interfaces enabling developers of C2 and machine learning algorithms to incorporate their software into the simulations.

PHASE II: Phase II award(s) will focus on development and testing of the modeling and simulation environments, adding visualizations, developing common libraries for integration with data feeds, AI/ML and building human interfaces.

PHASE III DUAL USE APPLICATIONS: Collaborative autonomous systems will have a role in public safety, logistics and other commercial activities. Modeling and simulation of these capabilities will be necessary for successful employment. This technology will likely have a large impact on society in the next 5 to 10 years.
Commercial applications for mission planning, command and control and system test and verification would benefit from having a robust modeling and simulation capability.

REFERENCES:

1. USAF Small UAS Flight Plan (2016-3036) https://apps.dtic.mil/sti/pdfs/AD1013675.pdf;
2. DoD Small UAS Capability Description Document (DOD SUAS CDD);
3. Papers by PLA researchers;


KEYWORDS: UAV;drone;swarm;digital engineering;mbse;model-based systems engineering;autonomy

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VERSION 2

AF242-0003 TITLE: Acoustic Recorders for Persistent High-Altitude Sensing

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber

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 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: High altitude balloons occupy the 'middle ground' between the Earth's surface and space because they can capture signatures that are difficult to record from either ground stations or satellites. Over the last decade, acoustic sensors on high altitude balloons have captured a diverse set of phenomena, including rocket launches, aircraft, spacecraft reentry, ground explosions, earthquakes, thunder, wind turbines, and even freight trains.

However, these sensors have consisted of repurposed ground micro barometers that have relatively high intrinsic noise levels. Currently there are no high quality, low size, weight, power and cost (SWaP-C) commercially available acoustic sensors with the required sensitivity and environmental resilience for use in the low atmospheric pressures and extreme temperatures found at high altitudes.

Adding an acoustic sensor to a HAB sensor suite will enable the detection, tracking and identification of ships and aircraft, even when they maintain radio silence, because their acoustic signatures are detectable at long ranges in the stratosphere. Currently, most acoustic recorders used on HABs were designed for use at the Earth's surface, where wind noise is much greater and therefore intrinsic sensor noise is less important. In contrast, background noise levels is extremely low on free floating balloons, far lower than would ever be realized on the ground.

This effort is related to existing infrasound detectors deployed around the world at ground level for the detection of explosions (chemical and nuclear) as well as seismic events.

DESCRIPTION: The work that would be accomplished in this specific topic would result in a new class of sensor that when deployed on a high altitude balloon (HAB) would enable the detection and tracking of aircraft, ships and other sources with acoustic signatures such as explosions, rocket launches, space object re-entry.

The proposed work would result in a combined acoustic sensor/accelerometer package meant for high altitude balloons. The sensor would be capable of recording faint sound waves emanating from distant sources and utilizing the accelerometer to determine the direction of origin of the signal. This would permit the detection, tracking, and identification of human and natural phenomena such as chemical and nuclear explosions, aircraft, ships, hypersonic objects, meteors, volcanic eruptions, and earthquakes. Additional diagnostics such as the existence and state of health of infrastructure such as bridges, dams, and industrial facilities could be collected also.

These acoustic sensors are expected to be lightweight with low power requirements. Most of the sensor data processing can be performed at the sensor reducing the data bandwidth requirements.

These sensors could be an important part of the growing interest in HABs for surveillance, electronic warfare, and communications support. Because of their small size, low weight, low power requirements and low cost, combined with their ability to provide information on a wide range of activity and threats, they could be used on almost all HAB platforms. The intent is to make it simple to add the sensor to existing HABs with larger payloads, thereby developing an acoustic network from already-extant constellations. The sensor package could be flown on small, dedicated balloons as well.

PHASE I: In Phase I, awardee(s) will produce a preliminary design with resource requirements, performance, and cost estimates.

Included in the resource requirements are size, weight and power for both the sensor and any on-board processing. To reduce data communication requirements most signal processing will need to be done on board.

The performance estimates include sensitivity and noise level across from infrasound (0.1 Hz) to the lower-mid range of human hearing (1 kHz), as well as the accuracy of direction of arrival measurements. Cost estimates should include low volume initial production costs as well as estimates for a commercial product.

PHASE II: During Phase II the awardee(s) would complete its preliminary designs from Phase I, develop prototype that can be evaluated in altitude chambers and on short duration high altitude balloon flights and incorporate the results of these tests into low-rate initial production articles for testing. The proposed high altitude platform is the Sandia heliotrope solar hot air balloon, which can deliver a payload of up to 2 kg at the target altitudes for several hours of level flight. This is a standard platform for high altitude infrasound sensing. Multi-day high altitude balloon flights would be used for operational testing of the test articles. The results of the operational testing would be incorporated into designs that would become commercial products under a Phase III award.

Because these devices should be relatively inexpensive and fairly well understood it is reasonable to accomplish this during a Phase II contract.

PHASE III DUAL USE APPLICATIONS: During Phase III the acoustic sensors would become a commercial product available for use by DoD and IC, and potentially our allies, on high altitude balloon flights to refine their concept of operational employment and tactics, techniques and procedures.

The Army and Navy use of high altitude balloons would likely benefit from incorporating acoustic sensors on their platforms.

Having acoustic sensors on multiple high altitude balloons in a region results in better geolocation of targets. Follow-on efforts to develop algorithms for exploiting acoustic data from multiple sources would enhance the utility of this data.

REFERENCES:
1. Silber, S. A. and Bowman, D. C. (2023). Detection of the Large Surface Explosion Coupling Experiment by a sparse network of balloon-borne infrasound sensors. MDPI Remote Sensing 15, 542.
2. Bowman, D. C., Rouse, J. W., Krishnamoorthy, S. and Silber, S. A. (2022). Infrasound direction of arrival determination using a balloon-borne aeroseismometer. The Journal of the Acoustical Society of America – Express Letters 2 (5)

3. Garcia, R. F., Klotz, A., Hertzog, A., Martin, R., Gérier, S., Kassarian, E., Bordereau, J., Venel, S. and Mimoun, D. (2022) Infrasound from large earthquakes recorded on a network balloons in the stratosphere. Geophysical Research Letters 49 (15), e2022GL098844
4. Bowman, D. C. and Albert, S. A. (2018). Acoustic Event Location and Background Noise Characterization on a Free Flying Infrasound Sensor Network in the Stratosphere. Geophysical Journal International 213, p. 1524-1535;

KEYWORDS: high altitude balloons;stratospheric sensors;acoustic sensor;infrasound;microbarometer;remote sensing

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VERSION 2

AF242-0004 TITLE: Intelligent Traffic Management System (ITMS)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Sensing and Cyber; Integrated Network System-of-Systems; Human-Machine Interfaces

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 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 proposed topic is to develop an integrated Intelligent Traffic Management System (ITMS) that addresses the complex traffic management needs of Joint Base San Antonio (JBSA) and significantly improves the efficiency and security of base access across 502 ABW installations. The ITMS will seamlessly integrate with our existing infrastructure, providing real-time, automated gate traffic status updates to base personnel and visitors, while minimizing gate congestion, reducing security risks, and improving the overall user experience.

DESCRIPTION: The ITMS will leverage commercial industry best practices, and be capable of handling high-volume traffic during peak hours, as well as the surges in traffic experienced during our Basic Military Training Graduation ceremonies. By leveraging geolocation technology, the ITMS will guide personnel and visitors to the most efficient gate based not only on their proximity but also on real-time traffic conditions and wait times. This capability will maximize base access efficiency, reduce congestion, and improve satisfaction among base personnel and visitors alike.

In addition, the system will also enhance base security by detecting and reporting attempted pedestrian and wrong-way entrances, providing invaluable input to the Base Defense Operations Center (BDOC), Crisis Action Team (CAT), Command Post (CP), and Public Affairs (PA).

The ITMS needs to be accessible through the JBSA App or similar API, and will integrate with the AF Connect application. The system will also ensure compatibility with our existing traffic management systems, such as DBIDS and Cameras, facilitating seamless integration and a more efficient traffic management process.

Finally, the ITMS will be compliant with DoD Cybersecurity Policies, including RMF, NIST 800-53 and 800-171 and incorporate effective user management capabilities, allowing us to establish separate permissions for JBSA personnel and visitors, thereby ensuring appropriate Force Protection. With the capacity to identify or utilize AF Connect for data storage, the system will handle high volumes of traffic data securely and efficiently, enhancing the overall effectiveness and operational security of our base."

PHASE I: The principal objective of Phase I is to gauge the scientific and technical value and feasibility of the proposed Intelligent Traffic Management System (ITMS) within the operational environment of Joint Base San Antonio (JBSA). This phase involves a rigorous review and evaluation of existing technologies, with the aim of identifying viable solutions that can address the specific needs of JBSA. Key aspects of this evaluation include real-time traffic management, geolocation-based direction, integration with existing systems, and security enhancements.

VERSION 2

Following the comprehensive technology evaluation, the phase moves towards conceptualizing the ITMS. This involves designing a preliminary model that aligns with JBSA's unique needs, incorporating critical features like real-time traffic reporting, geolocation services, pedestrian and wrong-way detection, as well as seamless integration with systems like DBIDS, Cameras, and platforms such as JBSA App and AF Connect. The culmination of this phase will be a thorough feasibility analysis of the preliminary ITMS design, providing vital insights for Phase II development.

Examples of information included in the feasibility study:
Current Commercial Solutions Evaluation: The initial part of the project will involve conducting a thorough review of existing traffic management solutions to understand their capabilities and limitations, and to see how they can be applied to JBSA's specific needs.

Requirement Mapping and Technology Evaluation: The project team will match the specific requirements of JBSA to potential technologies that could be part of the ITMS. This step will help identify the best technologies for the project and highlight any areas that might need custom solutions.

Conceptualization and Preliminary Design: A preliminary design for the ITMS will be developed based on the requirements and the identified technologies. This design will include key features like real-time traffic reporting, integration with existing systems like DBIDS, Cameras, and security measures like pedestrian/wrong-way detection.

Feasibility Analysis: An in-depth feasibility analysis will be conducted to identify potential barriers and risks, assess economic viability, and ensure that the design is in alignment with JBSA's operational practices and timelines.

Use Cases: The project will consider various use cases, including peak traffic management, security enhancement, system integration, user management, and data handling. These use cases will help evaluate the system's ability to meet JBSA's needs effectively."

PHASE II: Building upon the groundwork of Phase I, Phase II's primary objective is to propel the Intelligent Traffic Management System (ITMS) from concept to a comprehensive, tangible prototype. This phase is vital in demonstrating the scientific, technical, and commercial merit of the ITMS for Joint Base San Antonio (JBSA). This stage involves intensive research and development, solidifying design, software programming, testing, and verification processes.

Objectives and Expectations for the Phase II Period of Performance

Technical Design Refinement: Leveraging the insights from Phase I, the project team will refine and finalize the ITMS design. This involves addressing potential limitations identified in the feasibility analysis and integrating suggestions from the JBSA personnel and stakeholders.
Prototype Development: The approved design will be transitioned into a fully functioning ITMS prototype. The prototype will incorporate essential features like real-time traffic management, geolocation-based directions, integration capabilities with existing systems, pedestrian/wrong-way detection, and user management.

System Testing: The developed prototype will undergo rigorous testing to ensure its functionality, performance, compatibility with existing systems, and overall robustness. Any bugs or glitches identified will be addressed and rectified in this stage.

Prototype Deployment and Field Validation: Post the successful completion of system testing, the ITMS prototype will be deployed in a controlled setting within JBSA for a pilot run. The field validation will provide crucial insights into the system's effectiveness and any unforeseen challenges in a real-world environment.

Prototyping Expectations

Operating Parameters: The ITMS should efficiently handle peak and off-peak traffic conditions, provide accurate real-time traffic updates, and suggest the most efficient routes for personnel and visitors. It should also reliably detect pedestrian and wrong-way movements.

Testing Requirements: The prototype should undergo comprehensive functional, compatibility, performance, and stress testing. This will ensure the system's readiness for full deployment, its integration with JBSA's existing infrastructure and systems, and its performance under varying loads.

Success Criteria: The ITMS prototype's success will be determined by its ability to meet all technical specifications, its effectiveness in managing traffic, its seamless integration with existing systems, its user-friendly interface, and positive feedback from JBSA's personnel and visitors during the pilot deployment.

Phase II aims to deliver a robust and fully functional ITMS prototype that can be deployed to enhance the traffic management and security at JBSA, contributing significantly to improving the base's overall efficiency and safety. The successful implementation of this phase sets the stage for Phase III, which focuses on DoD cybersecurity compliance, fielding and full-scale deployment of the ITMS across JBSA."

PHASE III DUAL USE APPLICATIONS: Phase III of the Intelligent Traffic Management System (ITMS) is focused on transitioning the system from a validated prototype to a fully operational and commercialized product, which is to be deployed across the Joint Base San Antonio (JBSA). At the onset of this phase, the system will be at a Technology Readiness Level (TRL) 7 or higher, demonstrating its readiness for operational deployment. The efforts of this phase will encompass fine-tuning of the system based on Phase II feedback, preparation for commercialization, large-scale deployment across JBSA, and provision of post-deployment support for maintenance and continuous improvement.

An integral part of this phase is adhering to DoD cybersecurity processes, thus ensuring the system's robust security and resilience to cyber threats. This includes obtaining an Authority to Operate (ATO), which underscores the ITMS's compliance with federal security directives and its readiness to operate within the DoD network.

REFERENCES:

1. Air Force Instruction (AFI) 35-101, Public Affairs Responsibilities and Management;
2. Air Force Instruction (AFI) 31-101, Integrated Defense;
3. Department of Defense Instruction (DoDI) 2000.16;

KEYWORDS: Traffic Management System; Real-Time Data; Geolocation; Base Security; User Management; Data Integration; Automated Reporting; Sensor Technology; Infrastructure Modernization; Facial Recognition

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VERSION 2

AF242-0005 TITLE: Next Generation Field Calibration Suite for Radiometric Sensors

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic is to design and construct a system that provides a mobile trailer, outfitted with an array of extended blackbody sources with aperture areas of 24”x24” or greater, for the purpose of field reference calibration data for radiometric imagers.

DESCRIPTION: Radiometric Imager calibrations are required for accurate signature data of air and ground targets, as well as airborne strategic expendables (e.g., flares and chaff). Calibration requires a truth source called a blackbody that emits heat across an extended panel.
The goal for this project is to provide better truth sources, with more pixels on source for banded radiometers on the test range.

The requirement is a mobile lab with an array of six to eight black body source panels, each with an extended area aperture of 24” or greater and a temperature range of a temperature span from ambient to 600° C variable by panel. Temperature readings and controls need to be controllable from a remote interface located in the imagers control area.

The blackbody should be installed in a manner that makes them visible by a tracking mount holding radiometric imagers at a minimum distance of 100 yards. Blackbody sources should have a probe well for the purpose of self-calibration and temperature reading verification.

PHASE I: Awardee(s) will determine the feasibility of mounting large frame blackbodies to a mobile structure. Questions for which answers will be sought include:

1. What blackbodies will be used to meet our requirements?
2. What type of mobile platform to carry the blackbodies?
3. How will the blackbodies be controlled remotely? What operating and maintenance requirements would be involved in the upkeep of the system?

PHASE II: The questions answered in Phase l will serve as the foundation for the prototype delivered in Phase ll. The prototype will be some sort of ground based trailer, towed by a government pick up truck, and capable of housing the required blackbodies.

PHASE III DUAL USE APPLICATIONS: The proposed trailer can be adapted to fit a wide variety of needs within the DoD. The device will also provide valuable data that could be of interest to various academic institutions and weather organizations. In Phase lll, efforts will be made to identify any other organizations who might be interested in using this device.

REFERENCES:

VERSION 2

1. Berk, A., P.K. Acharya, L.S. Bernstein, G.P. Anderson, P. Lewis, J.H. Chetwynd, and M.L. Hoke, "Band Model Method for Modeling Atmospheric Propagation at Arbitrarily Fine Spectral Resolution";

KEYWORDS: Infrared; Blackbody; Calibration; longwave Infrared; MWIR; LWIR; UV; ASTE; IRCM; Signature; Radiometric; Radiometer; Extended Area; Aperture; Radiation; Emitter

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VERSION 2

AF242-0006 TITLE: Fast-Response Flow Meters for Onboard Systems (Harsh Chemicals)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber

OBJECTIVE: To develop a fast-time-response, low flow-impedance, flow meter compatible with a pyrophoric fluid such as Tri-ethyl Aluminum (TEA) that has a small form factor and is easily integrated with standard stainless-steel tubing for use as flight hardware.

DESCRIPTION: Pyrophoric liquids such as triethylaluminum are currently being used in the Towed Airborne Plume Simulator (TAPS) to simulate the plumes of surface to air missiles in order to test aircraft missile warning systems. The flow rate of the pyrophoric liquid is controlled to simulate the temporal behavior of the intensity of a missile plume. The radiometric intensity produced by TAPS burner is strongly proportional to the flow rate of the pyrophoric fuel controlled through a specialized valving system. The system currently is lacking an accurate method of measuring the pyrophoric liquid flow rate during the TAPS burner operation. Measuring this flow rate during a burn will allow control system improvements and provide valuable diagnostic and health information. Flow sensors are unavailable that meet the requirements for time response, flow rate range, and compatibility with pyrophoric fuels which ignite upon the presence of oxygen. The viscosity of the target fluids is 2-3 centipoise. It is preferred that the solution be non-intrusive, having no effect on the flow; otherwise, having minimal impedance to the flow. Digital and analog outputs are desired to provide maximum flexibility with control and data systems.

The sensor must be repeatable and have sufficient linearity to be capable of being absolutely calibrated. The flow meter must meet current turbine flow meter specifications using low pressure-drop methods and with a relatively small form factor. The flow meter must be capable of being non-destructively operated with gaseous (typically air or nitrogen) flow when the liquid is not present. The flow meter must be able to withstand harsh vibration and temperature (roughly -40 °F to 120 °F) environments without significant degradation in performance. The flow meter must be designed with modular replacement and installation in mind.

The desired performance characteristics include:
-Repeatability of ±0.2% of reading (threshold), ±0.04% of reading (objective), ±0.02% of reading (stretch goal)
-Linearity of ±0.5% and ±0.1% using software (threshold), ±0.2% and ±0.05% using software (objective), ±0.05% and ±0.01% using software (stretch goal)
-Calibration Uncertainty of ±0.5% of reading (threshold), ±0.2% of reading (objective), ±0.05% of reading (stretch goal)
-Accuracy of ±0.4% of reading + 0.2% of full scale (threshold), ±0.2% of reading + 0.2% of full scale (objective), ±0.1% of reading + 0.1% of full scale (stretch goal)
-Response Time to Step Change in Flow Rate of ≤ 4 millisecond (threshold), ≤ 1.0 millisecond (objective), ≤ 0.2 millisecond (stretch goal)
-Flow Range of 0.05 to 5 gal/min (threshold), 0.05 to 10 gal/min (objective), 0.05 to 30 gal/min (stretch goal)
-Power Supply Voltage to be fixed input in the range of 5 to 30 VDC (threshold), uses any arbitrary voltage in the range from 5 to 24 VDC (objective), uses arbitrary voltage in the range from 303 to 52 VDC (stretch goal)
-Effective output Resolution of 2048 levels (threshold), 4096 levels (objective), 8192 levels (stretch goal)
-Maximum Power Usage of 100 Watts (threshold), 10 Watts (objective), 1 Watt (stretch goal)
-Size of 6”x3”x1” (threshold), 4”x2”x1” (objective), 2”x2”x0.5” (stretch goal)
-Maximum Operating Pressure of 130 psi (threshold), 160 psi (objective), 180 psi (stretch goal)
-Tubing Size of 0.5” to 1.0” (threshold), 0.25” to 2.0” (objective), 0.25” to 3” (stretch goal)

-Materials of Construction of 304/306 stainless steel (threshold), 304/306 stainless steel (objective), Performance alloy (stretch goal)
-Performance Life of 10,000 hours (threshold), 50,000 hours (objective), 100,000 hours (stretch goal)

PHASE I: Awardee(s) will develop a proof of principle design concept that satisfies the aforementioned requirements. Awardee(s) will research current methodologies and COTS components to conceptualize a prototype flowmeter. Awardee(s) will verify any potential high technical risk elements through analysis or empirical demonstration and assess potential points of failure and uncertainty of the measurement.

PHASE II: Awardee(s) will develop of a flow meter that meets the space, power, and packaging requirements of the flight-ready TAPS system. Awardee(s) will demonstrate flow meter performance in a relevant environment for up to 100 hours or until failure. Awardee(s) will sequentially evaluate three additional working prototype systems incorporating lessons learned to achieve a sufficiently robust and reliable flow meter technology that meets all objective requirements and/or stretch goals.

PHASE III DUAL USE APPLICATIONS: Awardee(s) can expect to formalize the production process and design the appropriate machinery/infrastructure to support full-scale commercial production.

REFERENCES:

1. Clark C, Zamora M, Cheesewright R, Henry M, “The dynamic performance of a new ultra-fast response Coriolis flow meter”, Flow Measurement and Instrumentation 17 (2006), pp391-98, doi:10.1016/j.flowmeasinst.2006.07.002;
2. Coriolis Flowmetering Technology: Theory and Practice: https://eng.ox.ac.uk/airg/research/coriolis-research/;
3. Commercial Flow Meter (less than 4 ms response time, gaseous flow only) https://www.axetris.com/en-fr/mfd/products/mass-flow-meter;
4. Commercial Flow Meter (20 ms response time, liquid flow, measures line pressure and temperature as bonus feature) https://www.instrumart.com/brand-category/994/3049/alicat-scientific-flow-meters?gad_source=1&gclid=EAIaIQobChMImMO3lMXEgwMVbDPUAR2mrQNZEAAYASAAEgJLJvD_BwE;


KEYWORDS: flow meters; pyrophoric; flow measurement; turbine meter; positive displacement meter; vortex shedding meter; magnetic meter; ultrasonic flow meter; Coriolis type; thermal meter

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VERSION 2

AF242-0007 TITLE: Rotor High Speed Imaging System

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber

OBJECTIVE: Develop a high-speed imaging system synchronized with the rotation of a rotor hub that will allow visualization of a “still” image of the hub and its instrumentation while the rotor is spinning and with the ability to control the rotational position of the hub as it is displayed in the “still” image.

DESCRIPTION: Reduction in Lost Test Time (LTT) through application of new health monitoring capability for rotorcraft testing. NFAC rotorcraft tests utilize hundreds of research data signals and rely on real time health monitoring to ensure safe operations. Much of the instrumentation used for health monitoring is mounted in the rotating frame. Cables transfer the analog signals to the fixed frame through a slip ring. There are often multiple wire harnesses and connector unions near the root end of each rotor blade that are tied off and secured to the rotor hub to prevent centrifugal forces and vibrations from fatiguing the wires to failure. Despite substantial efforts to secure wires pre-test, the likelihood of repair work at some point during a test is high. There is currently no way to detect the onset of a failure in real time until a signal becomes intermittent or is lost, which means damage has already been experienced and LTT is incurred. A high-speed imaging system synchronized with the rotation of a rotor hub that will allow the test team to visualize a “still” image of the hub and its instrumentation while the rotor is spinning with the ability to control the rotational position of the hub shown in the “still” image. This capability would provide visualization of wiring issues before more significant damage occurs.

PHASE I: Awardee(s) will develop a proof of principle design concept that satisfies the aforementioned requirements based upon research of current methodologies and COTS components to conceptualize a prototype system. Identify potential high technical risk elements through analysis or empirical demonstration and assess potential points of failure and uncertainty of the measurement. If possible, awardee(s) will demonstrate the feasibility of the approach in a laboratory environment.

PHASE II: Awardee(s) will develop a prototype system that meets the listed requirements, demonstrate the performance in a relevant environment and provide an appropriately ruggedized protype appropriate for permanent installation in the NFAC facility. Awardee(s) will assist NFAC personnel in fully integrating the system into existing NFAC video system that allows system control and image display in the NFAC control room.

PHASE III DUAL USE APPLICATIONS: This system technology could have applications for rotor system visualization in other ground-testing or flight-testing environments. At NFAC, this type of system could evolve from a health monitoring system to a data acquisition system depending on the research objectives of a test entry.

REFERENCES:

1. "Deformation Measurements of Helicopter Rotor Blades Using a Photogrammetric System”. Chenglin Zuo *, Jun Ma, Chunhua Wei, Tingrui Yue and Jin Son.


KEYWORDS: high speed photography; rotor hub; rotor system

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VERSION 2

AF242-0008 TITLE: Fire Ignition Video Analysis Tool

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Advanced Computing and Software; Advanced Materials

OBJECTIVE: Awardee(s) will develop a thermal video analysis tool capable of temporal and spatial discrimination of fragment flash and armor piercing incendiary (API) projectile function cloud in three dimensions using data from both high-speed visual and infrared camera systems.

DESCRIPTION: Work has been underway for many years to understand the fire ignition phenomena in aircraft dry bays (void spaces) from the interaction of an impacting ballistic threat with a flammable fluid container such as a fuel tank. These threats include fragments produced by a warhead detonation, which cause a vaporific flash when impacting aircraft structural materials, or API projectiles, which result in release and ignition of incendiary material upon impact. The fragment or core of the projectile can penetrate the fluid container, releasing the fluid into a dry bay where the flash or incendiary functioning is occurring, and the overlap of these events results in an onboard fire. A fire ignition can start rapidly when the fluid is first spurting from the tank. During ballistic testing, many methods have been used to visualize the flash or function interaction with the leaking fuel. Both visual and infrared high-speed cameras have been used to capture the event as it unfolds. However, analysis of the event is difficult and subject to many variables, even when multiple cameras are employed from various angles and with multiple camera settings. Even with the presence of thermocouples and calibrated infrared cameras, it is very difficult to accurately capture temperature at precise locations over time. Both the timing and physical overlap in space of the flash/function and fuel are critical. Various data processing tools have been used to examine this issue, but identification of the size, location, volume, and relative intensity of the flash/function is very difficult. The presence of ignited material particles from the threat and spall from impacted aircraft surfaces makes characterization of the event even more difficult.

This SBIR Phase I effort will focus on demonstrating a post-test processing tool for capturing both temporal and spatial characteristics of the flash/function cloud in relation to leaking fuel, so more informed models can be developed to predict fire ignition. The tool must help distinguish between the presence of the flash/function and the origin of fire ignition. This requires a more accurate characterization of the flash/function cloud, including the size, location, volume and intensity of areas of the cloud. The final tool must not only provide this characterization but must be able to track the presence and relative location of leaking fuel, particularly as it interacts with the cloud. This tracking must be possible in both low and bright light conditions. It must also provide a means for observing the event with both visual and infrared high-speed camera data and being able comparing and contrast these data.

PHASE I: Awardee(s) will conduct a literature review and feasibility study to determine capability to characterize ballistic fragment flash and API projectile function size, location, volume, and relative intensity over time, while observing leaking fuel during dry bay fire testing.

PHASE II: Awardee(s) will design, develop, and demonstrate a software tool capable of characterizing the temporal and spatial characteristics of ballistic fragment flash and API projectile function, an ability to distinguish these characteristics throughout the flash/function duration, identification of adjacent fuel leakage temporal and spatial characteristics, overlap of the two elements, and timing and location of fire ignition with minimal manual manipulation.

PHASE III DUAL USE APPLICATIONS: Development of this tool will enable greater characterization of other ballistic event phenomena, such as warhead threat detonation and fragmentation, and hydrodynamic ram. It could also have commercial potential for forensic investigation of events recorded by video imagery.

VERSION 2

REFERENCES:

1. Choi, J.; Han, T.; Lee, S.; Song, B. “Deep learning-based small object detection.” J. Inst. Electron. Inf. Eng. 2018, 55, 57–66.
2. Kim, H.; Park, M.; Son, W.; Choi, H.; Park, S. “Deep Learning based Object Detection and Distance Estimation using Mono Camera.” J. Korean Inst. Intell.t Syst. 2018, 28, 201–20.

KEYWORDS: ballistic threat; flash; function; incendiary; fire ignition; temporal; spatial

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VERSION 2

AF242-0009 TITLE: Graphene CBRN Overgarment

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Emerging Threat Reduction; Mission Readiness & Disaster Preparedness; Nuclear; Sustainment & Logistics; Military Infectious Diseases

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 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: By using Graphene, provide a two-part CBRN Protective overgarment with the first part protecting the wearer from most if not all CBRN agents while reducing the weight and thermal load of the overgarment. The second part will be using Graphene to create ballistic plating up to level III+ while weighing a fraction of what current level III+ plates (roughly between 4-11 pounds). With the reduced weight it would allow the wearer to don more protective pieces to areas such as the arms, legs, and other body parts.

DESCRIPTION: Results of breakthrough times for the Graphene suit against CBRN agents and compare them to the current protective overgarment as well as comparing the results to Level B and Level A Chemical suits used in HAZMAT.

Ballistic test results for the lighter weight level III+ plates showing that the Graphene plates can meet or exceed the standard of current plates.

PHASE I: Awardee(s) will determine if a Graphene composite is a suitable replacement by testing CBRN agents against the material while measuring breakthrough times. The 1st part of the suit should be a cloth like graphene composite allowing maneuverability for the wearer. Items to be used for testing will be precursors to CWAs as well as the most lethal final product that can be legally obtained for testing purposes before it is sent to Dugway Proving grounds.
The 2nd part or outer layer of the suit will be made out of a Graphene/Polymer composite for ballistic protection only and does not need to protect the wearer from CBRN agents as that is what the 1st layer is designed for.

PHASE II: Awardee(s) will develop a proof-of-concept prototype.
The 1st layer of should be able to incapsulate most of the members body ideally being like that of a hooded dive suit however not as tight.

The 2nd layer should allow for further body coverage without sacrificing maneuverability as well as negating the need for Kevlar further reducing the weight while still maintaining shock absorption properties of Graphene.

PHASE III DUAL USE APPLICATIONS: Awardee(s) can expect to develop commercialization of the suit, manufacturing methods, cost analysis, and finalize the suit's capabilities. This phase will require involving other branches of service per public law 103-160. For this idea to be approved it must become a joint program with validated research from each branch of service. After the research is conducted every branch of service must agree to the use of the suit before acquisitions take place to replace the JSLIST.

VERSION 2

REFERENCES:

1. S. Bhattacharjee; R. Joshi; A.A. Chughtai; C.R. McIntyre; “Graphene Modified Multifunctional Personal Protective Clothing”. Adv Mater Interfaces, 2019 Nov 8; 6(21): 1900622.

KEYWORDS: Graphene; CBRN; Defense

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VERSION 2

AF242-0010 TITLE: All-Passive Nonreciprocal Power Limiters

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Quantum Science; Advanced Materials; Microelectronics

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 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: Design, fabricate and characterize a new category of optical nonlinear metasurfaces operating as asymmetric power limiters. Such devices will be important for the protection of sensitive equipment from external interference, in particular waves from different directions in free space. The use of nonlinear effects will allow the proposed devices to be all passive, without the need of external biasing fields or signals, in contrast to other approaches for designing nonreciprocal devices, which are based on magnetic biasing or modulation with electrical signals. Furthermore, they will be ultra-thin and light-weight, making them suitable for mobile applications. The nonreciprocal response will provide an isolation larger than 10 dB, an insertion loss in the order of 1 dB over a large range of input powers and angles of incidence.

DESCRIPTION: Nonreciprocal devices are very important components for civilian and defense communication systems, in order to protect sensitive components from external interferences. Such devices are conventionally realized through magnetic materials under static magnetic fields, but this approach is accompanied by several problems, including the scarcity of magnetic materials, the large size and weight of the magnets required for the magnetic biasing and the incompatibility of magnetic materials with integration technologies. For this reason, the design of magnet-free nonreciprocal devices has recently attracted a lot of attention, with the majority of proposed approaches based on spatiotemporal modulation of appropriately designed circuits. However, these approaches often require external modulation sources, which may not be an option for applications where availability to external power supply is limited. For these cases, reciprocity can be broken by combining spatial asymmetries with nonlinear responses. In particular, including nonlinear effects in asymmetric resonators, it is possible to achieve very large transmission from one side and very small from the opposite one for sufficiently strong input signals. This call explores the application of these concepts to metasurfaces for free space isolation, protection and radiation hardening, and power limiting, operations of great importance for DoD applications.

PHASE I: Awardee(s) will explore the modelling and designing of nonlinear optical metasurfaces operating as free-space asymmetric power limiters. Analytical models to understand the underlying physics and full-wave simulations to develop optimum designs will be carried forward. Phase I awards should include preliminary fabrication experiments that demonstrate the feasibility of the approach and benchmarks on the improved properties.

PHASE II: In the Phase II effort, the design and fabrication process identified in Phase I will be evolved towards improving several metrics of the devices, including bandwidth, insertion loss, nonreciprocal power range and incident angles range. Towards this direction, different approaches, including multi-layer and multi-resonant metasurfaces will be explored, and realization of an optimal prototype will be carried forward.

PHASE III DUAL USE APPLICATIONS: The Phase III work will demonstrate the repeatability of the fabrication process and the feasibility of the proposed approach for large scale fabrication. A partnership with industry to commercialize the technology will be created. Beside the applications across all branches of the armed forces, civilian applications of this technology will be explored, including communication systems, laser protection, etc. Furthermore, exploration of these concepts for the realization of broadband and broad-angle power limiter metasurfaces will be investigated.

REFERENCES:

1. Lax B. & Button K. J. Microwave ferrites and ferrimagnetics (McGraw-Hill, 1962).
2. Estep, N., Sounas, D. L., Soric, J. & Alu, A. “Magnetic-free non-reciprocity based on parametrically modulated coupled-resonator loops,” Nature Physics 10, 923-927 (2014).
3. J. Soric, D. L. Sounas, and A. Alù, “Non-Magnetic, Non-Linear Radio-Frequency Isolator with Large Isolation and Small Insertion Loss,” in 2016 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, Fajardo, Puerto Rico, June 26 - July 1, 2016.;

KEYWORDS: Power limiter; nonreciprocal; chip scale; nonlinearity; modulation; isolation; interference

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VERSION 2

AF242-0011 TITLE: Chip scale resonant sensors

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Microelectronics; Quantum Science; Advanced 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 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: Design, fabricate and characterize a new category of optical sensors with reduced dimensions that can operate with high sensitivity and spectral selectivity using highly resonant photonic devices.

DESCRIPTION: Compact sensor chips engaging guided-mode lattice resonance effects are of high utility in quantitatively detecting biological analytes and chemical species. Compact chips with high well densities can be economically and expeditiously fabricated with nanoimprint methods. Recently discovered are new radiation properties enabled by defects in resonant photonic lattices (PL). Incorporating a defect breaks the lattice symmetry and generates radiation through stimulation of leaky waveguide modes near the non-radiant bound (or dark) state spectral location. It has been shown that the defects produce local resonant modes that correspond to asymmetric guided-mode resonances in spectra and near-field profiles. Without a defect, a symmetric lattice in the dark state is neutral, generating only background scattering. Incorporating a defect in the PL induces high reflection or transmission by robust local resonance radiation depending on the background radiation state at the bound state in the continuum (BIC) wavelengths. The sensing properties of resonance lattices incorporating defects are unexplored. The defect inclusions can be designed to host quantum states. Analogous methods have significant potential to enable new modalities of radiation control in metamaterials and metasurfaces based on defects including enablement of new sensing modalities via combined classical and quantum effects.

PHASE I: Awardee(s) will design a chip scale resonant sensor compatible with standard semiconductor nanofabrication platform:

1. Select optimal materials and chemistry for IR operation.
2. Apply detailed electromagnetic design methodology to achieve a leaky wave resonant sensor design that provides superior sensing performance.
3. Evaluate expected operational capabilities versus conventional sensors, including evaluating the efficiency and signal-to-noise ratio.
4. Develop a lithography and nanoimprint plan for a phase II effort which would involve building the sensor.

The sensor developed in this effort will demonstrate the feasibility of directly integrating these sensors into current and future DoD systems for operational and cost improvements.

PHASE II:

1. Build grating based sensor processing line specifically for resonant fabrication. Perform experimental verification of the proposed materials in the appropriate spectral regime. This would include testing and quality control on all steps of the lithography and chemical depositions processes to verify the range of realizable sensitivity.

2. Refine/update and further optimize the designs using experimentally derived material properties and numerically verify the designs using full-wave electromagnetic modeling software.
3. Fabrication of three or more of the optimized designs. Multiple fabrication rounds will be performed to optimize the fabrication of the sensors.

PHASE III DUAL USE APPLICATIONS: Partner with a DoD prime contractor to develop a fabrication process that is compatible with their current (or planned) IR sensors. Integration will demonstrate the SWaP-C compared to conventional systems. A statement of work and deliverables will be identified in conjunction with AFRL and prime partner.

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1. Ko YH, Magnusson R. Radiation control by defects in dark-state resonant photonic lattices. Opt Lett. 2023 Jun 15; 48(12):3295-3298. doi: 10.1364/OL.493721. PMID: 37319085.
2. S. Noda, K. Kitamura, T. Okino, D. Yasuda and Y. Tanaka, "Photonic-Crystal Surface-Emitting Lasers: Review and Introduction of Modulated-Photonic Crystals," in IEEE Journal of Selected Topics in Quantum Electronics, vol. 23, no. 6, pp. 1-7, Nov.-Dec. 2017, Art no. 4900107, doi: 10.1109/JSTQE.2017.2696883.
3. Azzam, S. I., Kildishev, A. V., Photonic Bound States in the Continuum: From Basics to Applications. Adv. Optical Mater. 2021, 9, 2001469. https://doi.org/10.1002/adom.202001469
4. Dominic Bosomtwi, Viktoriia E. Babicheva, Beyond Conventional Sensing: Hybrid Plasmonic Metasurfaces and Bound States in the Continuum, Nanomaterials, 10.3390/nano13071261, 13, 7, (1261), (2023).

KEYWORDS: Bound in continuum; sensor; nanophotonic; leaky wave; resonant; grating

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AF242-0013 TITLE: Outer Mold Line Material Condition Probe

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced 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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This topic seeks to develop and commercialize a capability for assessing the material condition of aircraft outer mold line (OML) topcoat paint systems, in the form of a handheld, lightweight, and easy-to-use measurement probe.

DESCRIPTION: The Department of Defense is interested in exploring technology solutions to inform fleet-level decisions on repainting schedules for air vehicles, in accordance with a transition from traditional schedule-based maintenance to condition-based maintenance (CBM) for the visual appearance of air vehicles. The work to be accomplished under the SBIR funding includes the development and commercialization of a handheld, lightweight, and easy-to-use measurement probe for assessing the material condition of aircraft outer mold line (OML) topcoat paint systems. The topic seeks to develop this capability in order to provide data to inform air vehicle repainting schedule decisions. Proposed technology solutions must be rugged and easy to operate in a flightline and/or hangar environment with minimal training/re-training and qualification requirements. Ideally, self-calibration or user calibration is highly desirable and much preferred over periodic factory calibration. Solutions based primarily on colorimetric (color and gloss) measurements are particularly sought, although other modalities for assessing condition/quality of painted coatings are also acceptable. Other modalities might include but are not limited to: mechanical durability, surface roughness, surface energy, contact angle. High repeatability and low variability (gauge R&R) are key performance metrics, along with measurement acquisition speed and broad applicability across many different types of coatings, including different colors, and both matte and gloss finishes. It is anticipated that the work will generate considerable quantities of experimental data. Technical proposals should therefore equally emphasize the development of algorithms for interpreting these large experimental data sets, including but not limited to multi-dimensional datamining and/or machine learning (ML) based approaches. Technology solutions will be required to achieve Occupational Safety and Health Administration (OSHA) Class 2 Division 1 electrical compliance certification in order to be used in the shadow of the aircraft. This Phase I topic is expected to deliver at least one working prototype to develop further for field trials in the follow-on Phase II effort. The successful Phase I effort will conclude with a coupon-level demonstration of the prototype technology in a lab environment.

PHASE I: The Phase I effort shall include determining, insofar as possible, the scientific and technical merit and feasibility of ideas appearing to have commercial potential, i.e. Phase I will take the form of a feasibility study. Sufficient work must be completed in the Phase I in order to validate the product-market fit between the proposed solution and a potential AF stakeholder (program office). The offeror shall define a clear, immediately actionable plan with the proposed solution and the AF customer at the beginning of the Phase I effort. The feasibility study should include; (i) identification of the prime potential AF end user(s) for the non-Defense commercial offering, and how the offered product has been modified to solve the AF need; (ii) description of perceived integration cost(s) and feasibility of integration with current mission-specific products such as existing OML topcoat systems; (iii) a description of how the product can be used by other DoD or Governmental customers. General Size Weight and Power (SWaP) requirements will be supplied by the relevant AF stakeholders along with electrical and other certifications necessary for successful technology transition to the warfighter.

PHASE II: Under the Phase II effort, the awardee(s) shall sufficiently develop the technical approach and prototype system in order to conduct a small number of relevant demonstrations at the customer organization's facilities (Ogden Air Logistics Center (OO-ALC), Hill AFB, UT and/or NAVAIR Fleet Readiness Center - East (FRC-E), Cherry Point, NC. Identification of manufacturing/production issues and or business model modifications required to further improve product or process relevance to improved sustainment costs and aircraft availability should be documented under the Phase II effort. These Phase II awards are intended to provide a path to commercialization, not the final step for the proposed solution. Expected Technology Readiness Level (TRL) at end of Phase II is TRL 7 - System prototype demonstration in an operational environment.

PHASE III DUAL USE APPLICATIONS: The awardee(s) can expect to pursue commercialization of the various technologies developed in Phase II for transitioning expanded mission capability to a broad range of potential government and civilian users and alternate mission applications. Direct access with end users such as OEM's and government customers such as Program Offices will be provided. Opportunities will be made available to the small business to receive Phase III awards for providing the government direct procurement of products and services developed in coordination with the program. Phase III activities will include obtaining various approvals from OEM and program office, including program support equipment endorsements, electrical safety certifications, etc. Expected TRL at Phase III entry is TRL 7 - System prototype demonstration in an operational environment.

REFERENCES:
1. Arthur D. Broadbent, Colorimetry, Methods, Editor(s): John C. Lindon, George E. Tranter, David W. Koppenaal, Encyclopedia of Spectroscopy and Spectrometry (Third Edition), Academic Press, 2017, Pages 321-327, ISBN 9780128032244, https://doi.org/10.1016/B978-0-12-803224-4.00014-5;

KEYWORDS: Outer Mold Line; OML; Topcoat; Colorimetry; Degradation

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VERSION 2

**TOPIC MOVED TO SOLICITATION 24.B AS TOPIC SF24B-T011**

VERSION 2

SF242-0015 TITLE: Programmability of Regional and/or Local Multi-Source PNT for Joint All-Domain Operations

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): FutureG; Trusted AI and Autonomy; Integrated Network System-of-Systems; Space Technology

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OBJECTIVE: Develop programmability aid techniques, tools, and processes to enable broad adoption of external PNT sources for resilient and assured position, velocity and timing (PVT) solutions, including ranging and relative time synchronization to precisions when GPS is degraded or not presented to address emergent needs for joint all-domain missions, including Mobility & Logistics, and Space Security, among others.

DESCRIPTION: The Air Force seeks solutions to enable broad adoption of emerging time-keeping technologies and network synchronization protocols for a multi-source PNT capability that is essential to regional and/ or local areas of interest composed of cooperative remote platforms with continuity of information synchronization and command and control for joint all-domain campaigns. An integrated multi-source PNT capability will be determined to be regionally and/or locally capable if it collectively maintains accurate PNT information over the limited time required by a specific mission and cooperatively provides remote platforms with the best possible realization of Universal Coordinated Time (UTC), in addition of other aids of local atomic clocks, GPS receivers, etc. required over the limited area when global PNT information may not be available. Specifically, regional and/or local PNT sources are those which are available from remote attritable platforms over a limited geographical area or are available at mission-essential levels of precision for a limited time because of phase and frequency offsets, unknown phase jumps, short-term noises, etc. which in turn require recalibration. As potential complements to GPS as part of a resilient integrated PNT architecture, these cooperative remote platforms providing regional and/or local PNT service coverages are enabled by wireless communications and data networks. Very often, all the remote platforms need to have a common Universal Coordinated Time (UCT) reference. Consequently, innovative standards and protocols pertaining to networked time transfer and synchronization for regional and/or local sources of PNT information are necessary.

Prospective solutions should consider: i) Complex ad-hoc networks, including tree-structure based, cluster-structure based, and fully distributed; ii) Network synchronization with asynchronous communications with reliability and bandwidth requirements; iii) Two-way time transfers against asymmetric propagation delays, Sagnac effects, and hardware operations; and iv) Convergence rates, robustness, stability, and scalability subject to network sizes and member source qualities. Furthermore, challenges and the need for further research and development – related to programmability may include but are not limited to: greater use of artificial intelligence and autonomous agents, human hierarchical guidance or in-the-loop decision, and translation of inevitable uncertainty and variability associated with individual PNT sources to achieve specific common network time synchronization accuracy and resilience metrics.

VERSION 2

PHASE I: The awardee(s) will develop necessary plans and concepts illustrating a proof-of-concept design. The feasibility study should include such information:

1) describing how networked time transfer and synchronization technologies would enable missions in cislunar space;
2) resulting networked time transfer and synchronization requirements traced back to specific use cases;
3) describing necessary network-controlled protocols, interfaces, resilience measures, etc. and
4) modeling and simulation tools which would enable USSF force design decisions for the need for over-the-air demonstrations.

PHASE II: Awardee(s) will finalize the design of a demonstration prototype. Awardee(s) will plan and coordinate one or more demonstrations to provide proof of concept determination. Awardee(s) will perform experiments and analyze results to establish the adequacy of the solution approach and minimize transition risk. Awardee(s) will contact potential customers and establish a transition plan with partners supporting Phase III activities. Awardee(s) will provide regular communication to the government sponsor to ensure understanding of risk mitigation.

PHASE III DUAL USE APPLICATIONS: Focus on maturing the prototype technologies and processes developed in Phase II into commercial technologies. Integrate with prospective follow-on transition partners. The contractor will transition the solution of networked time transfer and synchronization to provide improved operational capability to a broad range of potential Government and civilian users and alternate mission applications, e.g., cislunar mission services.

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1. Department of Defense, “Goal 2: Enhance the Delivery, Diversity, and Resilience of Position, Navigation, and Timing (PNT) Information”, DoD C3 Modernization Strategy, Sept 2020. https://dodcio.defense.gov/Portals/0/Documents/DoD-C3-Strategy.pdf;
2. Breakiron, Lee A., et al. "The accuracy of two-way satellite time transfer calibrations." Proceedings of the 36th Annual Precise Time and Time Interval Systems and Applications Meeting. 2004;
3. K. D. Pham, “Systems and Methods of Resilient Clock Synchronization in Presence of Faults,” US Patent #11,509,451, November 03, 2022;


KEYWORDS: Remote Platforms; Regional and/or Local Multi-Source PNT; Universal Coordinated Time; Networked Time Transfer and Synchronization; Resilience Metrics; Programmability


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VERSION 2

SF242-0016 TITLE: Neuromorphic Camera for Space Domain Awareness

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Space Technology

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 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: Neuromorphic or event camera technology can be applied to space domain awareness and offers the possibility of collecting data continuously, allowing an object's angle and rate to be determined instantaneously and significantly reducing initial orbit determination time. This topic seeks to develop a neuromorphic camera for the low signal-to-noise and low photon environments seen in space domain awareness that is capable of detecting and tracking satellites in geosynchronous orbit.

DESCRIPTION: This topic seeks to produce a neuromorphic camera for space domain awareness. A camera will be designed and manufactured that is capable of observing and tracking satellites in geosynchronous orbit. The low signal-to-noise environment consistent with astrometric observations will be considered, along with the overall capability of the sensor such as focal plane size, pixel count, read noise, and detection threshold. The camera will be designed so that it can be used for both bench-top and on-sky testing with a one meter class telescope system.

PHASE I: In Phase I a design will be created for the camera. A sensor will be designed using a combination of in-house and procured components, and a design up to PDR will be produced that includes estimated performance information when coupled with a one meter class telescope. Specific consideration should be given to the sensor's size, read noise, detection threshold, and uniformity. The design should include a comparison to other available cameras, including both U.S. and foreign produced.

PHASE II: In Phase II a prototype will be created based off the design produced in Phase I. The prototype should be deliverable to the government for bench-top testing and evaluation. Post-delivery the sensor will be characterized by the government and compared to other similar cameras.

PHASE III DUAL USE APPLICATIONS: In Phase III the Department of the Air Force will consider ordering several of the produced prototypes, with or without modification, for research and operational space domain awareness sensors. The results of the prototype evaluation will be shared with the customer base and the decision to purchase additional units will be left to the various customer program managers.

REFERENCES:


1. Bacon, Joseph G. Jr., "Satellite Tracking with Neuromorphic Cameras for Space Domain Awareness" (2021). Theses and Dissertations. 4968.;


KEYWORDS: Space Domain Awareness; Neuromorphic Cameras


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VERSION 2

SF242-0017 TITLE: Cover glass solutions

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology

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 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: Improve space-based photovoltaic power generation through alternatives and modifications to space-qualified cover glass and encapsulants that increase insolation capture and conversion efficiencies of integrated photovoltaic cells. Solutions should demonstrate the ability to increase power generation from systems utilizing state-of-practice photovoltaic devices.

DESCRIPTION: Space Systems Command (SSC), located at Los Angeles Air Force Base, is responsible for developing, equipping, fielding, and sustaining lethal and resilient space capabilities for warfighters. Historically, SSC requires each mission block to have 3-5% more power. This is critical for the United States to maintain space dominance over its adversaries. Unfortunately, efficiency improvements in III-V solar cells have begun to plateau and obtaining 3-5% more power due exclusively through cell efficiency gains is becoming increasing unlikely. In order to reach the goals set by SSC, increased power generation must come from non-traditional improvement methods, including advances in cover glass technology. Cover glass is critical to protect solar cells from the harsh environment of space in Earth’s orbit. Since it is a necessity to have in the system, finding a way to utilize cover glass beyond just a protective barrier can lead to increased performance in the solar module system. There are several approaches to obtain this goal. First, there has been success in literature in texturing cover glass to improve non-normal incident light transparency. By increasing transparency, more light will reach the solar cell to be converted to useful energy that would otherwise be lost. Second, down-shifting molecules absorb harmful UV photons and convert/reemit them in the visible wavelength. This increases the concentration of useful energy reaching the solar cells while simultaneously decreasing the amount of UV light that can degrade them. Last, there is room for improvement in traditional, chemically applied anti-reflective coatings (ARCs). Wider bandgap, less expensive ARCs is another way to increase the amount of light that reaches the solar cells to increase their total power conversion efficiency. Mitigating losses is becoming crucial to keep up with the demands of the increasing more complex and power-hungry spacecrafts fielded by the U.S. Space Force.

PHASE I: Awardee(s) will demonstrate materials capable of increased throughput of photons with wavelengths relevant for state of art photovoltaics for space assets. Approaches should aim to modify or replace space-grade cover glass without impacting the durability and usability of the material in a space environment. Candidate technologies include textured cover glass surfaces, doped cover glass or films capable of wavelength shifting non-useable photons, or high-efficiency, low cost anti-reflective coatings.

PHASE II: Awardee(s) will develop and demonstrate higher power generation by integrating space-qualified solar cells to the technology advancements demonstrated in Phase 1. Performance should be tested in relevant parameters to the space environment, including electrical characterization and stress testing. Results should be compared to relevant, state of art PV systems.

PHASE III DUAL USE APPLICATIONS: Awardee(s) will develop robust manufacturing method(s) and demonstrate consistency and reliability through statistical process control and relevant characterization. Awardee(s) will develop licensing or partnerships to transition technology to established vendors of space-grade photovoltaics. Awardee(s) will perform relevant qualification and validation testing through flight-like articles to advance TRL from 4 to 6 or higher.

REFERENCES:

1. https://www.nrel.gov/docs/fy01osti/28264.pdf
2. https://www.sciencedirect.com/science/article/pii/S0038092X23004061
3. https://ieeexplore.ieee.org/abstract/document/654284
4. https://www.sciencedirect.com/science/article/abs/pii/S0927024809000762
5. USSF Power & Energetics CCT Tech Need 857 – Space Photovoltaic Cell and CIC Efficiency;


KEYWORDS: cover glass; texturing; down-shifting molecules; anti-reflective coating; reflective loss; space solar; power systems

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VERSION 2

SF242-0018 TITLE: Neon recovery and reliquefication for low temperature characterization of infrared focal plane arrays

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology

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 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 primary objective is to develop commercial products that specifically permit infrared detector characterization lab users to recover, purify and reliquefy neon gas, at the small scale (<10 liters per day of liquid neon), back into a cryogenic liquid intended for use in pour fill cryogenic dewars, and, thereby, reducing the burden of acquiring additional liquid neon.

DESCRIPTION: Characterizing infrared focal plane arrays is ideally done with the test part in a pour fill dewar that uses liquid cryogens, rather than a closed-cycle system which potentially contributes noise to the test system and limits ones ability to perform focal plane array characterization at a remote facility such as a radiation source. Liquid neon is a near ideal liquid cryogen for this role. It boils at 27.5 K, which is well below liquid nitrogen and, more specifically, below where typical high performance infrared sensors operate, including long wave infrared detectors. Liquid neon also has over 40 times the refrigerant capacity per unit volume than liquid helium.[1] During a detector characterization, these two properties translate into fewer liquid cryogen transfers into the dewar using liquid neon, leaving more time for characterization. This is an absolutely indispensable advantage in the highly unique circumstance of a remote focal plane array radiation tolerance experiment, where access to the radiation source is strictly limited, rarely available and expensive, and the part must be kept cold for over a week at a time. Unfortunately, due to some unusual circumstances, liquid neon is very expensive and difficult to come by. This is because 70% of the neon produced in the world is used in the growing semiconductor chip manufacturing industry, where argon-flourine-neon excimer pulsed lasers are the workhorse source for deep ultraviolet lithography and the ultra-high purity neon (~99.9999%) used in them must be replenished every two weeks. Additionally, neon production occurs mainly as a byproduct of nitrogen generation via cryogenic distillation of air, a technique that happened to be perfected in the Ukraine where grain production requires large amounts of nitrogen for fertilizer. Given the current difficulties in the Ukraine and its diminished production capacity and the growing use of neon in semiconductor manufacturing, the price of liquid neon has risen to roughly $3000/liter, a 600% increase since 2014. Furthermore, there is currently a single domestic distributor of liquid neon, Linde Corp. However, there is a straightforward path to alleviating some of the hardship associated with the use of liquid neon for characterizing focal plane arrays.

The technology to recover and liquefy certain gases, such as helium, at the small scale (~25 liters per day) has been commercially available for nearly a decade and has had a major impact on research and medical institutions ability to experiment, or run their instruments, at cryogenic temperatures. For example, Quantum Design North America, located in San Diego, CA, already offers a complete line of helium liquifiers and helium recovery, storage and purification systems, which allows users to recover and liquefy the exhausted helium gas currently being lost from the normal boil off and helium transfers to cryogenic instruments.[2] This technology alleviates the user's dependence on cryogen suppliers and lessens the impact of rising costs and undependable supply, as well as helps preserve a precious natural resource which is vital to scientific research and medical treatment. With some modification, a similar approach can now likely be adopted for the small scale (<10 liters per day) recovery and reliquefication of neon used in scientific research. In fact, reliquefication of exhausted neon gas was already demonstrated at the laboratory scale (~3 liters per day) in the early 1990s, but the technique was never adopted, likely due to cost and availability of liquid neon.[3]

PHASE I: Awardee(s) will perform initial technical feasibility study and develop plans for a system to recover, purify and reliquefy neon gas at the small scale for use in a detector characterization lab, or semiconductor device fa. System should be similar to existing helium reliquefiers that are currently commercially available (e.g. Quantum Design ATL160L, etc.) but with a smaller capacity of no more than 50 liquid liters and with the capability to be transportable to remote experiments. Feasibility study should also consider recovery and purification of neon from contaminated lasing gas discharged by excimer lasers used for semiconductor processing.

PHASE II: Awardee(s) will build, characterize and deliver a prototype system to recover, purify and reliquefy neon gas at the small scale for use in a detector characterization lab. System should be similar to existing helium reliquefiers that are currently commercially available (e.g. Quantum Design ATL160L, etc.) but with a smaller capacity of no more than 50 liquid liters and with some capability to be transportable to remote experiments. System characterization should show any applicability to recovery and purification of neon from contaminated lasing gas discharged by excimer lasers.

PHASE III DUAL USE APPLICATIONS: If a successful prototype is developed, then prototype will be commercialized to improve availability of liquid neon in DOD focal plane characterization laboratory and similar domestic laboratories across the US.

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1. Hammond, C. R. "The Elements, in Handbook of Chemistry and Physics, 81st edition.", CRC press, p. 19, ISBN 0849304814.;
2. Quantum Design Inc. "Helium Liquefiers, Purifiers and Recovery Systems." Mar 2023, https://qdusa.com/products/helium_liquefiers.html;
3. Francavilla et al., Simple apparatus for the liquefaction of neon directly into a research Dewar, Rev. Sci. Instrum. 64, 2023, 1993.;


KEYWORDS: neon, cryogenics, recovery, purification, reliquefication, infrared detectors, excimer lasers

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VERSION 2

SF242-0019 TITLE: Hydrogenation for defect passivation in (Si)GeSn alloys

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic is to evaluate the extent to which the background carrier concentration and the minority carrier lifetime of (Si)GeSn semiconductor alloys can be improved by post growth hydrogenation.

DESCRIPTION: Incorporation of Sn into either Silicon or Germanium semiconductors causes a reduction of the bandgap and indirect/direct transition around 8% Sn for GeSn alloys. Tunability of the material system has shown coverage of the short- to mid-wave infrared wavelength spectrum (2.0 to 8.0 micrometers). Couple the tunability with large area substates (8 inch Silicon) and mature CMOS processing technology; the ingredients for high performance, high manufacturability photodetection are available. As of this year the minority carrier lifetime has been shown to be short (~3 ns) with a high background carrier concentration as a limiter to device performance [1].

This recent demonstration of minority carrier lifetime in GeSn/SiGeSn quantum well is significant because the lifetime reflects how long charge excited by incoming infrared radiation can transport in the material before it can no longer be collected by the EO/IR system, i.e. the likelihood that the photon is seen. Long lifetime lead to efficient collection of charge and low dark currents, two key attributes of an efficient, high signal-to-noise image sensor. While other measures of performance are associated with the material's fundamental nature (e.g. mobility, absorption, ect.), lifetime is fundamentally a measure of concentration of defects in the material and thus the lifetime is improved by innovation and advances in material synthesis (i.e. defects add to the background carrier concentration).

As discussed in greater detail in Ref.1, the challenge to further improving (Si)GeSn for infrared-sensing applications is that low growth temperatures increase the incorporation of defects and higher growth temperatures significantly inhibit the incorporation of Sn. Increasing the growth temperature shortens the maximum cutoff of the materials as Sn, the element responsible for reducing the bandgap, incorporates less efficiently. The path forward for (Si)GeSn will require either a novel growth approach that enables more effective incorporation of Sn in (Si)GeSn at higher growth temperatures where the background carrier concentration/minority carrier lifetime can be optimized, or a means of passivating defects present in (Si)GeSn alloys grown at lower growth temperatures wither Sn incorporates more efficiently.

This topic seeks to evaluate post-growth hydrogenation as a means to passivate defects and improve the background carrier concentration/minority carrier lifetime in low-temperature grown (Si)GeSn alloys. Hydrogenation is commonly used to passivate defects in a multitude of semiconductor materials that suffer from defects. Given that the lifetime has been shown to depend on the growth conditions utilized to synthesize the material, it is possible that the defects introduced at lower growth temperatures can be passivated, leading to lower background carrier concentrations and longer minority carrier lifetimes in (Si)GeSn alloys with sufficient Sn mole fraction to effectively cover the short- to mid-wave infrared spectrum.

VERSION 2

PHASE I: Awardee(s) will develop a hydrogenation recipe and test plan. Materials to be tested will be provided by the TPOC at AFRL/RVSU. Other materials suffering from non-optimal growth temperature constraints identified by the proposers may be included as well.

PHASE II: Awardee(s) will execute hydrogenation experiments. Hydrogenated materials will be returned to AFRL/RVSU for background carrier concentration/minority carrier lifetime testing and evaluation. An iterative process to optimize the hydrogenation technique will be performed.

PHASE III DUAL USE APPLICATIONS: If a successful hydrogenation recipe is identified, the process may be commercialized and utilized to improve (Si)GeSn and other optoelectronic materials that suffer from non-optimal growth conditions constraints.

REFERENCES:


1. P.C. Grant, P.T. Webster, R.A. Carrasco, C.P. Hains, N. Gajowski, S.-Q. Yu, B. Li, C.P. Morath, D. Maestas,"Auger Limited Minority Carrier Lifetime in GeSn/SiGeSn Quantum Well" Appl. Phys. Lett. (under review, Nov. 2023);


KEYWORDS: Hydrogenation; GeSn; SiGeSn


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SF242-0020 TITLE: Exploring Proliferated Warfighter Space Architecture (PWSA)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology

OBJECTIVE: The objective of this topic is to provide novel and innovative new technology to bolster the United States Space Force (USSF) Space Development Agency's (SDA) advancement of the Proliferated Warfighter Space Architecture (PWSA). SDA seeks proposals encompassing novel mission, system, value and warfighting engineering concepts, technologies, and capabilities which facilitate leap-ahead improvements for planned PWSA segments, layers and tranches or enable the creation of new missions and capabilities to address emerging warfighter needs. This effort aligns with the imperative to fortify space capabilities, ensuring their resilience against potential attacks, and to counter adversaries' advancements in space-based military capabilities targeting terrestrial assets, especially high-value power projection assets.

DESCRIPTION: SDA is actively seeking innovative proposals to advance the PWSA and create additional capability for the warfighter while maintaining affordability and resilience across the architecture. This call encompasses a wide array of themes, ranging from integrating commercially-sensed data into the transport layer by advancing SDA-standard compatible Optical Inter-Satellite Link (OISL) technologies, to networking, in-space processing, power enhancement for commoditized spacecraft buses, and robust multi-level security and cross domain solutions. These themes aim to drive advancements in affordability, capability, viability and interoperability. The goal is to bolster the resilience and capabilities of space assets while enabling new layers of capabilities to address evolving warfighter needs in a dynamic and challenging space environment.

PHASE I: The focus of Phase I is to identify and demonstrate the feasibility of novel technologies aimed at bolstering the PWSA. The emphasis should be on using analytical or computational methods to move beyond first principles and document proposed advancements, culminating in a demonstrative product that establishes the approach's viability and enables Phase II planning. While a complete production-level simulation may not be necessary, the computational intensity of the effort necessitates an unequivocable demonstration of the proposed methods, even if access to supercomputing resources is limited. This phase's goal is to affirm the potential and practicality of the outlined technological approaches, validating their computational foundations to efficiently create new warfighting capabilities enabled by a set of interoperable resilient, global, proliferated low Earth orbit spaceborne constellations.

PHASE II: Phase II of this research initiative builds upon the validated technological approaches from Phase I to develop a tangible prototype aimed at bolstering the Proliferated Warfighter Space Architecture (PWSA). This phase focuses on refining and translating the established computational foundations into a well-defined prototype. Objectives include prototype development, iterative technical refinement, rigorous testing to validate performance parameters, and assessing scalability and adaptability. Success criteria involve demonstrating functionalities aligned with PWSA objectives, passing comprehensive performance tests, ensuring compatibility within the PWSA architecture, and verifying scalability across segments. This phase aims to bridge the gap between conceptual validation and implementation, culminating in a prototype showcasing the practicality and potential of these technologies in enhancing PWSA capabilities within low Earth orbit spaceborne constellations.

PHASE III DUAL USE APPLICATIONS: Phase III represents the transition of the validated prototype developed in Phase II into practical applications for both military and commercial use, leveraging non-SBIR funds for further development and integration. The expected Phase III effort involves advancing the prototype to a Technology Readiness Level (TRL) suitable for operational deployment and widespread commercial adoption. At Phase III entry, the TRL is expected to be at a high level of maturity where the technology is ready for operational deployment or commercialization. Transition planning, utilizing non-

SBIR funds, will focus on scaling up production, integrating the technology into operational systems, conducting field trials for validation in real-world environments, and pursuing certification for commercial applications. Collaboration with industry partners and government agencies will be integral to ensure seamless integration into both military and civilian space applications. The Phase III dual-use effort aims to maximize the technology's impact by facilitating its transition from the prototype stage to widespread deployment.

REFERENCES:
1. http://www.sda.mil/home/work-with-us/resources/;

KEYWORDS: Cryptography; Networking; Resilience; Interoperability; Affordability; Mission; Warfighting

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VERSION 3

**DEPARTMENT OF AIR FORCE (DAF)**
**24.2 SMALL BUSINESS INNOVATION RESEARCH (SBIR) DIRECT-TO-PHASE-II (D2P2) PROPOSAL SUBMISSION INSTRUCTIONS**

The DAF intends these proposal submission instructions to clarify the Department of Defense (DoD) Broad Agency Announcement (BAA) as it applies to the topics solicited herein. **Firms must ensure proposals meet all requirements of the 24.2 SBIR BAA posted on the DoD SBIR/STTR Innovation Portal (DSIP) at the proposal submission deadline date/time.**

**Applicants are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.**

- The DoD Program BAA is located at: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements. Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

Please ensure all e-mail addresses listed in the proposal are current and accurate. The DAF is not responsible for ensuring notifications are received by firms changing mailing address/e-mail address/company points of contact after proposal submission without proper notification to the DAF. **If changes occur to the company mail or email addresses or points of contact after proposal submission, the information must be provided to the AF SBIR/STTR One Help Desk.** The message shall include the subject line, “24.2 Address Change”.

Points of Contact:

- For general information related to the AF SBIR/STTR program and **proposal preparation instructions**, contact the AF SBIR/STTR One Help Desk at usaf.team@afsbirsttr.us. All applicants have ample opportunity to request clarifying information. **The DAF encourages applicants to request clarifying information as early as possible, as delays in such requests constrain the DAF’s ability to provide satisfactory resolution to applicant concerns.**
- For questions regarding the **DSIP electronic submission system**, contact the DoD SBIR/STTR Help Desk at dodsbirsupport@reisystems.com.
- **For technical questions about the topics** during the pre-announcement and open period, please reference the DoD 24.2 SBIR BAA.
- Air Force SBIR/STTR Contracting Officer (CO):
  Mr. Daniel J. Brewer, Daniel.Brewer.13@us.af.mil

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

**DIRECT TO PHASE II**

15 U.S.C. §638 (cc), as amended by the SBIR AND STTR EXTENSION ACT OF 2022, 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 an SBIR program with respect to such project. DAF is conducting a "Direct to Phase II" implementation of this authority for these 24.2 SBIR topics and does not guarantee D2P2 opportunities will be offered in future solicitations. Each eligible topic requires documentation to determine whether the feasibility requirement described in the Phase I section of the topic has been met.

**DIRECT TO PHASE II PROPOSAL SUBMISSION**

The DoD SBIR 24.2 Broad Agency Announcement, https://www.dodsbirsttr.mil/submissions/login, includes all program requirements. Phase I efforts should address the feasibility of a solution to the selected topic's requirements.

The complete proposal must be submitted electronically through DSIP. Ensure the complete technical volume and additional cost volume information is included in this sole submission. The preferred submission format is Portable Document Format (.pdf). Graphics must be distinguishable in black and white. **VIRUS-CHECK ALL SUBMISSIONS.**

The System for Award Management (SAM) allows proposing small business concerns interested in conducting business with the Federal Government to provide basic information on business structure and capabilities as well as financial and payment information. Proposing small business concerns must be registered in SAM. To register, visit www.sam.gov. A proposing small business concern that is already registered in SAM should login to SAM and ensure its registration is active and its representations and certifications are up-to-date to avoid delay in award.

On April 4, 2022, the DUNS Number was replaced by the Unique Entity ID (SAM). The Federal Government will use the UEI (SAM) to identify organizations doing business with the Government. The DUNS number will no longer be a valid identifier. If the proposing small business concerns has an entity registration in SAM.gov (even if the registration has expired), a UEI (SAM) has already been assigned. This can be found by signing into SAM.gov and selecting the Entity Management widget in the Workspace or by signing in and searching entity information. For proposing small business concerns with established Defense SBIR/STTR Innovation Portal (DSIP) accounts, update the Small Business Concern profile with the UEI (SAM) as soon as possible.

For new proposing small business concern registrations, follow instructions during SAM registration on how to obtain a Commercial and Government Entry (CAGE) code and be assigned the UEI (SAM). Once a CAGE code and UEI (SAM) are obtained, update the Small business concern's profile on the DSIP at https://www.dodsbirsttr.mil/submissions/.

**INTRODUCTION**: D2P2 proposals must follow the steps outlined below:

1. Applicants must create a Cover Sheet in DSIP; follow the Cover Sheet instructions provided in the DoD SBIR 24.2 BAA.Applicants must provide documentation satisfying the Phase I feasibility requirement* to be included in the Phase II proposal. Applicants must demonstrate completion of research and development through means other than the SBIR/STTR Programs to establish the feasibility of the proposed Phase II effort based on the criteria outlined in the topic description.
2. Applicants must submit D2P2 proposals using the instructions below.

*NOTE: DAF will not consider the applicant's D2P2 proposal if the applicant fails to demonstrate technical merit and feasibility have been established. It will also not be considered if it fails to demonstrate the feasibility effort was substantially performed by the applicant and/or the principal investigator (PI). Refer to the topics' Phase I descriptions for minimum requirements needed to demonstrate feasibility. Feasibility documentation cannot be based upon or logically extend from any prior or ongoing federally funded SBIR or STTR work.

VERSION 3

## DIRECT TO PHASE II PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

A. Proposal Requirements. A Direct To Phase II proposal shall provide sufficient information to persuade the AF the proposed technology advancement represents an innovative solution to the scientific or engineering problem worthy of support under the stated criteria.

B. Proprietary Information. Information constituting a trade secret, commercial/financial information, confidential personal information, or data affecting National Security must be clearly marked. It shall be treated in confidence to the extent permitted by law. Be advised, in the event of proposal selection, the Work Plan will be incorporated into the resulting contract by reference. Therefore, DO NOT INCLUDE PROPRIETARY INFORMATION in the work plan. See the DoD BAA regarding proprietary information marking.

C. General Content. Proposals should be direct, concise, and informative. Type shall be no smaller than 11-point on standard 8 ½ X 11 paper, with one-inch margins and pages consecutivelynumbered. Applicants are discouraged from including promotional and non-programmatic items. If included, such material will count toward the page limit.

## DIRECT TO PHASE II PROPOSAL FORMAT

Complete proposals must include all of the following:

**Volume 1:** DoD Proposal Cover Sheet

Note: If selected for funding, the proposal's technical abstract and discussion of anticipated benefits will be publicly released. Therefore, do not include proprietary information in this section.

**Volume 2:** Technical Volume

**Volume 3:** Cost Volume

**Volume 4:** Company Commercialization Report

**Volume 5:** Supporting Documents, e.g. DoD Form 2345 (if applicable), Militarily Critical Data Agreement (if applicable); etc.

**Volume 6:** Fraud, Waste, and Abuse Training Completion

Phase II proposals require a comprehensive, detailed description of the proposed effort. AF D2P2 efforts are to be proposed in accordance with the information in these instructions. 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.

All D2P2 research or research and development (R/R&D) must be performed by the small business and its team members in the United States, as defined in the DoD SBIR 24.2 BAA. The Principal Investigator's (PI's) primary employment must be with the small business concern at the time of awardand during the entire period of performance. Primary employment means more than one-half the PI's time is spent in the small business' employ. This precludes full-time employment with another entity. Only one principal investigator/project manager can be designated to a proposal at any given time.

Knowingly and willfully making false, fictitious, or fraudulent statements or representations may be a felony under18 U.S.C. Section 1001, punishable by a fine up to $250,000, up to five years in prison, or both.

Please note the FWA Training must be completed prior to proposal submission. When training is complete and certified, DSIP will indicate completion of the Volume 6 requirement. The proposal cannot be submitted until the training is complete. The DAF recommends completing submission early, as site traffic is heavy prior to solicitation close, causing system lag. **Do not wait until the last minute.** The AF will not be responsible for proposals not completely submitted prior to the deadline due to system inaccessibility unless advised by DoD. The DAF will not accept alternative means of submission outside of DSIP.

**DOD PROPOSAL COVER SHEET (VOLUME 1)**

Complete the proposal Cover Sheet in accordance with the instructions provided via DSIP. The technical abstract should include a brief description of the program objective(s), a description of the effort, anticipated benefits and commercial applications of the proposed research, and a list of keywords/terms. The technical abstract of each successful proposal will be submitted to the Office of the Secretary of Defense (OSD) for publication and, therefore, must not contain proprietary or classified information.

**TECHNICAL VOLUME (VOLUME 2)**

The technical proposal includes all items listed below in the order provided. All topics have a page limit of 35 pages. Pages in excess of this count will not be considered by the Government in evaluations.

(1) **Table of Contents:** A table of contents should be located immediately after the Cover Sheet.

(2) **Glossary:** Include a glossary of acronyms and abbreviations used in the proposal.

(3) **Milestone Identification:** Include a program schedule with all key milestones identified.

(4) **Identification and Significance of the Problem or Opportunity:** Briefly reference thespecific technical problem/opportunity to be pursued under this effort.

(5) **Phase II Technical Objectives:** Detail the specific objectives of the Phase II work and describe the technical approach and methods to be used in meeting these objects. The proposal should also include an assessment of the potential commercial application for eachobjective.

(6) **Work Plan:** The work plan shall be a separate and distinct part of the proposal package, using a page break to divide it from the technical proposal. It must contain a summary description of the technical methodology and task description in broad enough detail to provide contractual flexibility. The following is the recommended format for the work plan; begin this section on a new page. **DO NOT include proprietary information.**

a) 1.0 – Objective: This section is intended to provide a brief overview of thespecialty area. It should explain the purpose and expected outcome.
b) 2.0 – Scope: This section should provide a concise description of the work to beaccomplished, including the technology area to be investigated, goals, and majormilestones. The key elements of this section are task development and deliverables, i.e., the anticipated end result and/or the effort's product. This section must also be consistent with the information

in Section 4.0 below.

c) <u>3.0 – Background</u>: The applicant shall identify appropriate specifications, standards, andother documents applicable to the effort. This section includes information or explanation for, and/or constraints to, understanding requirements. It may include relationships to previous, current, and/or future operations. It may also include techniques previously determined ineffective.

d) <u>4.0 – Task/Technical Requirements</u>: The detailed individual task descriptions must be developed in an orderly progression with sufficient detail to establish overall program requirements and goals. The work effort must be segregated into major tasks and identified in separately numbered paragraphs.

Each numbered major task should delineate the work to be performed by subtask. The work plan MUST contain every task to be accomplished in definite, realistic, and clearlystated terms. Use "shall" whenever the work plan expresses a binding provision. Use "should" or "may" to express a declaration or purpose. Use "will" when no contractor requirement is involved, i.e., "... power will be supplied by the Government."

(7) **<u>Deliverables</u>:** Include a section clearly describing the specific sample/prototype hardware/ software to be delivered, as well as data deliverables, schedules, and quantities. Be aware of the possible requirement for unique item identification IAW DFARS 252.211-7003, ItemIdentification and Valuation, for hardware. If hardware/ software will be developed but not delivered, provide an explanation. At a minimum, the following reports will be required under ALL Phase II contracts.

a) <u>Scientific and Technical Reports</u>: Rights in technical data, including software, developed under the terms of any contract resulting from a SBIR Announcement generally remain with the contractor. The Government obtains SBIR/STTR data rights in all data developed or generated under the SBIR/STTR contract for a period of 20 years, commencing at contract award. Upon expiration of the 20-year SBIR/STTR license, the Government has Government purpose rights to the SBIR data.

i. <u>Final Report</u>: The first page of the final report will be a single-page project summary, identifying the work's purpose, providing a brief description of the effort accomplished, and listing potential result applications. The summary may be published by DoD. Therefore, it must not contain any proprietary or classified information. The

remainder of the report should contain details of project objectives met, work completed, results obtained, and technical feasibility estimates.

ii. <u>Status Reports</u>: Status reports are due quarterly at a minimum.

b) <u>Additional Reporting</u>: AF may require additional reporting documentation including:

i. Software documentation and users' manuals;
ii. Engineering drawings;
iii. Operation and maintenance documentation

iv. Safety hazard analysis when the project will result in partial ortotal development and delivery of hardware; and
v. Updates to the commercialization results.

(8) **Related Work:** Describe significant activities directly related to the proposed effort, including any previous programs conducted by the Principal Investigator, proposing firm, consultants, or others, and their application to the proposed project. Derscribe how these activities interface with the proposed project and discuss any planned coordination with outside sources. Also list any applicant-identified subject matter experts, regardless of affiliation, providing comments regarding the applicant's knowledge of the state-of-the-art in the specific approach proposed. 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)
c. Date of completion

**(9) Commercialization Potential:**

a) The DoD requires a commercialization plan be submitted with the Phase II proposal,specifically addressing the following questions:
   i. What is the first planned product to incorporate the proposed technology?
   ii. Who are the probable customers, and what is the estimated market size?
   iii. How much money is needed to bring this technology to market and how will it be raised?
   iv. Does your firm have the necessary marketing expertise and, if not, how will your firm compensate?
   v. Who are the probable competitors, and what price/quality advantage is anticipated by your firm.

b) The commercialization strategy plan should briefly describe the commercialization potential for the proposed project's anticipated results, as well as plans to exploit it. Commercial potential is evidenced by:

   i. The existence of private sector or non-SBIR/STTR Governmentalfunding sources demonstrating commitment to Phase II efforts/results.
   ii. The existence of Phase III follow-on commitments for the research subject.
   iii. The presence of other indicators of commercial technology potential,including the firm's commercialization strategy.

c) If awarded a D2P2, the awardee will be required to update periodically the commercialization results of the project via SBA. These updates will be required at completion of the effort, and subsequently when the contractor submits a new SBIR/STTR proposal to DoD. Firms not submitting a new proposal to DoD will be requested to provide updates annually after the D2P2 completion.

d) Note, the "Commercialization Plan" and the "Company Commercialization Report" are distinct documents. The Company Commercialization Report (CCR) comprises Volume 4 as separately indicated in these instructions.

(10) **Relationship with Future R/R&D Efforts**:

a) State the anticipated results of the proposed approach, specifically addressing plans for Phase III, if any.
b) Discuss the significance of the D2P2 effort in providing a basis for the Phase III R/R&D effort, if planned.

D. **Key Personnel:** In the technical volume, identify all key personnel involved in the project. Include information directly related to education, experience, and citizenship. Atechnical resume for the Principal Investigator, including publications, if any, must also be included. Concise technical resumes for subcontractors and consultants, if any, are also useful. Identify all non-U.S. citizens expected to be involved in the project as direct employees, subcontractors, or consultants. For these individuals, in addition to technical resumes, please provide countries of origin, type of visas or work permits held, and identify the tasks they are anticipated to perform.

Foreign Nationals (also known as Foreign Persons) means any person who is NOT:

a. a citizen or national of the United States; or
b. a lawful permanent resident; or
c. a protected individual as defined by 8 U.S.C. § 1324b

ALL applicants proposing to use foreign nationals MUST follow the DoD 24.2 BAA and disclose this information regardless of whether the topic is subject to ITAR restrictions.

When the topic area is subject to export control, these individuals, if permitted to participate, are limited to work in the public domain. Further, tasks assigned must not becapable of assimilation into an understanding of the project's overall objectives. This prevents foreign citizens from acting in key positions, such as Principal Investigator, Senior Engineer, etc. Additional information may be requested during negotiations in order to verify foreign citizens' eligibility to perform on a contract awarded under this BAA.

The following will apply to all projects with military or dual-use applications developing beyond fundamental research (basic and applied research ordinarily published and sharedbroadly within the scientific community):

(1) The Contractor shall comply with all U. S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, andthe Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, in the performance of this contract. In the absence of available license exemptions/exceptions, the Contractor shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of (including deemed exports) hardware, technical data,and software, or for the provision of technical assistance.
(2) The Contractor shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of this contract, including instances where thework is to be performed on-site at any Government installation (whether in or outside the

United States), where the foreign person will have access to export-controlled technologies,including technical data or software.

(3) The Contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.

(4) The Contractor shall be responsible for ensuring that these provisions apply to its subcontractors.

E. **Facilities/Equipment:** Describe instrumentation and physical facilities necessary and available to carry out the D2P2 effort. Justify equipment to be purchased (detail in cost proposal). State whether proposed performance locations meet environmental laws and regulations of Federal, state, and local Governments for, but not limited to, airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulkwaste disposal practices, and handling and storage of toxic and hazardous materials.

F. **Consultants/Subcontractors**: Private companies, consultants, or universities may be involved in the project. All should be described in detail and included in the cost proposal. In accordance with the Small Business Administration (SBA) SBIR Policy Directive, a minimum of 50% of the R/R&D must be performed by the proposing firm, unless otherwise approved in writing by the Contracting Officer. These requests can only be made upon proposal submission. Signed copies of all consultant or subcontractor letters of intent must be attached to the proposal. These letters should briefly state the contribution or expertise being provided. Include statements of work and detailed cost proposals. Include information regarding consultant or subcontractor unique qualifications. Subcontract copies and supporting documents do not count against the Phase II page limit. Identify any subcontract/consultant foreign citizens per E above.

G. **Prior, Current, or Pending Support of Similar Proposals or Awards:**
WARNING: While it is permissible, with proper notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work forconsideration under numerous Federal program solicitations, it is unlawful to enter into contracts or grants requiring essentially equivalent effort. Any potential for this situation must be disclosed to the solicitation agency(ies) before award. If a proposal submitted in response to this BAA is substantially the same as another proposal previously, currently, or in the process of being funded by another Federal agency/DoD Component or the DAF, the applicant must so indicate on the Cover Sheet and provide the following:

a) The name and address of the Federal agency(ies) or DoD Component(s) towhich proposals were or will be submitted, or from which an awarded is expected or has been received;
b) The proposal submission or award dates;
c) The proposal title;
d) The PI's name and title for each proposal submitted or award received; and
e) Solicitation(s) title, number, and date under which the proposal was or will besubmitted, or under which an award is expected or has been received.
f) If award was received, provide the contract number.
g) Specify the applicable topics for each SBIR proposal submitted or award received.

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

**COST VOLUME (VOLUME 3)**

A detailed cost proposal must be submitted. Cost proposal information will be treated as proprietary. Proposed costs must be provided by both individual cost element and contractor fiscal year (FY) in sufficient detail to determine the basis for estimates, as well as the purpose, necessity, and reasonableness of each. This information will expedite award if the proposal is selected. Generally, Firm-Fixed-Price contracts are appropriate for Phase II awards. In accordance with the SBA SBIR/STTR Policy Directive, Phase II contracts must include profit or fee.

Cost proposal attachments do not count toward proposal page limitations. The cost proposalincludes:

a) **Direct Labor:** Identify key personnel by name, if possible, and labor category, if not. Direct labor hours, labor overhead, and/or fringe benefits, and actual hourly rates for each individual are also necessary for the CO to determine whether these hours, fringe rates, and hourly rates are fair and reasonable.

b) **Direct Cost Materials:** Costs for materials, parts, and supplies must be justified and supported. Provide an itemized list of types, quantities, prices, and, where appropriate, purpose. If computer or software purchases are planned, detailed information such as manufacturer, price quotes, proposed use, and support for theneed will be required.

c) **Other Direct Costs:** This includes specialized services such as machining or milling, special test/analysis, and costs for temporary use/lease of specialized facilities/ equipment. Provide usage (hours) expected, rates, and sources, as well as brief discussion concerning the purpose and justification. Proposals including leased hardware must include an adequate lease versus purchase rationale.

d) **Special Tooling, Special Test Equipment, and Material:** The inclusion of equipment and materials will be carefully reviewed relative to need and appropriateness to the work proposed. Special tooling and special test equipment purchases must, in the CO's opinion, be advantageous to the Government and relate directly to the effort. These toolings or equipment should not be of a type that an applicant would otherwise possess in the normal course of business. These may include such items as innovative instrumentation and/or automatic test equipment.

e) **Subcontracts:** Subcontract costs must be supported with copies of subcontract agreements. Agreement documents must adequately describe the work to be performed and cost bases. The agreement document should include a SOW, assignedpersonnel, hours and rates, materials (if any), and proposed travel (if any). A letter from the subcontractor agreeing to perform a task or tasks at a fixed price is not considered sufficient. 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, unless otherwise approved in writing by the Contracting Officer.

The prime contractor must accomplish price analysis, including reasonableness, of the proposed subcontractor costs. If based on comparison with prior efforts, identify the basis upon which the prior prices were determined reasonable. If price analysis techniques are inadequate or the FAR requires subcontractor cost or pricing data submission, provide a cost analysis. Cost analysis includes but is not limited to, consideration of materials, labor, travel, other direct costs, and proposed profit rates.

f) **Consultants:** For each consultant, provide a separate agreement letter briefly stating the service to be provided, hours required, and hourly rate, as well as ashort, concise resume.

g) **Travel:** Each effort should include, at a minimum, a kickoff or interim meeting. Travel costs must be justified as required for the effort. Include destinations, numberof trips, number of travelers per trip, airfare, per diem, lodging, ground transportation, etc. Per Diem and lodging rates may be found in the Joint Travel Regulation (JTR),Volume 2, www.defensetravel.dod.mil.

h) **Indirect Costs:** Indicate proposed rates' bases, e.g., budgeted/actual rates per FY, etc. The proposal should identify the specific rates used and allocation bases to which they are applied. Do not propose composite rates; proposed rates and applications per FY throughout the anticipated performance period are required.

i) **Non-SBIR Governmental/Private Investment:** Non-SBIR Governmental and/or private investment is allowed. However, it is not required, nor will it be a proposal evaluation factor.

NOTE: If no exceptions are taken to an applicant's proposal, the Government may award a contract without exchanges. Therefore, the applicant's initial proposal should contain the applicant's best terms from a cost or price and technical standpoint. If there are questions regarding the award document, contact the Phase I CO identified on the cover page. The Government reserves the right to reopen exchanges later if the CO determines doing so to be necessary.

## COMPANY COMMERCIALIZATION REPORT (VOLUME 4)

Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR 24.2 BAA for full details on this requirement. Information contained in the CCR will not be considered by the Air Force during proposal evaluations.

## SUPPORTING DOCUMENTS VOLUME (VOLUME 5)

**The following documents may be required if applicable to your proposal:**

1. DD Form 2345: For proposals submitted under export-controlled topics (EXCEPT AF242-D008, AF242-D014, AF242-D016, AF242-D019), either International Traffic in Arms or Export Administration Regulations (ITAR/EAR), a copy of the certified DD Form 2345, Militarily Critical Technical Data Agreement, or evidence of application submission must be included. The form, instructions, and FAQs may be found at the United States/Canada Joint Certification Program website, http://www.dla.mil/HQ/InformationOperations/Offers/Products/LogisticsApplications/JCP/DD2315Ins tructions.aspx. DD Form 2315 approval will be required if proposal if selected for award.

a. *Topics AF242-D008, AF242-D014, AF242-D016, and AF242-D019 **ONLY**: the certified and completed DD Form 2345, Military Critical Technical Data Agreement, must be included with the initial proposal submission. Proposals that do not include this document will be disqualified.

2. Verification of Eligibility of Small Business Joint Ventures (Attachment 3 to the DOD SBIR 24.2 BAA)
3. Technical Data Rights Assertions (if asserting data rights restrictions)

**Feasibility Documentation (required for all proposal submissions, contained within Volume 5, not subject to page limitations)**

1. D2P2 proposals require a comprehensive, detailed effort description. Proposals should demonstrate sufficient technical progress or problem-solving results to warrant more extensive RDT&E. Developing technologies with commercial and military potential is extremely important. Particularly, AF is seeking proposals emphasizing technologies' dual-use applications and commercialization.
2. * NOTE: The applicant shall provide information to enable the agency to make the 15 U.S.C. 638(cc) determination of scientific and technical feasibility and merit. Applicants are required to provide information demonstrating scientific and technical merit and feasibility has been established. The DAF will not review the Phase II proposals if it is determined the applicant 1) fails to demonstrate technical merit and feasibility are established or 2) the feasibility documentation does not support substantial performance by the applicant and/or the PI. Refer to the Phase I description within the topic to review the minimum requirements needed to demonstrate scientific and technical feasibility. **Feasibility documentation cannot be based upon or logically extend from any prior or ongoing federally funded SBIR or STTR work.**
3. If appropriate, include a reference or works cited list as the last page.
4. Feasibility efforts detailed must have been substantially performed by the applicant and/or the PI. If technology in the feasibility documentation is subject to intellectual property (IP) rights, the applicant must provide IP rights assertions. Additionally, applicants shall provide a short summary for each item asserted with less than unlimited rights describing restriction's nature and intellectual property intended for use in the proposed research. Please see DoD SBIR 24.2 BAA for technical data rights information.
5. DO NOT INCLUDE marketing material. Marketing material will NOT be evaluated.

**FRAUD, WASTE, AND ABUSE TRAINING (VOLUME 6)**

Note that the FWA Training must be completed prior to proposal submission. When training is complete and certified, DSIP will indicate completion of the Volume 6 requirement. The proposal cannot be submitted until the training is complete.

**DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)**

The DAF does not participate in the Discretionary Technical and Business Assistance (TABA) Program. Proposals submitted in response to DAF topics should not include TABA.

**METHOD OF SELECTION AND EVALUATION CRITERIA**

D2P2 proposals are evaluated on a competitive basis by subject matter expert scientists, engineers, or other technical personnel. Throughout evaluation, selection, and award, confidential proposal and evaluation information will be protected to the greatest extent possible. D2P2 proposals will be disqualified and not evaluated if the Phase I equivalency documentation does not establish the proposed technical approach's feasibility and technical merit.

Proposals will be evaluated for overall merit in accordance with the criteria outlined in the 24.2 BAA Section 6.0. DAF is seeking varying technical/scientific approaches and/or varying and new technologies that would be responsive to the problem statement(s) and area(s) of interest in the topic. Multiple procurements are planned and anticipated to be awarded as a result of the topic, each proposal is considered a separate procurement and will be evaluated on its own merit, and that the Government may award all, some, or none of the proposals. Any per-award or per-topic funding caps are budgetary estimates only, and more or less funding may become available. Funding decisions are made with complete disregard to the other awards under the same topic.

In accordance with Section 4 of the SBIR and STTR Extension Act of 2022, the DAF will review all proposals submitted in response to this BAA to assess security risks presented by small business concerns seeking a Federally funded award. The DAF will use information provided by the small business concern in response to the Disclosure of Foreign Affiliations or Relationships to Foreign Countries and the proposal to conduct a risk-based due diligence review on the cybersecurity practices, patent analysis, employee analysis, and foreign ownership of a small business concern, including the small business concern and employees of the small business concern to a foreign country, foreign person, foreign affiliation, or foreign entity. The DAF will also assess proposals utilizing open-source analysis and analytical tools, for the nondisclosures of the information set forth in 15 U.S.C. 638(g)(13). If DAF assesses that a small business concern has security risk(s), DAF will review the proposal, the evaluation, and the security risks and may choose to either 1) create a plan to mitigate the risk(s) or 2) DAF may decide not to select the proposal for award based upon a totality of the review.

**MAJORITY OWNERSHIP IN PART BY MULTIPLE VENTURE CAPITAL, HEDGE FUND, AND PRIVATE EQUITY FIRMS**

Small business concerns that are owned in majority part by multiple venture capital operating companies (VCOCs), hedge funds, or private equity funds are not eligible to submit applications or receive awards for Department of Air Force Topics.

**PERFORMANCE OF WORK REQUIREMENTS AND LOCATION OF WORK**

For Phase I, a minimum of two-thirds of the research or analytical effort must be performed by the Awardee. The DAF measures percentage of work by both direct and indirect costs, not including profit. Occasionally, the DAF will consider deviations from this performance of work requirement. **Requests for Performance of Work deviations must be made twice: prior to submission during the topic open period and as part of the initial proposal submission.** For requests prior to the initial proposal submission, the DAF will consider the request and approve or disapprove requesting applicants to proceed with DSIP submission. Upon proposal receipt, the DAF will again consider such requests for approval for the resultant award.

All R/R&D work must be performed in the United States. Based on a rare and unique circumstance, the DAF may approve a particular portion of the R/R&D work to be performed or obtained in a country outside of the United States. The awarding Funding Agreement officer must approve each specific condition in writing. Applicants seeking this approval must make such a request with their initial proposal submission. The DAF will not consider these requests prior to proposal submission.

**DAF USE OF SUPPORT CONTRACTORS**

Restrictive notices notwithstanding, proposals may be handled for administrative purposes only, by support contractors. These support contractors may include, but are not limited to APEX, Peerless Technologies, Engineering Services Network, HPC- COM, Mile Two, REI Systems, MacB (an Alion company), Montech, Oasis, Astrion/Oasis, and Infinite Management Solutions. In addition, only Government employees and technical personnel from Federally Funded Research and Development Centers (FFRDCs) MITRE and Aerospace Corporations working under contract to provide technical support to AF Life Cycle Management Center and Space Force may evaluate proposals. All support contractors are bound by appropriate non-disclosure agreements. **Contact the AF SBIR/STTR Contracting Officer (Daniel.Brewer.13@us.af.mil) with concerns about any of these contractors**.

## PROPOSAL STATUS AND FEEDBACK

The Principal Investigator (PI) and Corporate Official (CO) indicated on the Proposal Cover Sheet will be notified by e-mail regarding proposal selection or non-selection. Small Businesses will receive a notification for each proposal submitted. Please read each notification carefully and note the Proposal Number and Topic Number referenced.

Automated feedback will be provided for proposals designated Not Selected. Additional feedback may be provided at the sole discretion of the DAF.

**IMPORTANT:** Proposals submitted to the DAF are received and evaluated by different organizations, handled by topic. Each organization operates within its own schedule for proposal evaluation and selection. Updates and notification timeframes will vary. If contacted regarding a proposal submission, it is not necessary to request information regarding additional submissions. Separate notifications are provided for each proposal.

The Air Force anticipates that all proposals will be evaluated and selections finalized within approximately 90 calendar days of solicitation close. Please refrain from contacting the BAA CO for proposal status before that time.

Refer to the DoD SBIR Program BAA 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: Air Force SBIR/STTR Contracting Officer Daniel J. Brewer, Daniel.Brewer.13@us.af.mil.

## AIR FORCE SUBMISSION OF FINAL REPORTS

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

VERSION 3

## Department of Air Force SBIR 24.2 D2P2 Topic Index

| Topic Number | Topic Name | Maximum Value* | Maximum Duration** |
|---|---|---|---|
| AF242-D001 | High Impact LED Defense Aid | $1,800,000.00 | 24 |
| AF242-D002 | Detection and Geolocation of Signals of Interest Given Distributed End-User Devices | $1,800,000.00 | 24 |
| AF242-D003 | Exoskeleton Augmentation for Flightline and Airfield Operations | $1,800,000.00 | 15 |
| AF242-D004 | Waterjet Vision System | $1,800,000.00 | 24 |
| AF242-D005 | Continued enhancement of Additive Manufactured Foundry-grade Sand Molds | $1,800,000.00 | 24 |
| AF242-D006 | Chemical-Free Robotic Vegetation Control for Base Facilities and Runways | $1,250,000.00 | 24 |
| AF242-D007 | Machine-Assisted Electronic Protection | $1,800,000.00 | 24 |
| AF242-D008 | Affordable AESA for Multi-function Seeker | $1,800,000.00 | 24 |
| AF242-D009 | Exum Massbox: semi-nondestructively material characterization of small parts to aid in reverse engineering. | $1,800,000.00 | 24 |
| AF242-D010 | Co-Bot Robotic Arm (COBRA) Range | $1,800,000.00 | 24 |
| AF242-D011 | Segment Anything For Extended Reality | $1,800,000.00 | 24 |
| AF242-D012 | Humanoid Mobile Robot Manipulation Behavior Development | $1,800,000.00 | 24 |
| AF242-D013 | AI/ML Maintenance On-Prem Platform | $1,800,000.00 | 24 |
| AF242-D014 | Wide Field of View Lensing Spatially Variant Photonic Crystals | $1,800,000.00 | 24 |
| AF242-D015 | Mapping Complex Sensor Signal Processing Algorithms onto Neuromorphic Chips | $1,800,000.00 | 24 |
| AF242-D016 | High Voltage Fireset/Electric Gun System Development | $1,800,000.00 | 24 |
| AF242-D017 | High Resolution Low SWaP Attritable EO/IR Sensors for Stratospheric Operations | $1,800,000.00 | 24 |
| AF242-D018 | Development of Advanced Surface Treatments for Astroquartz Fibers | $1,800,000.00 | 24 |
| AF242-D019 | Seeker for Low-Cost Base Defense Munition | $1,800,000.00 | 24 |
| AF242-D020 | Treatments for Crack Propagation in Metal Aircraft Parts | $1,800,000.00 | 24 |
| AF242-D021 | Trusted, Generative AI for Acquisition Process Acceleration | $1,800,000.00 | 24 |
| SF242-D022 | Uncertainty Management for Space Domain Awareness of Non-Standard Threats | $1,800,000.00 | 24 |
| SF242-D023 | Small Satellite Swarms for ISR | $1,800,000.00 | 24 |
| SF242-D024 | ICED-T – Innovative Cargo Exoatmospheric Delivery Technology | $1,800,000.00 | 24 |
| SF242-D025 | DEMISE - DEploy Material Into Space Experiments | $1,800,000.00 | 24 |

| | | | |
|---|---|---|---|
| SF242-D026 | FLOATS - Floating and Loitering Ocean Advanced Technology Sensing | $1,800,000.00 | 24 |
| SF242-D027 | ROC STAR - ROcket Cargo System Technologies And Research | $1,800,000.00 | 24 |
| SF242-D028 | Strategic Advancements in Resilient Space Technologies for PWSA Enhancement | $1,800,000.00 | 24 |
| SF242-D029 | Space Based Environmental Monitoring (SBEM) | $3,000,000.00 | 24 |

*Proposals that exceed this amount will be disqualified.
**Proposals that exceed this duration will be disqualified.

VERSION 3

AF242-D001 TITLE: High Impact LED Defense Aid

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Directed Energy (DE)

OBJECTIVE: Developing and implementing less-lethal technologies such as the light-emitting diode (LED) weapon is crucial to ensuring the safety of both law enforcement officers and civilians during potentially violent interactions. The objective of this initiative is to provide officers with non-lethal alternatives that minimize the risk of injury or death to both suspects and bystanders while also being effective in stopping potential threats. In recent years, there has been a growing awareness of the need for less-lethal options in law enforcement and military operations. Lethal force should only be used as a last resort, and officers must have effective alternatives that can be used when lethal force is unwarranted or could cause unnecessary harm. Less-lethal options like LED weapons have proven effective in incapacitating or disorienting suspects while minimizing the risk of serious injury or death.

DESCRIPTION: The Air Force Security Forces Center has identified a critical need for a less-lethal weapon that can incorporate incapacitating LED lights and be deployed by throwing it into a room before entry. This weapon will provide security forces with an effective tool to minimize the risk of injury or death to all parties involved during operations that require non-lethal force. The proposed weapon will also be designed to meet the unique needs and requirements of the Air Force. It will undergo rigorous testing and evaluation to ensure its effectiveness and safety. The development of this weapon aligns with the Air Force's commitment to modernizing its equipment and enhancing the capabilities of its security forces to carry out their missions effectively and efficiently. The weapon must meet the following characteristics. 1. Lightweight and compact; The weapon should be small and easy to carry and not add significant weight to the equipment of security forces. 2. Durable; The weapon should withstand the impact of being thrown into a room or against a hard surface without breaking or malfunctioning. 3. LED lights; The weapon should feature bright, flashing LED lights capable of temporarily incapacitating individuals, causing confusion, and disorienting the target. 4. Non-lethal; The weapon should be designed to minimize the risk of serious injury or death, both to the target and to bystanders in the area. 5. Accuracy; The weapon should be designed to enable accurate throwing so that security forces can aim it at specific targets and minimize the risk of hitting innocent bystanders. 6. Reusability; The weapon should be designed to be reusable so that security forces can deploy it multiple times in a single operation if necessary. 7. Safety; The weapon should undergo rigorous testing and evaluation to ensure it does not pose a significant risk of injury or death to security forces or targets. 8. Compatibility; The weapon should be compatible with other equipment and technology security forces use and easily integrate into existing operational procedures. 9. Compliance; The weapon must meet all DOD and Air Force Compliance standards

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Applicants are expected to provide feasibility documentation that addresses the following information:

1) Provide a detailed technical description of the weapon system, including its design, components, and functionality. This must include information on using LED lights and the ability to deploy the system by throwing it into a room before entry.
2) List how the weapon system will meet the requirements, such as being lightweight and compact, durable, incorporating LED lights, and designed to minimize the risk of severe injury or death.
3) Provide a detailed Development Plan for developing the weapon system, including a timeline, milestones, and estimated costs.

PHASE II: System Development, Testing, Deployment Testing and Evaluation

The testing and evaluation process for the non-lethal weapon system would involve rigorous testing to ensure its safety, effectiveness, and compatibility with other equipment and technology. The weapon would undergo various testing scenarios to simulate real-world situations to assess its performance in different environments and against various targets. The tests would evaluate the weapon's ability to withstand impact, accuracy, and its capacity to disorient or incapacitate targets. Testing would also examine the weapon's reusability, durability, and compatibility with other equipment and technology. The weapon would also be evaluated for safety, ensuring it does not pose a significant risk of injury or death to security forces or targets.

Deployment
Implementing the non-lethal weapon system would involve integrating it into existing operational procedures. This would require training and education for security forces to ensure they understand the capabilities and limitations of the weapon and can use it effectively and efficiently. Logistical and operational considerations would also need to be addressed, including how to distribute the weapon and how to handle any malfunctions or issues that may arise during deployment.

PHASE III DUAL USE APPLICATIONS: Awardee(s) will be expected to expand the capability of a non-lethal system by conducting further research and development to identify additional features or improvements that could be made to enhance its effectiveness and versatility. This could include exploring different types of non-lethal technology, such as sound-based or electric-based incapacitating devices and integrating them into the system. Additionally, expanding the system's capability would require ongoing testing and evaluation to ensure that any new features or improvements do not compromise the safety of security forces or the system's effectiveness. This testing and evaluation process could involve simulated scenarios and real-world testing under controlled conditions. Finally, expanding the capability of the non-lethal system would also require ongoing training and education for security forces to ensure that they are equipped with the knowledge and skills necessary to use the system in various situations effectively. This could involve regular training exercises and simulations, as well as incorporating the system into the standard training curriculum for security forces.

REFERENCES:
1. AFI 31-117, Arming and Use of Force by Air Force Personnel;
2. DoD Instruction 5200.08, Defense Law of War Program;
3. DoD Instruction 3150.08, Application of Laser and Directed Energy Weapons.;

KEYWORDS: Non-lethal weapons; Security forces; Military operations; Law enforcement; Incapacitating devices; Research and development; Light Emitting Diode: LED; Less than Lethal

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VERSION 3

AF242-D002 TITLE: Detection and Geolocation of Signals of Interest Given Distributed End-User Devices

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Integrated Sensing and Cyber; Integrated Network System-of-Systems; Human-Machine Interfaces

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 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: Air Force Research Lab (AFRL) is developing a protocol to leverage the sensing capacity of general-purpose end-user devices distributed on the battlefield, considering factors such as device duty cycle, power and resource constraints, sensor capability, and geographic and relative position. The objective of this SBIR topic is twofold: 1. to develop client-side algorithms to exploit the sensors available on a modern smartphone (such as the Samsung Tactical Edition commonly used as an Android Tactical Assault Kit (ATAK) end-user device) to detect signals of interest and/or anomalous signals such as GPS jammers/spoofers, small unmanned aerial systems (sUAS), cell signal jammers, gunshots, Wi-Fi, or Bluetooth and 2. to develop server-side (or distributed) algorithms to fuse reports from client devices in order to accurately geolocate the source of identified signal or signals.

DESCRIPTION: Modern smartphones are powerful, general-purpose compute devices that provide low-level access to an array of sophisticated sensors for connecting to radio-frequency (RF) systems, reporting on movement, recording audio/video, and other modalities. Increasingly, these devices are positioned on the battlefield and have immediate access to operationally relevant data and signals. This topic aims to capitalize on this underutilized potential, prompting the development of client capabilities to better sense the environment and server capabilities to better reason over edge sensor reports. New development under this SBIR will tie directly into AFRL's effort to develop a distributed sensor tasking protocol to enable such technologies. Awardees under this topic will be given access to beta releases and supporting data for the new protocol, as well as APKs, SDKs, documentation, supporting frameworks, and developer expertise for the Tactical Assault Kit (TAK) ecosystem, including ATAK, iTAK, and TAK Server.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Applicant(s) are expected to provide detail and documentation in the proposal that demonstrates feasibility via achievement of a "Phase I-type" effort for client and/or server-side sensing or geolocation of signals of interest.

PHASE II: Applicants should include development, installation, integration, demonstration and/or test and evaluation of proposed client and/or server software. This demonstration should evaluate the proposed solution against beta releases of AFRL's protocol for tasking distributed client sensors. Phase II awards are intended to provide a path to commercialization, not the final step for the proposed solution.

PHASE III DUAL USE APPLICATIONS: Successful Phase II technology effort reaching suitable TRL (6-7) will be candidates for additional Phase III development, including potential for transition to the Tactical Assault Kit (TAK) ecosystem in partnership with the TAK Product Center (TPC). In addition, Phase III efforts will focus on delivering client sensing and server localization capabilities to potentially a broader spectrum or series of diverse customers for operational use in a relevant commercial/ civilian, or government/military working environment.

REFERENCES:

1. https://tak.gov;
2. https://www.ion.org/publications/abstract.cfm?articleID=15546;
3. https://navi.ion.org/content/69/3/navi.537;

KEYWORDS: distributed sensing; end-user devices; signals of interest; GPS jamming/spoofing

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VERSION 3

AF242-D003 TITLE: Exoskeleton Augmentation for Flightline and Airfield Operations

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Biotechnology; Advanced Materials; Trusted AI and Autonomy; Human-Machine Interfaces

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 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 longitudinal data that shows an exoskeleton system appropriate for airmen performing airfield and flightline operations such as Aerial Port, Fuels, and Transportation Management is both effective and reliable in an operational environment.

DESCRIPTION: Airmen performing flightline and airfield operations suffer from a wide range of acute and chronic musculoskeletal injuries that arise from heavy physical strain put on the personnel while performing their duties. These injuries afflict the joints of the body head-to-toe including the ankles, knees, hips, lumbar vertebra, shoulders, elbows, and wrists. A career of moving heavy loads, climbing ladders and stairs, jumping from elevated platforms, and maneuvering over uneven terrain and surfaces leaves these airmen debilitated with any combination of afflicted joints. This has the potential to take them out of the fight earlier in their career and contributes to personnel staffing and retention problems. Austere airfields only compound this problem. Austere environments can be expected to include non-paved surfaces, rolling terrain, poor access to local material handling equipment, poor access to local energy sources including suitable fuel, and tight access to airfields and aprons. Flightline and airfield crews may also be minimally staffed, not having enough personnel to fulfill all the necessary roles. This leaves airmen pulling double duty or completing their job with fewer than optimal personnel and without some of the necessary equipment used to do their job. The mindset of aerial porters and other operators is to get the job done with what is available, and this often puts them at increased risk of injury to complete their mission and increases the strain on their bodies.

Without the logistical power these airmen provide, the Air Force cannot operate within Agile Combat Employment (ACE) concepts as intended. The inadequate personnel staffing, injury, and equipment problems described above affecting our airmen severely limits our ability to operate at the accelerated tempo and with the reduced logistical footprint needed to win a near-peer fight.

However, wearable exoskeletons may provide some relief for airmen in flightline and airfield operations. These devices can offload a percentage of the load put on airmen when performing their duties and can potentially augment their strength and stamina. Exoskeletons may be an important force multiplier capability that can enable our airmen to perform their duties safely and within ACE concepts even in the face of inadequate manning and unavailable equipment. Although exoskeleton technologies have been developed that address the aerial porter job 4, there is still a critical need to address the problem of proving effectiveness and reliability of these systems in an operational environment. To date, there are no statistically-relevant data that shows these exoskeleton systems are effective at meeting the user requirements of airfield and flightline AFSCs in operationally relevant environments or that the systems are reliable and safe for airmen to use over the course of their careers. Without this information, commanders and end user confidence in exoskeletons remains skeptical, adoption of new assistive technologies will continue to suffer, and these problems facing our airmen will persist.

In order to solve these problems, appropriate exoskeleton systems must be proven against a list of end-user-derived requirements under a protocol that will produce statistically-relevant results.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior "Phase I-type" effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement.

Applicant(s) must have developed a concept for a workable prototype or design to address at a minimum the basic capabilities of the stated objective above. Applicant(s) must show, as appropriate to the proposed effort, a demonstrated technical feasibility or nascent capability to meet the capabilities of the stated objective. Applicant may provide example cases of this new capability on a specific application. The documentation provided must substantiate that the proposer has developed a preliminary understanding of the technology to be applied in their Phase II proposal to meet the objectives of this topic. Documentation should include all relevant information including, but not limited to technical reports, test data, prototype designs/models, and performance goals/results.

PHASE II: Awardee(s) will develop a wearable exoskeleton to meet user requirements in flightline and airfield operations. Awardee(s) will test the system to ensure it meets capability and reliability requirements.

i. Develop and demonstrate wearable exoskeleton to augment strength and/or stamina of airmen and reduce risk of musculoskeletal injury when performing flightline and airfield operations in their duty tasks.
ii. Develop and demonstrate wearable exoskeleton to operate in austere locations with a minimum IP rating of IP57W, with an ideal rating of IP68W.
iii. Develop and demonstrate wearable that can operate in a temperature environment of -40 to 125 degrees F.
iv. Ensure the system meets all other identified end user capability requirements . These include but are not limited to:
    a. 8-12 hour run time between recharge/refuel.
    b. Assist lifting boxes >51 lbs. when building/disassembling pallets.
    c. Maintain maneuverability and not snag when working with nets/chains/tie downs.
    d. Assist lifting items (135+ lbs) from ground to height of 80" and vice versa.
    e. Assist handling dunnage.
    f. Maintain maneuvering ability when carrying a load.
    g. Assist pushing pallets to/from the aircraft using the arms pushing forward or the back pushing backwards.
    h. Maintain ability to climb up and down vehicles, highline docs, containers, etc.
    i. Assist pulling fuel hoses 300 ft.
    j. Assist unfolding and moving 50k gallon fuel bladders.
    k. Ability to tune force output quickly and intuitively.
    l. Incorporate emergency shutdown to protect the user if unsafe conditions arise.
    m. Incorporate graceful failure modes to abort lifts in event of system failure or shutdown.
v. The system should not require the user to doff the system when operating any vehicle employed in flightline and airfield operations.
vi. Develop meaningful performance metrics and gather statistically relevant-data on system performance
vii. Awardees are expected to participate in a Military User Assessment with end users to ensure the system meets capability requirements.
viii. Awardees are expected to participate in a long-term MUA to ensure the system meets reliability requirements.

ix. Awardees should be prepared to deliver up to five (5) systems in order to adequately test the systems in an operationally relevant environment .
   a. Cargo area of a C-130 or C-17
   b. Operate in and around airfield and aircraft snag hazards without snagging.
   c. Uneven terrain and non-smooth surfaces found in austere airfields.
   d. Maneuver through tight quarters between cargo loads or aircraft walls as tight as an 8" clearance.
   e. Laying supine under rolling stock.
   f. Wearable while operating vehicles and Material Handling Equipment (MHE).

x. Document all methods and results in a final report.

PHASE III DUAL USE APPLICATIONS: The Government has an interest in transition of the demonstrated concept to flightline and airfield operations. Solutions may have application to commercial air cargo operations, warehouse material handling operations, and construction.

REFERENCES:

1. Department of the Air Force Operational Imperatives, https://www.af.mil/Portals/1/documents/2023SAF/OPERATIONAL_IMPARITIVES_INFOGRAPHIC.pdf
2. Lt.Col. P Lucas; 72469 USAFSAM PHR Report – AMC 2T2 Consult Memo, 2017
3. Lt.Col. P Lucas; 78627 USAFSAM PHR Cargo Mvmt – AMC 2T2 Consult Memo, 2018
4. Giardina, Gina M; Take the load off: Exoskeleton to enhance safety, retention for aerial porters, others. - https://www.afrl.af.mil/News/Article-Display/Article/3187272/take-the-load-off-exoskeleton-to-enhance-safety-retention-for-aerial-porters-ot/, 2022;

KEYWORDS: Contested Logistics, austere operations, austere environment, aerial port, logistics, cargo handling, exoskeletons, material handling equipment (MHE), flightline operations, airfield operations, Agile Combat Employment

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VERSION 3

AF242-D004 TITLE: Waterjet Vision System

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This project will focus on the development of a system to produce AI generated one-off robotic programming. The programming should use visual data collected and assessed in an autonomous manner. An optimized physical system should be delivered and integrated into the Depot environment.

DESCRIPTION: Water Jet is one of the optimal choices for coating removal due to its low stock loss on parent material. Ageing weapon systems have lead to each repair becomes its own snowflake (one of a kind) item, thus small spots of the coatings are often not removed and require sections of the program to be reran. Vision systems are being developed for several different types of technology for determining areas that need to be processed. the system develops the path planning to successfully process the part. Building on vision system technology, this project would make recommendations to complete the coating removal and speed up the unique rework loop.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. The applicant should be able to prove a firm understanding and ability to demonstrate an ability to meet the requirements of the project. Specifically, they should have some working relationship with vision systems and/or water jet stripping technology. The vendor must be able to provide sufficient data for the government to determine feasibility.

PHASE II: This will be a SBIR D2P2 with a 24 month Period of performance. This project will be the application and development of a machine vision system for Depot level waterjet cleaning and material removal. The applicant should advance the previous AFRL MANTECH associated work using similar technologies for sanding processes. The scope of the project will evaluate through an applicant developed system that will be integrated with existing an existing Depot waterjet. The system will be optimized for propulsion parts to include the scale of size and geometric complexity. An optimized demonstration of the physical system is expected as part of the deliverable.

PHASE III DUAL USE APPLICATIONS: Following successful SIBR prototyping, the ALC will dedicate CIP funds to upgrade all 11 of the water jet stripping systems to have this vision system.

REFERENCES:


1. https://www.fanucamerica.com/products/robots/vision-products;
2. https://www.progressivesurface.com/waterjetcleaning.htm;


KEYWORDS: Waterjet; Vision; AI; Artificial Intelligence; Cleaning; Depot; Machine Vision

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VERSION 3

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VERSION 3

AF242-D005 TITLE: Continued enhancement of Additive Manufactured Foundry-grade Sand Molds

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced 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 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: Advance the use of Lost-PLA to be able to achieve aerospace grade aluminum castings. Upon completion of the project, Tinker will be able to cheaply deploy investment casting type capabilities within REACT within an easily scalable workflow.

DESCRIPTION: -Deploy PLA manufacturing systems within REACT that are compatible with the ATO.
-Establish digital workflow to go from a reverse engineered part to a PLA print capable of operating as a casting positive
-Establish process controls and facility requirements for the investment and set up of the casting
-Perform sufficient testing to demonstrate AMS 2175 quality of Class B or

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Applicant(s) must be able to demonstrate ability to use evaporative casting methodologies (e.g. lost-PLA or lost-foam) previously. PLA or foam tooling manufacturing must be of additive/digital variety. The applicant(s) must be able to provide sufficient data for the government to determine feasibility.

PHASE II: -Deploy PLA manufacturing systems within REACT that are compatible with the ATO.
-Establish digital workflow to go from a reverse engineered part to a PLA print capable of operating as a casting positive
-Establish process controls and facility requirements for the investment and set up of the casting
-Perform sufficient testing to demonstrate AMS 2175 quality of Class B or higher

PHASE III DUAL USE APPLICATIONS: Output from Phase II will result in a low cost (~$15k-30k) ability for Tinker to expand to lost-PLA casting. Other bases with the ability to melt (e.g. Rock Island Arsenal in the US Army). The ALC will purchase technology using organization (working capital) funds.

REFERENCES:

1. AMS 2175;


KEYWORDS: Casting; Investment Casting; Lost PLA; Aluminum


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VERSION 3

AF242-D006 TITLE: Chemical-Free Robotic Vegetation Control for Base Facilities and Runways

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Microelectronics

OBJECTIVE: Explore and develop innovative technology solutions to automate base maintenance equipment that reduces manpower, maintains high readiness, and reduces toxic chemical environmental impact from maintenance operations.

DESCRIPTION: Weeds and invasive vegetation control is a critical foreign object debris (FOD) prevention activity. The National Association of FOD Prevention Inc. reports that FOD costs the aviation industry US$13 billion per year in direct plus indirect costs. Vegetation attracts wildlife, introducing a bird/wildlife aircraft strike hazard (BASH).

At many Air Force bases, entomologists conduct critical weed and invasive vegetation control activities to reduce the flightline FOD risk and keep aircraft safe and operational. This time-consuming manual activity relies on inordinate amounts of manpower, and exposes airmen to the toxic herbicides used to remove weeds. Herbicide exposure requires Airmen to don protective gear. Airmen undergo medical examinations every six months to check for hazardous chemicals in their bloodstream. These Integrated Pest Management Program activities are expensive and puts Airmen health at risk.

Agricultural and ground management operations have been disrupted by labor shortages and shortages of critical agricultural inputs, including synthetic fertilizers (Russia a leading supplier) and chemical herbicides (China sole component supplier). Recent global events have also highlighted global food supply vulnerabilities, either from malicious actions of foreign adversaries, unsecure technology, or climate change. Risks of worsening disruptions can be mitigated by developing vegetation management technologies that reduce dependency on herbicides and synthetic fertilizers, which, if deployed on a large scale, would simultaneously reduce greenhouse gas emissions, and help reverse catastrophic climate change trends. The same agricultural technologies could reduce cost to maintain or reduce invasive species, ensuring warfighters have a food supply at least as safe and reliable as that expected by the consumer.

This topic seeks solutions the DAF can use to automatically maintain vegetation near the flightline, reducing manpower and cost, while eliminating the use of chemicals. Specifically, the DAF is seeking solutions that provide autonomous, chemical-free control of vegetation growing in hard-to reach locations such as along fence lines and building foundations. It is expected the solution also provides a means for enabling increased adoption of regenerative agriculture practices, mitigating the impact of input scarcity while assuring agricultural output sufficient to feed warfighter and the free population alike.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Applicant(s) must include in its response to this topic "Phase I-type" feasibility documentation that substantiates the scientific and technical merit and "Phase I-type" effort such as developed a concept for a workable prototype or design to address, at a minimum, the basic requirements as described above. Documentation should include all relevant information including, but not limited to technical reports, test data, prototype designs/models, and performance goals/results for establishing the scientific and economic feasibility of the proposed work. Work submitted within the feasibility documentation must have been substantially performed by the offeror and/or the principal investigator (PI).

VERSION 3

PHASE II: Phase II will be a continuation of research and development already performed in a “Phase I-type” effort. The focus in this phase should finish refinements of system design concepts, building and testing of a field-scale prototype, and prototype validation based on field usage and base demonstration. Proposals should include development, installation, integration, demonstration and/or test and evaluation of the proposed solution prototype system.

These activities should focus specifically on:

- Evaluating the adapted solution against the proposed objectives and measurable key results.
- Describing in detail how the installed solution differs from the non-defense commercial offering to solve the Air Force and/or Space Force need(s), as well as how it can be scaled for wide adoption, i.e., modified for scale.
- Identifying the proposed solution's clear transition path, taking into account input from affected stakeholders, including but not limited to, end users, engineering, sustainment, contracting, finance, legal, and cyber security.
- Specifying the solution's integration with other current and potential future solutions.
- Describing the solution's sustainability, i.e., supportability. Identifying other specific DoD or Governmental customers for the solution.

PHASE III DUAL USE APPLICATIONS: Military Application: Automated equipment that enables widespread adoption of sustainable vegetation management agricultural practices, reducing operational costs and ensuring food supply to warfighters and US allies. Similar equipment supports the rapid deployment of mobile bases, in a wide variety of terrains and environmental conditions, as well as routine base maintenance.

Commercial Application: Agricultural equipment that enables widespread adoption of sustainable agricultural practices, profitably, across a variety of agricultural conditions.

REFERENCES:


1. The National Association of FOD Prevention Inc. reports that FOD costs the aviation industry US$13 billion per year in direct plus indirect costs. https://fodprevention.com/fod-prevention-information/
2. Gillezeau C, van Gerwen M, Shaffer RM, Rana I, Zhang L, Sheppard L, Taioli E. The evidence of human exposure to glyphosate: a review. Environ Health. 2019 Jan 7; 18(1):2. doi: 10.1186/s12940-018-0435-5. PMID: 30612564;
3. PMCID: PMC6322310.
4. Pesticide Supply Outlook: Pesticide Shortages, High Prices Unlikely to Ease in 2022 https://www.dtnpf.com/agriculture/web/ag/crops/article/2022/02/08/pesticide-shortages-high-prices-ease;


KEYWORDS: Biotechnology; Directed Energy (DE); weed abatement; Autonomous maintenance; Vegetation control; Robotics; Herbicide reduction; Regenerative agriculture; Dual-Use;


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AF242-D007 TITLE: Machine-Assisted Electronic Protection

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this Small Business Innovation Research (SBIR) Direct to Phase II topic is to develop an innovative system for Opportunistic Selection and Waveform Adaptation (OSWA) to resist adversary jamming. OSWA will use cognitive radar utilizing machine learning to intelligently select and adjust resistant waveforms during real-world operation response.

DESCRIPTION: Cognitive radar has shown some capability to automate intelligent radar responses to the electronic environment. This includes being able to quickly identify and react to electronic attacks such as jamming or deception. Phase I developed the OSWA to make this technology feasible. Therefore, this SBIR phase II prototype shall be able but not limited to improve cognitive intelligence in radar functionality. (i.e., it will develop Opportunistic Selection and Waveform Adaptation for electronic warfare (EW).) Phase II will also seek to increase signal processing and EW hardware systems for radar technology. This phase II seeks efficient prototype development that will be operationally used in the Air Force.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement.

This topic aims to develop an advanced Opportunistic Selection and Waveform Adaptation (OSWA) system, leveraging AI and ML, particularly in cognitive electronic warfare. The OSWA system will enhance modern radar systems' resilience against electronic attacks like barrage noise and deceptive jamming by dynamically selecting and adjusting jam-resistant waveforms using real-time feedback on effectiveness and adversary behavior. Phase I focused on demonstrating continual adaptation of waveforms to counter electronic attacks, combining expert rules and reinforcement learning, integrating cutting-edge machine learning algorithms with signal processing and electronic warfare hardware proficiency. This technology is currently at an acceptable stage to award a D2P2.

PHASE II: For this phase II, the proposals should include development, installation, integration, demonstration, test and evaluation of the proposed solution prototype system enhancement of their Phase I like prototype equivalent solution. This Phase II will seek to implement and demonstrate a realistic case scenario of cognitive EW successfully resisting adversary jamming with radar. Moreover, this SBIR phase II prototype shall be able but not limited to successfully resist adversary jamming through cognitive radar.

PHASE III DUAL USE APPLICATIONS: Phase III efforts will focus on transitioning operationally ready technology to a commercial sector or DoD environment. The offeror will identify transition partners. TRL should be at a minimum of a TRL 6. The AI technology will have a well-developed radar functionality to deliver the realization of such technology to the war fighter or commercial sector. Once this technology hits the required rightness level, then it will be integrated in the ARTS V3 ground radar program.

REFERENCES:

1. https://www.sbir.gov/node/2328925;
2. https://ieeexplore.ieee.org/document/9035657;
3. https://ieeexplore.ieee.org/document/9446140;


KEYWORDS: machine learning; artificial intelligence; data fusion; space domain awareness; cognitive ew; cognitive radar;

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AF242-D008 TITLE: Affordable AESA for Multi-function Seeker

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Microelectronics

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OBJECTIVE: The objective of this effort is to enhance the manufacturability and reduce the unit cost of scalable AESA front-end RF electronics apertures for SWAP-constrained munitions platforms and other small unmanned airborne platforms.

DESCRIPTION: Seekers for evolving weapon platforms require affordable wide-band front-end RF electronics to enable long-range, all-weather, GPS-denied precision strike. This topic will address this need by developing and maturing an affordable, scalable AESA front-end for SWaP-constrained munitions platforms. Critically, the effort should address improvements in manufacturability, reliability, testability, producibility, and maintainability aspects of the AESA design that are key drivers for overall component affordability. To achieve these goals, it is expected that the proposer will have significant previous design, engineering, and development experience with AESA front-end apertures and, likely, an existing basic AESA design consistent with application to munitions platforms. The ultimate end-product of this effort will be a functional prototype AESA front-end that has been tested and demonstrated in a realistic laboratory environment. The effort must include DFx analyses (e.g., design for manufacturability, design for reliability, design for testability, design for producibility, design for maintainability, design for cost, etc.) that support the cost objective.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Applicant(s) will demonstrate feasibility be describing previous design, engineering, and development experience with AESA front-end RF electronics apertures for SWAP and cost constrained tactical airborne platforms.

PHASE II: With a keen focus on design-for-affordability and manufacturability, the awardee(s) will develop, refine, and prototype a high-performance, wideband AESA and front-end electronics solution using next-gen beam-forming integrated circuits. The targeted unit volume production cost is $15,000. The awardee(s) will demonstrate performance by integrating with back-end support electronics to create a functional RF system prototype and conduct laboratory testing. The awardee(s) will also perform Design For (X) (DFx) to ensure the design is ready for transitioning to targeted tactical airborne platforms; including volume manufacturing, reliability, testability, cost-effectiveness, quality, and maintainability efforts, with the results folded into the final design.

PHASE III DUAL USE APPLICATIONS: Phase III will focus on productization of the system developed during the Phase II. AFLCMC/EBDA has expressed interest in funding Phase III maturation of this technology in response to ACC requirements.

VERSION 3

REFERENCES:

1. Active Electronically Scanned Arrays: Fundamentals and Applications, Brown, Arik, D., IEEE Press, 2021.
2. Phased Array Antenna Handbook, 3rd Ed., Mailloux, Robert, J., Artech House, 2017.
3. Beam Steering and Beam Stabilization of Active Electronically Scanned Array (AESA) Seeker for Missile Guidance, Patel, Vikas and Madhukar, H. 2021 International Conference on Control, Automation, Power, and Signal Processing (CAPS), IEEE, Dec 2021.;

KEYWORDS: Active electronically scanned array; AESA; tightly coupled dipole array; stand-off attack munition; wideband array; beamforming integrated circuits; system-in package

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VERSION 3

AF242-D009 TITLE: Exum Massbox: semi-nondestructively material characterization of small parts to aid in reverse engineering.

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced 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 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: There is a strong demand within the AFCS to accurately and quickly perform material identification on parts, specifically with the purposes of reverse engineering and rapid prototyping. The current practices for material identification are often prohibitive due to cost, time, and need for skilled operators. The current deficit in material testing means that many projects are completed without pertinent material information, or they are simply canceled due to the inability to complete the material testing requirements. The goal of this award would be to perform a detailed trial run of Exum's novel Massbox technology alongside conventional testing methods to determine if it is a suitable replacement for conventional testing, and ultimately implementing it as a more cost/time affective solution where applicable.

DESCRIPTION: To meet the AFCS material testing needs, the outcome of this SIBR should include testing a variety of common aerospace materials (i.e., aluminum, titanium, steel, nickel) with a focus on comparing the data generated by the Exum Massbox with that of conventional material testing methods. To meet the objective of implementing the Massbox as an alternative to the cost prohibitive conventional testing, the test results must show that the Massbox produces comparable data, specifically with the light elements that XRF struggles with and at a lower cost than the current methods employed.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior "Phase I-type" effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. The applicant(s) must feasibility by demonstrating the ability to provide data generated from a working Massbox indicating that the instrument is currently operational and capable of deployment for a feasibility study.

PHASE II: An operational Massbox will be delivered to REACT for evaluation of the capabilities. Over the course of 2 years, Exum will work jointly with REACT to develop machine parameters that allow for the material identification of a majority of all alloys regularly used in the aerospace industry (i.e. standard aluminum alloys,
nickel alloys, iron, copper, cobalt, titanium, etc.). The final data output from the Massbox must be comparable or better than that generated by a standard OES machine.

PHASE III DUAL USE APPLICATIONS: The expected TRL at Phase III entry is a TRL 7 or TRL 8. If Phase II proves successful and economically viable, Phase III efforts will include technology transfer to other ALC Bases.

REFERENCES:

1. Digital Material ID;

VERSION 3

KEYWORDS: Exum; Massbox

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AF242-D010 TITLE: Co-Bot Robotic Arm (COBRA) Range

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Human-Machine Interfaces; Advanced Computing and Software

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 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: System should be fully automated with an integrated approach to radome testing. Should utilize co-bot and radio frequency (RF) software and include a user friendly interface. New system should reduce the testing time for the end item, increase reliability and sustainability of the test system and increase the security of personnel operating the equipment.

DESCRIPTION: Would like for project to deliver an upgraded robot, upgrade operating system to windows 10 or newer and upgraded software and hardware. Rewrite of software should include redefined scan patterns to help improve efficiency. New user interface should integrate robot motion scan patterns and RF measurement collection to a single platform to fully automate the testing process. New system should use commercial off the shelf parts to guarantee supportability of the equipment for years to come. Lastly will need to include the development of a range check-out procedure for verification and calibration of range by the user.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement.

Collaborative Robots (Co-bots) are widely used in the manufacturing industry to collect measurements, probe, scan and successfully perform repetitive functions. Co-bots have demonstrated that they can be safely integrated for the use in non-destructive inspections (NDI) in many facets of the manufacturing industry. By arming the cobots with the correct hardware we can expand their usability and show they can be used to perform the electrical testing of various aircraft radomes. Equipping these co-bots with RF antenna probes and or standard gain horns will enable them to successfully create a two horn interferometer for the collection of RF measurements. This application should facilitate and improve the radome testing capabilities substantially if integrated with the use of proximity sensor and scanning technology.

PHASE II: The expected outcome of Phase II is for the vendor to develop, deliver, install, and commission: two co-bots capable of performing the required inspections and prove the motion synchronization and alignment system. Phase II should also lead to the production of the positioners required for the installation of the co-bots. Should demonstrate the system's ability to perform the required testing for B-1B radomes, which includes the tail cone, wing gloves and scuppers. This phase should also lead to the production of the necessary hardware required to mount the antennas to the end-of-arm of the co-bots. These mounts should make it easy for end user to change the required antennas on both co-bots. Vendor will also be required to develop, deliver and demonstrate the operating system and software necessary for the operation of the robots. Software delivered should have the ability to port existing scan patterns and allow end users to train co-bots. Software should also provide the ability for the editing and development of new patterns by allowing the users to manually guide co-bots. Software should also demonstrate that it is cable to execute the position based triggering necessary to fully automate testing procedures and allow for the collection of RF measurements and for the processing of the data collected during test.

PHASE III DUAL USE APPLICATIONS: Upon entry of Phase III, the project will be a minimum of TRL 7 with a target of meeting TRL 9. Once the system has been proven to work the plan is to perform developmental test and evaluate the system to ensure it meets design specifications. Ensure that the system is operational in its final configuration under the environmental condition it is expected to operate in and assess any problems and develop plans to resolve problems before finalizing the design. Verify system's actual application in its final form and under mission conditions. If the Phase II is successful in developing the needed technology, the ALC can/will purchase technology using organization working capital funds.

REFERENCES:
1. https://research.aimultiple.com/cobot/;

KEYWORDS: Co-bots; interface; radio frequency; radome testing; probe antenna; standard gain horn; antenna; positioner

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VERSION 3

AF242-D011 TITLE: Segment Anything For Extended Reality

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Integrated Sensing and Cyber; Human-Machine Interfaces

OBJECTIVE: there is a clear AFSC and DoD need to automate sustainment processes in order to improve safety, quality, capacity, and readiness. Our near peers are automating at an alarming rate, and we should be developing technologies that keep us as many steps ahead as possible. The purpose of this topic is to research, evaluate, and implement Artificial Intelligence (AI) based 3D spatial mapping techniques using COTS XR (Commercial Off The Shelf Extended Reality) devices for fast and precise detection of multiple known and unknown objects without the additional need of AI training. This data will enable other automated systems to understand their environment quickly and easily while empowering the human to add value and oversight.

DESCRIPTION: recent advances in AI-based 2D image segmentation methods such as Segment Anything Model (SAM) has enabled automatic detection and precise segmentation of any object in a 2D image without additional AI training. Additionally, this image segmentation can be customized based on the environment by points, areas, and size of objects in the 2D image. The segmentation AI models transfer over a range of different data sets and environments with a high accuracy, making it robust to changes in environments and objects in that space.
The use of mobile industrial robots in sustainment and depot environments has grown significantly over the years and provides great improvements in safety, quality, agility, and throughput metrics. A key challenge for mobile robots is to have an accurate 3D spatial map of dynamically changing environments in order to reach the target workpieces without accidentally colliding into other 3D objects or humans in the environment.
Using COTS XR devices to capture 3D images and applying and extending the 2D SAM models toward captured 3D images can enable real time 3D spatial mapping and segmentation of all objects in a dynamic operational environment. This segmentation information and precise localization of various objects in 3D space can be automatically transferred into robotic controls for precise path planning without collision. The desired process will be seamless for the operator, who can confirm on XR devices the accuracy of the segmentation in real time, practically eliminating error and making mobile robotic systems faster and more agile.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Applicant(s) will demonstrate feasibility by describing the ability to accurately and precisely detect various objects of interest in an aircraft sustainment depot in an operational environment.

PHASE II: Awardee(s) will develop a working prototype to detect multiple known and unknown 3D objects using an XR device and provide precise 3D segmentation of the objects in real time in a dynamic operational environment. The prototype will interface with a robotic controller software to automatically transfer the segmentation masks with 3D localization data in the world coordinate space.

PHASE III DUAL USE APPLICATIONS: If the Phase II is successful in developing the needed technology, WR-ALC will purchase additional systems using organization (working capital) funds. The procurement will include the refinement the AI and XR systems to increase accuracy and reliability. Achieve production-ready state for marketing to the Air Force, other related federal agencies, and private industry.

VERSION 3

REFERENCES:

1. Alexander Kirillov, et. al., "Segment Anything", IEEE/CVF International Conference on Computer Vision (ICCV), 2023.
2. Chao-Yuan Wu, et. al., "Multiview Compressive Coding for 3D Reconstruction", Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2023.
3. A. Mirzaei, et. al., "SPIn-NeRF: Multiview Segmentation and Perceptual Inpainting With Neural Radiance Fields", Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2023.;

KEYWORDS: Extended Reality 3D Segmentation

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VERSION 3

AF242-D012 TITLE: Humanoid Mobile Robot Manipulation Behavior Development

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Integrated Sensing and Cyber; Human-Machine Interfaces

OBJECTIVE: There is a clear AFSC and DoD need to automate our sustainment processes in order to improve safety, quality, capacity, and readiness. Our near peers are automating at an alarming rate, and we should be developing technologies that keep us as many steps ahead as possible. One limiting factor in the continued scaling/proliferation of automation/robotics is that we have shaped our world to fit the human form factor. And with that, single or dual arm industrial robots stationary or mobile are limited in the number of applications they can support without significant facility or process modifications. These modifications are expensive and often intrusive to process flow, slowing our ability to automate and compete.

DESCRIPTION: Recent developments in the broad capabilities of humanoid general-purpose robotics for item manipulation have positioned these systems to make increasingly significant impacts in sustainment and depot environments by helping to automate human-like activities. These systems can provide improvements in safety, quality, agility, and throughput metrics, allowing overnight or lights-out operation as well as working collaboratively alongside people. For these robotic systems to scale, they must address an ever-growing range of items presented in a vast range of poses and configurations.

One advantage of the humanoid form factor is the ability to adjust the robot’s manipulation workspace, the three-dimensional bubble containing all the points it can touch. In this way, legged mobility critically amplifies bi-manipulation to produce a generalized platform. This platform can then be utilized in an almost unlimited number of ways and applications.
The desired manipulation behaviors are closed-loop to improve their fluidity and robustness, meaning they should be dynamically updated based on real-time multi-modal sensor information (position, torque, vision, etc.) to increase the manipulation speed to near that of what a human normally achieves. The desired manipulation behaviors may require coordination of two arms, including bracing one hand on a surface to enable a long reach or picking up an object using both arms to increase the payload the robot is capable of handling, and utilization of the full body, such as squatting to pick up an object from the ground or leaning back to counterbalance a carried load.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. To demonstrate feasibility, applicant(s) must describe its ability to control humanoid robotic hardware systems to perform a baseline mobile manipulation-based box/item pick. The firm should demonstrate physically, in simulation, or in principle the foundational control algorithms or behavior structures needed to develop workspace configurations for high, low, and far reach.

PHASE II: The objectives of this topic are to develop a working prototype to show increased capability of item picking within a variable workspace; and maximize the efficiency of the robotic system by allowing the robot to operate in a real-world depot environment with items arranged in various locations and positions.

PHASE III DUAL USE APPLICATIONS: If the Phase II is successful in developing the needed technology, WR-ALC will purchase additional systems using organization (working capital) funds. The procurement will include the refinement of hardware and software to increase accuracy and reliability and achieve a production-ready state for procurement by the Air Force, other federal agencies, and private industry.

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1. Jorgensen, S. J., Lanighan, M. W., Bertrand, S. S., Watson, A., Altemus, J. S., Askew, R. S., ... & Mehling, J. S. (2019, October). Deploying the nasa valkyrie humanoid for ied response: An initial approach and evaluation summary. In 2019 IEEE-RAS 19th International Conference on Humanoid Robots (Humanoids) (pp. 1-8). IEEE.;
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KEYWORDS: Humanoid Mobile Manipulation Robotics; Humanoid Robotics Tool Manipulation

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VERSION 3

AF242-D013 TITLE: AI/ML Maintenance On-Prem Platform

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Advanced Computing and Software; Human-Machine Interfaces

OBJECTIVE: A stand-alone, scalable asset management software providing interactive local logic memory (LLM) knowledge base capability and AI/ML module for guided troubleshooting and maintenance of critical IPE (Industrial Plant Equipment).

DESCRIPTION: A real-time, dynamic, and interactive knowledge base capability for efficient technical data management and interaction is sought in this initiative. The capability developed here should provide for custom database generation allowing the underlying software to process and vectorize content using an AI/ML algorithms. The transformation of static textual data into a dynamic LLM database here should yield guided troubleshooting 'wizard' capability to decrease maintenance touch-time for critical/complex DIPE (Depot Industrial Plant Equipment). The software in this instance should also be able to link textual part data with 3D images for the purpose of streamlining procurement capability.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Applicant(s) will demonstrate the ability to automatically analyze commercial/technical manuals for IPE assets (CNC/Robotics) to identify specific maintenance & operational procedures in response to user inquiries. They must demonstrate the accuracy and completeness of findings to appropriately answer inquiries.

PHASE II: The objectives of this D2P2 is varied. Development of a stand-alone maintenance platform version allowing software to run on CPU/tablets with limited connectivity in industrial facilities is desired. Also, development of the capability for user to create multiple instances or databases to be processed through AI algorithm for LLM interactive capability is sought. Further, development and enablement of capture of custom SOP (standard operating procedures) for procedures not defined in existing COTs manuals or database which can then be uploaded and vectorized through AI/ML algorithm is being pursued. Still further, development, maturation, and integration of LLM AI modules into software providing an interactive 'chatbot' experience for guided troubleshooting capability of complex/critical IPE is needed. Additionally, development of a capability to link textual part data with 3D images of IPE subcomponents is sought after. Lastly, development of the capability to provide all associated materials and tools required for maintenance/operational procedures derived from user inquiries is needed

PHASE III DUAL USE APPLICATIONS: In the event the D2P2 is successful, WR-ALC leadership is committed to providing support to commercialize this capability. Further development will refine analysis to increase accuracy and reliability of maintenance procedure predictions/inquiries.

REFERENCES:

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2. Izabela Rojek, Małgorzata Jasiulewicz-Kaczmarek, Mariusz Piechowski and Dariusz Mikołajewski, Appl. Sci. 2023, 13(8), 4971; https://doi.org/10.3390/app13084971 - An Artificial Intelligence Approach for Improving Maintenance to Supervise Machine Failures and Support Their Repair.

VERSION 3

3. Mohammed Misbahuddin, Abul Kashem Mohammed Azad, Veysel Demir College, College of Engineering and Engineering Technology, Northern Illinois University, DeKalb, USA. https://doi.org/10.4236/ait.2023.134008 - Machine-to-Machine Collaboration Utilizing Internet of Things and Machine Learning;

KEYWORDS: AI/ML; LLM; Guided troubleshooting; interactive knowledge base

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VERSION 3

AF242-D014 TITLE: Wide Field of View Lensing Spatially Variant Photonic Crystals

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber

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 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: Design, fabricate, and characterize photonic crystals offering wide field-of-view lensing capabilities at short-wave and middle-wave infrared wavelengths.

DESCRIPTION: Novel three-dimensional (3D) devices are sought that are based on spatially variant photonic crystals and which support energy focusing across an ultrawide field of view and operation across a wide range of the infrared spectrum. The devices must be based on a 3D photonic-crystal architecture with an embedded lensing or focusing capability. Structural features of the devices should have a size which permits practical and scalable microfabrication. The designs must support a variety of structural geometries that are not limited to canonical shapes like cubes, shells, or rods. The design process should be intuitive and easy to replicate and/or modify, therefore designs based on optimization algorithms or inverse-design are generally not desired. The designs must also include structures that are internally connected and self-supporting (i.e., no support material). The devices should be comprised of practical materials, and not exotic high-index- or negative-index materials, metal, or other media that are lossy, difficult to fabricate, or costly to procure. The successful team will use open-source tools to perform simulation, design, and analysis that explore a variety of designs and provide proof of concept.

Related devices based on transformation optics, gradient index, and optimization algorithms typically fail to meet one or more of the criteria listed above. An alternative, novel approach is sought to overcome these limitations. The successful team will (1) demonstrate a novel design approach to meet the criteria, (2) perform simulations/analyses to provide a proof-of-concept for the proposed devices, and (3) fabricate functional devices operating across various infrared wavelengths.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior "Phase I-type" effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. In the "Phase I-type" effort, , the applicant shall have developed open-source software tools that offer the user the capability to model the following scenarios with spatially variant photonic crystals: embedded lenses, multiplexing similar or dissimilar wavelengths, beam collimation through sharp bends with minimal energy loss, sidelobe suppression, and frequency dependent surfaces. These models should facilitate focusing and beam control over a relatively wide field of view within the SWIR and MWIR bands. Basic fabrication and characterization of such structures are highly desired.

A D2P2 award is requested because of the demonstrations the sponsoring organization has observed during lab evaluations of the candidate technology. Lens-embedded spatially variant photonic crystals have been successfully demonstrated to achieve focusing over a relatively wide FOV. The entire structure comprised only a single low-index material, and the focal length and angular FOV could be tuned. Awarding a Phase 2 SBIR would allow for the development of photonic crystals with increased WFOV capabilities using appropriate materials for the SWIR and MWIR ranges. Great potential in this technology has been identified and we wish to expand its application to better fit our customers' needs.

PHASE II: Awardee(s) will fabricate the most promising lens-embedded designs that are agreed upon with the topic's principal investigator and that meet the criteria of Phase 1 above. The fabricated devices will undergo inspection and electromagnetic characterization to validate a wide field of view, sufficient bandwidth, polarization insensitivity, and related performance metrics. Explore fabrication with various materials to support a wide range of the infrared spectrum. Identify applications where these devices would offer improvements in size, weight, power, complexity, and efficiency. A device operating in relevant environments is expected to be successfully demonstrated at AFRL at Eglin AFB.

PHASE III DUAL USE APPLICATIONS: Energy directing devices are used for many commercial applications including aerospace, automotive, land, and remote sensing applications. Devices meeting the desired criteria, including reduced weight and complexity, would provide a considerable improvement to existing solutions and would find widespread commercial applications in these areas.

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1. M. Noori, M. Soroosh and H. Baghban. "Self-collimation in photonic crystals: Applications and opportunities." Ann. Phys. 2018, 530, 1700049-1 - 1700049-21, https://onlinelibrary.wiley.com/doi/epdf/10.1002/andp.201700049.
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3. B. B. Oner, M. Turduev and H. Kurt. "High-efficiency beam bending using graded photonic crystals." Opt. Lett. 2013, 38(10), 1688-1690, http://ol.osa.org/abstract.cfm?URI=ol-38-10-1688;

KEYWORDS: spatially variant photonic crystals; lens embedded; wide field of view; SWIR; MWIR; low-index material

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VERSION 3

AF242-D015 TITLE: Mapping Complex Sensor Signal Processing Algorithms onto Neuromorphic Chips

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Advanced Computing and Software; Microelectronics; Emerging Threat Reduction

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 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 efficient workflow and approach for mapping complex RF and radar signal processing algorithms onto neuromorphic hardware. The neuromorphic hardware can be a limited research prototype or a commercial product. The signal processing algorithms encompass processing of RF signals to decode communication waveforms, Multiple-Input Multiple-Output (MIMO) adaptive beamforming, Space-Time Adaptive Processing (STAP), Ground Moving Target Indicator radar, and generating Synthetic Aperture Radar (SAR) images from raw in-phase and quadrature data. The goal is to outline a versatile approach that can translate algorithms as specified in the Matlab or Python software environment into a neuromorphic model implemented in physical hardware.

DESCRIPTION: The ubiquity of embedded RF devices and the Internet of Things (IoT) has motivated approaches to process data with less latency and power consumption [1]. Neuromorphic integrated circuit (IC) hardware has enabled new ultra-low power embedded RF and radar signal processing applications implemented through deep learning neural network (DLNN) models [2-4]. Neuromorphic hardware provides an advantage of a factor of 100 in power consumption per inference relative to emulation using a traditional Graphics Processing Unit (GPU) [5].

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. The required feasibility demonstration must include successfully developing advanced AI-based radio frequency (RF) algorithms and successfully porting them to a neuromorphic chip, with the final chip performing very well.

PHASE II: Using a HWIL approach, awardee(s) will measure the response of the neuromorphic hardware to RF and radar signals in real time. Awardee(s) will validate the performance of the neuromorphic hardware in terms of power consumption and timing latency. Awardee(s) will confirm that the outputs are deterministic and compare favorably to the expected values from the M&S environment.

PHASE III DUAL USE APPLICATIONS: The awardee(s) will identify potential commercial and dual use neuromorphic applications for the IoT such as MIMO adaptive beamforming.

REFERENCES:

1. C. Xiao, J. Chen, and L. Wang, "Optimal Mapping of Spiking Neural Network to Neuromorphic Hardware for Edge-AI," Sensors, vol. 22, no. 19, p. 7248, 2022.
2. A. Baietto, J. Boubin, P. Farr, T. J. Bihl, A. M. Jones, and C. Stewart, "Lean neural networks for autonomous radar waveform design," Sensors, vol. 22, no. 4, p. 1317, 2022.

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4. M. Barnell, C. Raymond, M. Wilson, D. Isereau, and C. Cicotta, "Target classification in synthetic aperture radar and optical imagery using loihi neuromorphic hardware," in 2020 IEEE High Performance Extreme Computing Conference (HPEC), 2020, pp. 1-6: IEEE.
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6. (2023). RFView Family of Digital Engineering Tools. Available:
7. https://www.islinc.com/products/rfview;

KEYWORDS: AI; Neuromorphic computing; Low C-SWAP; Embedded processing

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VERSION 3

AF242-D016 TITLE: High Voltage Fireset/Electric Gun System Development

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Hypersonics; Advanced 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 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 super low inductance HV Fire-set System which focuses on enhancing performance for CDU Switches & HV capacitors subsystem technology components with very low ESR, high peak current (1MA to 2 MA) capability with ultra-fast di/dt current rates with operating ranges from 5 kV to 60 kV to drive 1in Flyer plates.

DESCRIPTION: Both the DoD and DoE explosive research community heavily rely upon HV Fire-set and Pulsed Power Systems to conduct detonation transfer reliability research to characterize the performance of explosive trains for future AF weapon systems. In addition, the described research is strongly tied to developing high fidelity hydro-code numerical models of detonation trains which provides tremendous cost-savings when it comes to weapon and experimental design implementations.

Furthermore, HV Fire-set systems are used for initiation studies to discharge large amounts of energy at ultra-fast di/dt current rates into Explosive Foil Initiators (EFI’s) to quantify detonation transfer performance of various flyer materials, geometries, and thicknesses into insensitive munition (IM) booster materials. Within the Air Force Research Lab, it has been discovered with their current HV fire-set systems that HV CDU capacitance & CDU switch performance is a critical technology base that needs refined development, and is a significant contributor to the overall performance reliability and repeatability of these systems. More importantly, the available energy, energy transfer efficiency, and peak current transfer rate of the HV Fireset system allows for optimum flyer velocities to be achieved. The advancement of CDU switch, HV Capacitor, & trigger technologies may vastly expand the DoD’s and DoE’s capability to conduct more robust experiments in controlling the resolution of achieving various flyer velocities. As a result, higher fidelity data sets can be attained to improve our understanding for detonation train performance and foster robust and reliable designs for future DoD weapon systems.

Key HV Fireset System design problems are prevalently associated with deficiencies in inductance, energy density transfer, and di/dt rates within the overall electrical performance limited by CDU switch performance & HV capacitor parasitic inductance. Development efforts should focus on leveraging both existing HV Pulsed Power switch & capacitor technologies. Switch technologies considered for Fireset integration may include spark gaps, rail gaps, and surface planar discharge gap switches that are either electrically or optically triggered, but not limited to other state of the art. Additionally, the proposers are encouraged to investigate the various cathode, anode, potting, and dielectric insulating materials, implemented for future designs to significantly decrease inductance, increase the life cycle, and ease of maintenance for both switch & capacitor technology. A suite of HV Capacitor & CDU switch design solutions to cover various ranges of operating voltages are acceptable with the goal to achieve the widest range as possible to achieve super high peak current outputs at very di/dt current transfer rates. Ideally, the proposers should have extensive expertise in HV pulsed powered system & capacitor design.

VERSION 3

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement.

The applicant must substantiate the technology maturity level of the pulse power design and system is robust and adequate to integrate into a functional lab tool. Proposals involving nascent technologies (e.g. switch design, pulse power trigger methods, etc.) may be considered based on the proposers proof of the reliability and performance of the device. The overarching goal will be to provide a completely functional fireset system that is operational within the provided design requirements and maintainable by lab technicians.

PHASE II: Develop and construct a fireset system ready per AFRL requirements for lab use. Perform laboratory bench level experiments to demonstrate the performance of the fireset system design. Establish operating voltage range along with the entire systems lump sum R, L, & C parameters including the output load representative to an EFI. In addition, provide ring down and load current waveforms at the various operating voltages.

PHASE III DUAL USE APPLICATIONS: The DoE and DoD will benefit from the utilization of highly optimized fireset systems, which will advance capabilities to test EFIs beyond conventional energy levels. As a result, extensive experimentation may be performed for advanced detonation transfer studies of novel IM and EFI technologies.

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1. H. Chau, G. Dittbenner, W. Hofer, C. Honodel, D. Steinberg, J. Stroud, R. Weingart and R. Lee, "Electric Gun: A versatile tool for high-pressure shock-wave research," Review of Scientific Instruments, vol. 51, no. 12, pp. 1676-1680, 1980.
2. R. C. Weingart, R. K. Jackson and C. A. Honodel, "Shock Initiation of PBX-9404 by Electrically Driven Flyer Plates," Propellants and Explosives 5, pp. 158-162, 1980.;



KEYWORDS: HV Pulsed Power; HV Pulsed Power Discharge Capacitor; HV Fireset; HV Electric Gun; Capacitor Discharge Unit



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VERSION 3

AF242-D017 TITLE: High Resolution Low SWaP Attritable EO/IR Sensors for Stratospheric Operations

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Emerging Threat Reduction; Integrated Network System-of-Systems

OBJECTIVE: The objective of this topic is to develop a high resolution, low Size, Weight, and Power (SWaP), attritable, Electro-Optical/Infra-Red (EO/IR) sensor capable of detecting, tracking, and identifying targets with a National Imagery Interpretability Rating Scale (NIIRS) value of 4 or higher from platforms operating in the stratosphere.

DESCRIPTION: The Air Force (AF) is currently pursuing Intelligence, Surveillance, and Reconnaissance (ISR) sensors to support high altitude, sustained flight for long periods (months) within designated operational airspace between 50,000-75,000 feet Mean Sea Level (MSL) that could participate in AF or Joint exercises, demonstrations, and/or test events in the Fiscal Year (FY) 2026-2030 time frame. Current AF efforts are focused on high Technology Readiness Level (TRL) commercial off the shelf (COTS) solutions. There is a near-term need to improve upon current capabilities and develop high resolution, low SWaP, attritable, EO/IR sensors that are capable of detecting, tracking, and identifying targets while operating in the stratosphere. These applications would directly support AF Operational Imperative 3 [1] by both detecting critical targets and distinguishing targets from decoys.

Sensor Capabilities:

- All sensors should have the capability to be operational within the 50,000 – 75,000 feet altitude band.
- All sensors should be prepared to supply their own heating or cooling solution to withstand extreme temperature conditions within the above altitude band.
- All sensors should be low power (less than 100 W continuous 500 W instantaneous)
- All sensors must be capable of being networked and interfacing with current Department of Defense (DoD) data transmission/data transfer systems (Datalinks including Line of Sight (LOS) and Beyond Line of Sight (BLOS).
- Sensor must be able to detect and identify targets with a NIIRS value of 4 or higher and a Ground Sampling Distance (GSD) not to exceed 1 meter at the stated operating range.
- Total system weight is not to exceed 80 lbs.
- Some jitter is expected. Payloads requiring pointing will need to provide their own gimballing or steering solution.
- Total system needs to fit withing a 14 (3.5 ft x 2 ft x 2 ft) cubic foot volume.
- Sensor systems need to be able to operate over an area of interest at altitude for several months at a time.
- Sensors are expected to be able to support both day/night operations.

Previous SBIR projects have pushed the envelope or this technology but there is an urgent need to minimize the power required to operate sensors within the given altitude band. Previous efforts have focused on larger power requirements; additional work needs to be completed to fit within the power constraints of the problem set [2].

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. This includes determining, insofar as possible, the scientific and technical merit and feasibility of ideas appearing to have commercial potential. It must have validated the product-market fit between the proposed solution and a potential AF stakeholder. The applicant should have defined a clear, immediately actionable plan with the proposed solution and the AF customer. The feasibility study should have:

- Identified the prime potential Department of the AF end user(s) for the non-Defense commercial offering to solve the AF need, i.e., how it has been modified;
- Described integration cost and feasibility with current mission-specific products;
- Described if/how the demonstration can be used by other DoD or Governmental customers.

PHASE II: Under the Phase II effort, the awardee(s) shall sufficiently develop a ruggedized ground-based EO/IR sensor system based off the defined requirements listed in the topic description. The sensor system should be capable of being tested on a high-altitude attritable system if testing opportunities become available.

PHASE III DUAL USE APPLICATIONS: Adapt existing design to meet SWaP requirements of multiple attritable platforms by incorporating Modular Open Systems Approach (MOSA)[3] and Sensor Open Systems Architecture (SOSA) [4] standards, exact platform is to-be-determined but should be roughly what is outlined in the description. Ruggedize design for flight environment up to 75kft and conduct flight testing. Offeror shall also provide a plan for upgrading the solution to include Anti-Tamper (AT) and cybersecurity capabilities, as agreed upon between the Offeror and the AF customer.

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2. AFMC-Guidebook-for-Implementing-MOSA-in-Weapon-Systems_V2.0_Distro_A.pdf (https://guide.dafdto.com/wp-content/uploads/2023/11/AFMC-Guidebook-for-Implementing-MOSA-in-Weapon-Systems_V2.0_Distro_A.pdf)
3. Reference Implementation Guide for the SOSA™ Technical Standard (https://publications.opengroup.org/standards/sosa);

KEYWORDS: Stratosphere; SWaP; EO/IR; High Altitude; Attritable; Sensor

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VERSION 3

AF242-D018 TITLE: Development of Advanced Surface Treatments for Astroquartz Fibers

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced 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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this project is to develop advanced coupling agents and surface treatments for Astroquartz fibers in order to increase the environmental and thermal durability of various Polymer Matrix Composite systems, which include a range of resin matrices from 350 degree Fahrenheit-curing epoxies to advanced polyimides.

DESCRIPTION: Astroquartz-reinforced Polymer Matrix Composites (PMCs) are widely utilized on aircraft in radome applications due to excellent dielectric properties compared to other variants of glass and carbon fiber reinforcements. Although the mechanical performance requirements for these applications are not as demanding as other structural PMC components that utilize carbon fiber reinforcement, the environmental and thermal durability can limit their service life and significantly impact maintainability. Recent testing performed on various PMC systems with resin matrices ranging from 350 degree Fahrenheit-curing epoxies to advanced polyimides have exhibited extensive disbonds at the fiber-matrix interface after moisture and thermal conditioning. The objective of this project is to develop advanced coupling agents and surface treatments for Astroquartz fibers in order to increase the environmental and thermal durability of various Polymer Matrix Composite systems of interest. This SBIR should seek to identify key contributing factors for the limited durability in PMC systems of interest, develop optimized surface treatment processes for woven Astroquartz reinforcements, and develop tailored coupling agents that offer increased durability over the current state-of-the-art systems.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. The applicant(s) must show evidence of previous efforts demonstrating their capability to perform and develop advanced surface treatments for glass materials and/or aerospace fiber reinforcements, and to tailor coupling agents/fiber finishes to a wide range of polymer matrices.

PHASE II: In the Phase II effort, the awardee(s) shall execute a comprehensive root cause analysis (RCA) to identify the key factors contributing to decreased mechanical performance in Astroquartz PMCs. Results from the RCA should inform either the development of optimized surface treatment processes to remove residual chemicals applied during the weaving process, or development of a tailored coupling agent to offer increased durability over the current state-of-the-art systems. The PMCs of interest shall include phenylethynyl-terminated polyimide and/or a 350 degree Fahrenheit-curing epoxy system.

PHASE III DUAL USE APPLICATIONS: The awardee(s) can expect to pursue commercialization of the technology developed in Phase II by either partnering with an aerospace-grade weaver or prepreg supplier. Direct access with end users and government customers will be provided with opportunities to receive Phase III awards for providing the government additional research & development, or direct procurement of products and services developed in coordination with the program. In Phase-III, the awardee(s) must scale up the prototype technology, integrate it within the current supply chain, and perform a series of full-scale production runs. Lastly, the contractor must generate qualification data on the final Astroquartz fabric PMC.

REFERENCES:
1. Cloth, Quartz Finished for Resin Laminates, ASM3846-D, SAE international, 2022;

KEYWORDS: Astroquartz; fiber sizing; fiber finish; fiber-resin interface; coupling agents; polymer matrix composites; epoxies; polyimides; thermosets;

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VERSION 3

AF242-D019 TITLE: Seeker for Low-Cost Base Defense Munition

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Microelectronics; Integrated Network System-of-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 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 low-cost passive imaging infrared seeker for a 70mm rocket, demonstrating effective performance against C-UAS targets in a rapid-launched or simultaneous-launched swarming scenario.

DESCRIPTION: Low cost UAS weapons are being put to effective use by US adversaries. US weapons to defeat these threats are effective, but not feasible at scale due to limited quantities and high cost. Commonly, multi-$M munitions are used to defeat targets that cost <$10K. A kinetic option is needed to defeat C-UAS and other threats at the same order of magnitude cost of the threat. Furthermore, an option is needed that can be produced, deployed, and launched at scale. This new capability must be delivered to the battlefield quickly, on a relevant timeframe. Therefore, it is necessary to consider low-cost options that are already in high rate of production and fielded on many platforms, have a reasonable cost, and can be readily modified to achieve the desired launch rate.

The scope of this topic includes not only imaging infrared (IIR) seeker hardware, but also algorithms needed to detect aerial or other threats, as well as any infrastructure needed to accomplish the fast-launching mission, such as hardware data links and collaborative ATR algorithms. Proposals may focus on one specific portion of the need, or aim to achieve a minimum viable product as quickly as possible. The topic will show preference to those who demonstrate a path to achieve a fieldable result within the cost/schedule of the program.
Proposers should be familiar with the C-UAS mission, and show that their imager has performance to detect a small object at a relevant range, within a field-of-view that the target has a high probability of detection in a lock-on-after-launch scenario. Lock-on-before-launch can also be assumed, so long as an existing fire-control solution or other CONOPS is identified that establishes feasibility of the concept. The imager should be able to identify plumes of friendly interceptor as non-targets.

One specific area of Air Force interest in an APKWS modification, which would require interaction and teaming with BAE, the prime contractor for APKWS. Other approaches will be considered, but may be competitive against APKWS.
The following approximate specs should be considered as rough order-of-magnitude needs, but strict adherence is not required.

1) Weapon cost <$50K
2) Seeker cost <$10K
3) Detection range > 2 KM
4) Identification range > 1 KM
5) Field of view > 10 degrees
6) Launch rate > 1 per second
7) Overkill of target < 20%

8) Probability of hit > 70%
9) Probability of false lock on friendly interceptor < 5%

Of equal interest is any unknown component of such a system that ought to be designed, or optimized, in participation with a system-level Prime contractor to achieve the above objectives/mission. The topic authors do not wish to overly prescribe a specific solution, and other solutions – even beyond sensors, are appropriate for this topic insofar as they achieve a meaningful capability for this requirement on the battlefield.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Prior work expected to be completed in a "Phase-I type" effort, in order to qualify for this D2P2, requires demonstrated feasibility which should include work and results in the following areas:
Phase I efforts should include modeling and simulation to show feasibility of performance of a imaging infrared seeker (or other low cost seeker) versus C-UAS targets and/or other faster aerial threats. Manufacturing, cost, timeline factors should all be established to build confidence that the final product can be fielded in a short-term, relevant, timeframe. Early laboratory or field tests showcasing hardware and/or software (sensing capabilities and algorithm detection capabilities) are expected.

PHASE II: Phase II efforts should include all-up-round guided free flight testing of the rocket versus C-UAS targets at a TRL 6. Prior to this point, significant integration work is expected to result in a manufacturable and fieldable design. The hardware should be plug-and-play with the fieldable interceptor solution. Weapon metrics mentioned previously, including the seeker subsystem, will be evaluated competitively against other solutions to assess useability for a Phase III.

PHASE III DUAL USE APPLICATIONS: Phase III will include both smaller quantities <100 of prototypes for experimentation, and quantities of >1000 if selected for inclusion within a program of record. PEO Customers include AFLCMC/EB, Army PEO M&S TAGM, Navy PMA-242, and SOCOM. Due to broad tri-service interest, it is expected that rapid fielding/production will begin in large quantities of multiple thousands if specification goals and met and proven in flight testing.

REFERENCES:
1. https://www.baesystems.com/en/article/apkws--laser-guidance-kits-successfully-tested-by-u-s--counter-drone-office
2. https://defensescoop.com/2023/11/03/ukraine-to-get-more-laser-guided-munitions-to-kill-drones/
3. https://www.reuters.com/world/europe/ukraine-downs-41-russian-drones-major-overnight-attack-2023-12-06/;

KEYWORDS: Base defense; APKWS; 70mm rocket; low-cost interceptor; infrared imaging seeker; fire-and-forget seeker; LWIR; SWIR; laser guidance

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AF242-D020 TITLE: Treatments for Crack Propagation in Metal Aircraft Parts

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Microelectronics; Advanced Materials; Advanced Infrastructure & Advanced Manufacturing; Sustainment & Logistics

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 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 ground support equipment capable of performing in-place repair of structural components with stress-induced cracks without removing component from aircraft.

DESCRIPTION: The lifetime of metal aircraft parts is limited by stress-induced crack initiation and propagation of these cracks until part failure results. Often these parts are difficult to replace, and methods to extend the useable service life of aircraft parts would be advantageous. Research on treatments to inhibit growth of cracks after initiation has shown promise. Practical applications of this research are sought to extend aircraft part lifetime while maintaining dimensional tolerances and mechanical properties of the components.
The ability to perform crack arrest repairs on parts without removing them from the aircraft will drastically reduce depot visits and increase aircraft availability. As such, the technology sought must be portable, and enable application of the repair in space-constrained areas of the aircraft. The desired characteristics of the developed technology include: (1) ability to apply repair with the part in a loaded (stressed) state, (2) maintains the designed functionality of the treated part without adversely impacting its lifetime in any other manner (e.g., must not induce galvanic corrosion due to application of dissimilar metal), (3) minimizes pre-repair part conditioning (e.g., as much as possible, leave protective coatings in place), (4) does not generate sparks, (5) must not have wireless emissions (no WIFI, Bluetooth, etc.), and (4) minimized repair time. Repair of aluminum alloys are of primary interest, but also steel. The successful technology must not require line power exceeding common voltages (120/240 V) and must minimize hazmat footprint.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. To demonstrate that the technology is ready for a D2P2, the applicant must be able to show they have a plan, or technology, that can repair the cracks in a rapid-repair capacity. This will show the technology is ready for prototype to fit the specific military needs based on aircraft parts, metals, and environments.

PHASE II: Awardee(s) will develop and demonstrate a prototype system that meets topic objective. The prototype demonstration should illuminate the ability of the technology to rapidly repair stress-induced cracks without removal from the aircraft, and address other desired characteristics (either in practice, or with a plan for future modification/development). Finally, effort will provide cost projection data to substantiate the design, performance, acquisition, and life cycle costs.

PHASE III DUAL USE APPLICATIONS: This topic is provided by AFGSC's Commercial Capabilities Integration and Transition Branch at the AFGSC/A5N branch. This branch is deliberately resourced and staffed exclusively to ensure R&D efforts are integrated into AFGSC programs of record and have senior leader sponsorship and POM/Programming advocacy among AFGSC corporate processes. There are resources set aside to effectively transition this effort into a Phase 3 follow on if the Phase 1 and Phase 2 efforts are successful.

REFERENCES:
1. C.M. Barr, T. Duong, D.C Bufford, et al. "Autonomous healing of fatigue cracks via cold welding." Nature 620, 552–556 (2023). https://doi.org/10.1038/s41586-023-06223-0
2. J. Huang, and H. Cardenas. "Fatigue Crack Arrest in Mild Steel via Iron Electroplating. Materials Sciences and Applications," 12, 484-503, 2021. doi: 10.4236/msa.2021.1211032.
3. C. R. Fisher, H. B. Henderson, M. S. Kesler, et al. "Repairing large cracks and reversing fatigue damage in structural metals," Applied Materials Today, Volume 13, 2018, Pages 64-68, ISSN 2352-9407
4. R. Jones, A.A. Baker, N. Matthews, V. Champagne. Aircraft Sustainment and Repair, Butterworth-Heinemann, 2017, ISBN 008100544X, 9780081005446
5. R. Jones, A. A. Baker, Bonded Repair of Aircraft Structures, Springer, Netherlands, 2012. ISBN:9789400927520, 9400927525
6. H. J. Gover, "Fatigue of Aircraft Structures," Defense Technical Information Center, AD0660529. 1966. https://apps.dtic.mil/sti/pdfs/AD0660529.pdf";

KEYWORDS: crack mitigation; crack propagation; crack arrest; aircraft fatigue failure; crack closure

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VERSION 3

AF242-D021 TITLE: Trusted, Generative AI for Acquisition Process Acceleration

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy

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 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: AFRL faces the challenge of current acquisition and contracting methods being rooted in manual processes and failing to deliver at the speed of need as a result of misalignment, errors, and inconsistencies. To keep up with the rapidly changing technological landscape and new threat dynamics, streamlined, AI-assisted acquisition processes are essential. The objective of this effort is to improve operational efficacy to enable better strategic positioning via a customizable, AI-assisted software tool.

DESCRIPTION: A trusted, vetted AI-assisted, automated acquisition workflow for FAR contracting should include the following aspects to meet the stated objective: (1) must include automation of repetitive tasks reserving human resources for decisional and/or complex tasks; (2) must be able to attain DoD Authorization to Operate (ATO) at sufficient security levels to meet contracting needs (Controlled Unclassified Information/Impact Level-5); (3) must standardize document preparation with built-in compliance for regulatory requirements to reduce errors and inconsistencies in acquisition document preparation; (4) must have scalable, modular architecture and be customizable to meet the growing demands of multiple organizations with unique needs; (5) must quantifiably speed up the acquisition process by reducing time-to acceptance, by reducing rework rate, and by reducing overall person-hours spent in pre-contracting document preparation; (6) must track critical timeline events and allow for workflow interruption/reprioritization; and (7) must include simple, user-friendly, adaptable interfaces for program managers, contracting officers/buyers, and management.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. This includes determining, insofar as possible, the scientific and technical merit and feasibility of ideas appearing to have commercial potential. It must have validated the product-market fit between the proposed solution and a potential AF stakeholder. The offeror should have defined a clear, immediately actionable plan with the proposed solution and the AF customer. The feasibility demonstration should have; (1) Demonstrated a Phase I-like/prototype software tool that uses customizable, trusted AI; (2) Identified the prime potential AF end user(s) for the non-Defense commercial offering to solve the AF need, i.e., how it has been modified; (3) Demonstrated ability to attain DoD ATO on similar products; and (4) Described if/how the demonstration can be used by other DoD or Governmental customers.

PHASE II: Under the phase II effort, the awardee(s)shall sufficiently develop the technical approach, product, or process in order to conduct a two relevant demonstrations using distinct contracting action types. Identification of business model modifications required to further improve product or process relevance to improve efficiency, compliance, and consistency should be documented. These Phase II awards are intended to provide a path to commercialization, not the final step for the proposed solution.

PHASE III DUAL USE APPLICATIONS: The awardee(s) can expect to pursue commercialization of the various technologies developed in Phase II for transitioning expanded mission capability to a broad range of potential government and civilian users and alternate mission applications. Direct access with end users and government customers will be provided with opportunities to receive Phase III awards for providing the government additional research & development, or direct procurement of products and services developed in coordination with the program.

REFERENCES:

1. https://dl.dod.cyber.mil/wp-content/uploads/cloud/pdf/DoD_Cloud_Authorization_Process.pdf;

KEYWORDS: Trusted AI; Generative AI; natural language processing; workflow automation

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VERSION 3

SF242-D022 TITLE: Uncertainty Management for Space Domain Awareness of Non-Standard Threats

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The objective of this topic is to develop algorithms and methodology to allow for better uncertainty propagation of beyond-GEO trajectories, which are subjected to more highly nonlinear dynamics, stochastic excitation, and uncertain initial conditions than typical GEO-and-below trajectories.

DESCRIPTION: One of the significant technical challenges in space domain awareness is the accurate and consistent propagation of uncertainty for objects governed by highly nonlinear dynamics with stochastic excitation and uncertain initial conditions. This challenge is even greater in the beyond-GEO region where three-body gravity becomes significant, resulting in the dynamics being more nonlinear. Additionally, the increased distance between an Earth-based sensor and the object reduces the apparent motion between them, resulting in little independent information to initialize an orbit. The initial uncertainties in xGEO orbits are therefore highly non-Gaussian, which inhibits the effectiveness of traditional propagation and filtering methods. Orbits within this area of regard enable low-cost options for spacecraft to rapidly alter course and threaten terrestrial and space-based assets. Being able to accurately understand and propagate the uncertainty of objects within this area is necessary to assess whether they pose a threat.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. Applicant(s) must have developed a concept for a workable prototype or design to address at a minimum the basic capabilities of the stated objective. Proposal must show, as appropriate to the proposed effort, a demonstrated technical feasibility to meet the capabilities of the stated objective. The documentation provided must substantiate that the proposer's technology is currently at an acceptable stage to be funded at the D2P2 level. Documentation may include reports demonstrating prior work demonstrating feasibility, results of prior efforts, success criteria of a prototype, or any other relevant documentation as applicable. GFE will not be provided.

PHASE II: Awardee(s) will develop algorithms and methodology to characterize uncertainty propagation, including contribution of higher-order moments, of xGEO trajectories. Awardee(s) will identify uncertainty propagation behavior in presence of variety of mission profiles, including low-thrust, long-duration maneuvers, quasi-periodic trajectories, and Lyapunov and transfer orbits. Awardee(s) will evaluate uncertainty propagation across sensor exclusion and occultation geometries and assess impact of maneuvers in this space. Awardee(s) will identify sensor network placement and tasking strategies to maximize information gain of xGEO objects and satisfy object custody requirements. Identify and develop estimation techniques applicable to the identified uncertainty distributions. Awardee(s) will evaluate the resultant uncertainty from initial orbit determination as well as catalog maintenance (filtering) algorithms. GFE will not be provided.

PHASE III DUAL USE APPLICATIONS: Develop a strategy to transition prototype residual capabilities and incremental proliferation based on operational USSF requirements.

REFERENCES:

1. T. Wolf, E.M. Zucchelli and B. A. Jones, "Multi-Fidelity Uncertainty Propagation for Objects in Cislunar Space," AIAA 2022-1774. AIAA SCITECH 2022 Forum. January 2022;
2. C. Freuh, K. Howell, K.J. DeMars, S. Bhadauria, and M. Gupta, "Cislunar Space Traffic Management: Surveillance Through Earth-Moon Resonance Orbits," 8th European Conference on Space Debris, ESA Space Debris Office, Darmstadt, Germany, Apr. 2021;
3. M.R. Thompson, N.P. Re, C. Meek, and B. Cheetham, "Cislunar Orbit Determination and Tracking via Simulated Space-Based Measurements," Advanced Maui Optical and Space Surveillance Conference, Maui, HI, Sept. 2021;

KEYWORDS: beyond-GEO, xGEO, cislunar, space traffic management, space domain awareness, uncertainty propagation, orbit determination, space sensor tasking

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SF242-D023 TITLE: Small Satellite Swarms for ISR

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology; Trusted AI and Autonomy; Integrated Network System-of-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 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 methods that are capable of using swarm-based architectures in the orbital domain for performing both Earth Observation and Space Domain Awareness tasks for support to multi-domain operations.

DESCRIPTION: Recent improvements to commercially-available hardware and software platforms have given rise to a proliferation of highly capable satellite platforms. Ongoing improvements in manufacturing processes are also reducing the size and costs of space-capable hardware. Not only is it more economical and feasible to launch platforms into space, but more platforms can be deployed to orbit at a lower cost. These trends, combined with comparable trends in the air domain regarding the commercial proliferation of unmanned aerial system (UAS) technology, suggest that orbital swarms are on the horizon. Swarm-based architectures and operations provide benefits to resiliency and scalability and are synergistically capable of handling some complex tasks beyond what fewer and larger independently-controlled drones may accomplish. These additional benefits come with the need to manage the health and coherency of the swarm, ensure that swarm members do not collide with others in nearby space, and that commands issued to the swarm are effectively communicated to all members. Such challenges are exacerbated as swarms begin operating in the orbital domain.

This topic seeks solutions that explore the use of swarm-based architectures in the orbital domain for performing Earth Observation (EO) and Space Domain Awareness (SDA) tasks in support of multi domain operations. Responses are sought that explore the potential for using and orchestrating orbital swarms to observe orbital and/or terrestrial objects through one or more sensor modalities. Areas of interest in proposed solutions include, but are not limited to: synergistic sensing effects from swarm-based sensors; unique swarm-enabled capabilities; orchestration schemes for command and control of individual swarms and/or multiple swarms working on concert; orbital swarm formation management; swarm space-based awareness and proximity-sensing capabilities; swarm orbital deployment and initialization schemes; low-observable swarms; and swarm collaboration schemes with other on-orbit assets.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement.

Applicant(s) must have developed a concept for a workable prototype or design to address at a minimum the basic capabilities of the stated objective. Applicant must show, as appropriate to the proposed effort, a demonstrated technical feasibility to meet the capabilities of the stated objective. The documentation provided must substantiate that the proposer's technology is currently at an acceptable stage to be funded at the D2P2 level. Documentation may include but not be limited to reports demonstrating prior work demonstrating feasibility, results of prior efforts, success criteria of a prototype, or any other relevant documentation as applicable. GFE will not be provided.

PHASE II: Awardee(s) will develop methods to use and orchestrate orbital swarms to observe orbital and/or terrestrial objects through one or more sensor modalities. Areas of interest in proposed solutions include, but are not limited to: synergistic sensing effects from swarm-based sensors; unique swarm-enabled capabilities; orchestration schemes for command and control of individual swarms and/or multiple swarms working on concert; orbital swarm formation management; swarm space-based awareness and proximity-sensing capabilities; swarm orbital deployment and initialization schemes; low-observable swarms; and swarm collaboration schemes with other on-orbit assets. GFE will not be provided.

PHASE III DUAL USE APPLICATIONS: Awardee(s) will mature prototype capabilities developed under Phase II. This topic promotes dual-use opportunities using the swarm operations paradigm as an alternative to provide orbital commercial services including but not limited to: Earth observation, Space observation, weather and climate assessment, water quality evaluation, land use management, communications networks and imagery products.

REFERENCES:

1. Yoan Grégoire, Hervé Guillon, Clément Dudal, David Valat, and Bernard Pontet; "Communication, Localization and Synchronization of Spacecraft for Swarm Missions"; in the Proceedings of the AIAA/USU Conference on Small Satellites (SmallSat), 2023
2. Maxwell Joyner and Laura Plice; "Active Swarm Resiliency in the HelioSwarm Mission"; in the Proceedings of the AIAA/USU Conference on Small Satellites (SmallSat), 2023
3. James Staley, Kerri Lu, Elaine Schaertl Short and Evana Gizzi; "A Framework for Multi-Agent Fault Reasoning in Swarm Satellite Systems"; in the Proceedings of the AIAA/USU Conference on Small Satellites (SmallSat), 2023
4. James Llinas; "Reexamining Information Fusion—Decision Making Inter-dependencies"; 2014 IEEE International Inter-Disciplinary Conference on Cognitive Methods in Situation Awareness and Decision Support (CogSIMA).
5. W. Pottenger, E. Blasch, J. Nagy, C. Janneck, C. Kelly, J. Okoth and R. Mann, "Fully-automated multi-INT Fusion, Pattern of Life and Anomaly Detection," in National Security Sensor and Data Fusion (NSSDF) Symposium, Gaithersburg, MD, 2018.;


KEYWORDS: small satellite swarms; swarm systems, air platform swarms, swarm command and control


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VERSION 3

SF242-D024 TITLE: ICED-T – Innovative Cargo Exoatmospheric Delivery Technology

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Sustainment & Logistics; Space Technology

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This topic seeks to perform concept exploration, prototype development, sub-scale experiments, test and evaluation of technology that enables up to 100 tons of containerized cargo from exoatmospheric altitudes surviving earth re-entry.

DESCRIPTION: The AFRL Rocket Cargo Vanguard Program is developing technologies that can deliver large payloads (shipping container sized) around the globe with speed in support of global logistics and the USSF logistics mission sets. The Rocket Cargo Vanguard is responsible for leading a test campaign to enable up to 30 tons of cargo to be delivered anywhere on the planet within tactical timelines. The goal is to demonstrate this speed through integrated demonstrations with the DOD logistics train, including responsive mission planning, rapid cargo logistics and ground launch operations, and coordination with commercial airspace.

Launch vehicles are limited in down-mass capacity during earth re-entry which limits the overall mass of delivered payloads. The AFRL Rocket Cargo Vanguard Program seeks technologies which will support payload re-entry independent of the launch vehicle after the launch vehicle has reached the desired orbit for separation. Technology includes the capability to decelerate the large payloads to survive re-entry and delivery to desired location with cargo remaining intact.
The main deliverables will be sub-scale experiments, tests, and demonstrations that advance the operational imperative.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior "Phase I-type" effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. This includes determining, insofar as possible, the scientific and technical merit and feasibility of ideas appearing to have commercial potential. It must have validated the product-market fit between the proposed solution and a potential AF stakeholder. The offeror should have defined a clear, immediately actionable plan with the proposed solution and the AF customer. Relevant areas of demonstrated experience and success include: M&S, cost benefit analysis, risk analysis, concept development, concept demonstration and concept evaluation, laboratory experimentation and field testing. Phase I type efforts should include the assessment of emerging operational imperatives and how they show a measurable value and operational impact. The result of Phase I type efforts is to assess and demonstrate whether commercial systems can support the furtherance of the operational imperatives.

Eligibility for a D2P2 award is predicated on the offeror having performed a "Phase I-type" effort predominantly separate from the SBIR/STTR Programs. These efforts will include M&S, simulation of prototype concepts, cost benefit analysis, system-of-systems studies, experimentation and evaluation of operational imperatives to enable future concepts. Prototypes, M&S and experimentation should explore a wide range of integrating commercial capabilities to support the operational imperatives. These capabilities should consider areas that are unique to military operations, logistics, mission planning, mission execution, base sustainment and logistics.

PHASE II: A goal is for Phase II efforts to conduct sub-scale experiments and provide test articles for further test and demonstration. Experiments should address military-unique requirements that may not be otherwise met by commercial capabilities.

PHASE III DUAL USE APPLICATIONS: Phase III shall include upgrades to the analysis, M&S, T&E results and provide mature prototypes of system concepts. Phase III shall provide a business plan and address the ability to transition technology and system concepts to commercial applications. The adapted non-Defense commercial solutions shall provide expanded mission capability for a broad range of potential Governmental and civilian users and alternate mission applications. Integration and other technical support to operational users may be required.

REFERENCES:

1. Seong-Hyeon, P. * "Re-entry analysis of critical components and materials for design-for-demise techniques", ScienceDirect, 2021;

KEYWORDS: Heat Shield; thermal protection systems; high temperature materials; re-entry

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SF242-D025 TITLE: DEMISE - DEploy Material Into Space Experiments

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials; Sustainment & Logistics; Space Technology

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This topic seeks to perform concept exploration, prototype development, sub-scale experiments, test and evaluation of technology to standardize containerization of cargo to survive the vacuum of space and deploy material into space.

DESCRIPTION: The AFRL Rocket Cargo Vanguard Program is developing technologies that can deliver large payloads (shipping container sized) around the globe with speed in support of global logistics and the USSF logistics mission sets. The Rocket Cargo Vanguard is responsible for leading a test campaign to enable up to 30 tons of cargo to be delivered anywhere on the planet within tactical timelines. The goal is to demonstrate this speed through integrated demonstrations with the DOD logistics train, including responsive mission planning, rapid cargo logistics and ground launch operations, and coordination with commercial airspace.

The AFRL Rocket Cargo Vanguard Program seeks standardized container technologies that can deploy material into space. Launch vehicles are limited in down-mass capacity during earth re-entry which limits the overall mass of delivered payloads. Commercial shipping containers are not adequately designed to survive exoatmospheric conditions which would allow the container to be separated in space prior to launch vehicle re-entry. The AFRL Rocket Cargo Vanguard Program seeks technologies which will support a container design that will adequately allow payload prolonged exposure in exoatmospheric conditions and re-entry independent of the launch vehicle after the launch vehicle has reached the desired orbit for separation.

The main deliverables will be sub-scale experiments, tests, and demonstrations that advance the operational imperatives.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. This includes determining, insofar as possible, the scientific and technical merit and feasibility of ideas appearing to have commercial potential. It must have validated the product-market fit between the proposed solution and a potential AF stakeholder. The offeror should have defined a clear, immediately actionable plan with the proposed solution and the AF customer. Relevant areas of demonstrated experience and success include: M&S, cost benefit analysis, risk analysis, concept development, concept demonstration and concept evaluation, laboratory experimentation and field testing.

Phase I type efforts should include the assessment of emerging operational imperatives and how they show a measurable value and operational impact. The result of Phase I type efforts is to assess and demonstrate whether commercial systems can support the furtherance of the operational imperatives.

Eligibility for D2P2 is predicated on the offeror having performed a “Phase I-type” effort separate from the SBIR/STTR Programs. These efforts will include M&S, simulation of prototype concepts, cost benefit analysis, system-of-systems studies, experimentation and evaluation of operational imperatives to enable future concepts. Prototypes, M&S and experimentation should explore a wide range of integrating commercial capabilities to support the operational imperatives. These capabilities should consider areas that are unique to military operations, logistics, mission planning, mission execution, base sustainment and logistics.

PHASE II: A goal is for Phase II efforts to conduct sub-scale experiments and provide test articles for further test and demonstration. Experiments should address military-unique requirements that may not be otherwise met by commercial capabilities.

PHASE III DUAL USE APPLICATIONS: Phase III shall include upgrades to the analysis, M&S, T&E results and provide mature prototypes of system concepts. Phase III shall provide a business plan and address the ability to transition technology and system concepts to commercial applications. The adapted non-Defense commercial solutions shall provide expanded mission capability for a broad range of potential Governmental and civilian users and alternate mission applications. Integration and other technical support to operational users may be required.

REFERENCES:
1. Seong-Hyeon, P. "Re-entry analysis of critical components and materials for design-for-demise techniques", ScienceDirect, 2021;

KEYWORDS: Space Container; space environment;

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SF242-D026 TITLE: FLOATS - Floating and Loitering Ocean Advanced Technology Sensing

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Mission Readiness & Disaster Preparedness; Sustainment & Logistics

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This topic seeks to perform concept exploration, prototype development, sub-scale experiments, test and evaluation of technology that is able to deliver low-cost persistent grid sensors technologies with the ability to station keep providing atmospheric and maritime research data

DESCRIPTION: The Air Force and Department of Defense struggle to provide domain awareness across millions of square kilometers of ocean in INDOPACOM, CENTCOM, SOUTHCOM, EUCOM and even on its own test ranges in NORTHCOM. There are limited manned and unmanned Intelligence, Surveillance and Reconnaissance (ISR) aircraft to patrol these geographies. Space-based ISR assets are also limited in number, provide episodic coverage and often focused on higher priority operational tasks beyond domain awareness. While the DAF and wider DOD have relied for 20+ years on uncontested ISR coverage to make critical decisions, a peer adversary will very likely immediately challenge all ISR coverage in pursuit of an anti-access and area denial (A2/AD) strategy.

The DAF needs new ISR capabilities which are easy to emplace, operate and recover; are inexpensive and quick to manufacture; persist in the same geography for weeks or months at a time; easily integrated into existing and future data processing architectures; scale to enormous geographies; can be operated nearly autonomously or with limited human input; and are not vulnerable to adversary weapons; and in a limited fashion can both avoid adversarial discovery and seizure, while remaining small and difficult to find.

The AFRL Integrated Capabilities Directorate seeks low-cost persistent grid sensors technologies with the ability to station keep providing atmospheric and maritime research data from the surface down to 50 meters. The main deliverables will be sub-scale experiments, tests, and demonstrations that advance the operational imperatives.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. This includes determining, insofar as possible, the scientific and technical merit and feasibility of ideas appearing to have commercial potential. It must have validated the product-market fit between the proposed solution and a potential AF stakeholder. The offeror should have defined a clear, immediately actionable plan with the proposed solution and the AF customer. Relevant areas of demonstrated experience and success include: M&S, cost benefit analysis, risk analysis, concept development, concept demonstration and concept evaluation, laboratory experimentation and field testing.

Phase I type efforts should include the assessment of emerging operational imperatives and how they show a measurable value and operational impact. The result of Phase I type efforts is to assess and demonstrate whether commercial systems can support the furtherance of the operational imperatives.

Eligibility for a D2P2 is predicated on the offeror having performed a “Phase I-type” effort predominantly separate from the SBIR/STTR Programs. These efforts will include M&S, simulation of prototype concepts, cost benefit analysis, system-of-systems studies, experimentation and evaluation of operational imperatives to enable future concepts. Prototypes, M&S and experimentation should explore a wide range of integrating commercial capabilities to support the operational imperatives. These capabilities should consider areas that are unique to military operations, logistics, mission planning, mission execution, base sustainment and logistics.

PHASE II: A goal is for Phase II efforts to conduct sub-scale experiments and provide test articles for further test and demonstration. Experiments should address military-unique requirements that may not be otherwise met by commercial capabilities.

PHASE III DUAL USE APPLICATIONS: Phase III shall include upgrades to the analysis, M&S, T&E results and provide mature prototypes of system concepts. Phase III shall provide a business plan and address the ability to transition technology and system concepts to commercial applications. The adapted non-Defense commercial solutions shall provide expanded mission capability for a broad range of potential Governmental and civilian users and alternate mission applications. Integration and other technical support to operational users may be required.

REFERENCES:
1. Warren, D. "Marines Use Sensor Buoys to Better Understand Ocean Battlespace"; Office of Naval Research; 2020
2. Mignerey, P., Emokpea, L., Schindall, J. "Experimental Demonstration of an Autonomous Distributed-Consensus Network for Underwater Passive-Acoustic Detection"; Office of Naval Research; 2022;

KEYWORDS: Mesh sensors; grid sensing; atmospheric data collection;

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VERSION 3

SF242-D027 TITLE: ROC STAR - ROcket Cargo System Technologies And Research

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Sustainment & Logistics; Mission Readiness & Disaster Preparedness

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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: This topic seeks to perform systems engineering, concept exploration, analysis, modeling and simulation, test and evaluation of point-to-point rocket transport of cargo.

DESCRIPTION: The commercial rocket industry is expected to have an evaluation of $1B over the next five years and the Department of the Air Force is interested in examining how this new emerging market can be utilized for point to point transport of cargo. Rocket transport of cargo opens up a new capability by enabling the delivery of goods to any point on the earth within 90 minutes or less. While this capability provides a transformation in cargo transport, many challenges remain in making cargo transport via rocket a reality. A specific focus is how the Government can take advance of commercial capabilities without taking sole ownership or creating a unique aspect that is Government only, thereby driving up life cycle cost. Another aspect of interest to the Government is the ability to influence designs early on so that if there are unique Department of Defense (DoD) requirements, they can be incorporated into the commercial product enabling dual-use aspect.

The Department of the Air Force is exploring rocket transportation capability for DoD logistics and the Air Force Research Laboratory (AFRL) is currently assessing emerging rocket capability across the commercial vendor base, and its potential use for quickly transporting DoD materiel to ports across the globe. The U.S. commercial launch market is building the largest rockets ever, at the lowest prices per pound ever, with second-stages that will reenter the atmosphere and be reused. These advances in the U.S. commercial launch market are presenting the need for assessment and maturation of system-of-systems concepts of rocket transportation for DoD (Department of Defense) logistics by the United States air Force and Space Force (USAF/USSF). A large trade space exists for the potential of rocket cargo for global logistics, to include improvements in delivery cost and speed compared to existing air cargo operations.

The goal of this effort is to investigate concepts, and yet to be develop concepts for rock cargo to determine technical feasibility and risk, programmatic costs, and schedule. The information, test and evaluation (T&E) under this effort will be used to influence and guide rocket cargo efforts. While the goal is to enable up to 100 tons of cargo to be delivered anywhere on the planet within tactical timelines, there may be optimization techniques and process with smaller amounts of cargo and transportation modes other than rockets that can provide rapid delivery of materials.
An objective of this effort is to grow AFRL’s Rocket Cargo industrial base. This topic is intended to reach companies capable of completing a feasibility study and prototype validated concepts under accelerated Phase I and II type schedules. This topic is aimed at later stage research and development efforts rather than “front-end” or basic research/research and development.

VERSION 3

The focus is on emerging commercial capabilities to minimize cost and enable agile logistics through the entire span of responsive mission planning, rapid cargo logistics, ground launch operations and coordination with commercial airspace.
The main deliverables will be modeling and simulation (M&S), T&E of concepts that advance the viability and utility of using commercial rockets and associated systems for Department of Defense global logistics to expanding capabilities of the USSF for combatant commanders.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior "Phase I-type" effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. This includes determining, insofar as possible, the scientific and technical merit and feasibility of ideas appearing to have commercial potential. It must have validated the product-market fit between the proposed solution and a potential AF stakeholder. The offeror should have defined a clear, immediately actionable plan with the proposed solution and the AF customer. Relevant areas of demonstrated experience and success include: M&S, cost benefit analysis, risk analysis, concept development, concept demonstration and concept evaluation, laboratory experimentation and field testing. Phase I type efforts should include the assessment of emerging operational imperatives and how they show a measurable value and operational impact. The result of Phase I type efforts is to assess and demonstrate whether commercial systems can support the furtherance of the operational imperatives.

Eligibility for a D2P2 award is predicated on the offeror having performed a "Phase I-type" effort predominantly separate from the SBIR/STTR Programs. These efforts will include M&S, simulation of prototype concepts, cost benefit analysis, system-of-systems studies, experimentation and evaluation of operational imperatives to enable future concepts. Prototypes, M&S and experimentation should explore a wide range of integrating commercial capabilities to support the operational imperatives. These capabilities should consider areas that are unique to military operations, logistics, mission planning, mission execution, base sustainment and logistics.

PHASE II: A goal is for Phase II efforts to conduct sub-scale experiments and provide test articles for further test and demonstration. Experiments should address military-unique requirements that may not be otherwise met by commercial capabilities.

PHASE III DUAL USE APPLICATIONS: Phase III shall include upgrades to the analysis, M&S, T&E results and provide mature prototypes of system concepts. Phase III shall provide a business plan and address the ability to transition technology and system concepts to commercial applications. The adapted non-Defense commercial solutions shall provide expanded mission capability for a broad range of potential Governmental and civilian users and alternate mission applications. Integration and other technical support to operational users may be required.

REFERENCES:

1. S. Sankar, " The Supply Chain Revolution: Innovative Sourcing and Logistics for a Fiercely Competitive World", American Management Association, 2017.
2. L. Lei, L. DeCandia, R. Oppenheim, Y. Zhao, "Managing Supply Chain Operations", World Scientific Publishing Co., 2017.
3. E. Harden, "Just-in-Time Logistics: Does it Fulfill the Surface Navy's Repair Parts Requirements to Support the National Military Strategy?", Creative Media Partners, LLC, 2012.
4. O. Yakimenko, "Precision Aerial Delivery Systems: Modeling, Dynamics, and Control", American Institute of Aeronautics and Astronautics, 2015.
5. *WHO, "Qualification of shipping containers, Technical supplement to WHO Technical Report Series, No. 961, 2011", QAS/14.598 Supplement 13, 2014

6. N. N. Ahypeeb, “Reusable Rockets and Missiles, Russian Cargo Delivery to Space, USSR”, Mockba, 1975;

KEYWORDS: Agile logistics; rapid cargo logistics; ground launch operations

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SF242-D028 TITLE: Strategic Advancements in Resilient Space Technologies for PWSA Enhancement

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology

OBJECTIVE: Provide novel and innovative new technology to bolster the United States Space Force (USSF) Space Development Agency's (SDA) advancement of the Proliferated Warfighter Space Architecture (PWSA). SDA seeks proposals encompassing novel mission, system, value and warfighting engineering concepts, technologies, and capabilities which facilitate leap-ahead improvements for planned PWSA segments, layers and tranches or enable the creation of new missions and capabilities to address emerging warfighter needs. This effort aligns with the imperative to fortify space capabilities, ensuring their resilience against potential attacks, and to counter adversaries' advancements in space-based military capabilities targeting terrestrial assets, especially high-value power projection assets.

DESCRIPTION: SDA is actively seeking innovative proposals to advance the PWSA and create additional capability for the warfighter while maintaining affordability and resilience across the architecture. This call encompasses a wide array of themes, ranging from integrating commercially-sensed data into the transport layer by advancing SDA-standard compatible Optical Inter-Satellite Link (OISL) technologies, to networking, in-space processing, power enhancement for commoditized spacecraft buses, and robust multi-level security and cross domain solutions. These themes aim to drive advancements in affordability, capability, viability and interoperability. The goal is to bolster the resilience and capabilities of space assets while enabling new layers of capabilities to address evolving warfighter needs in a dynamic and challenging space environment.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. This phase should thoroughly assess scientific and technical merit while establishing the feasibility of ideas with commercial potential. The applicant(s) must validate the product-market fit between the proposed solution and the warfighting customer, identifying potential end-users within the Department of Defense and exploring integration feasibility and costs with current mission-specific products. The documentation presented should encompass technical reports, test data, prototype designs/models, and achieved performance results aligned with the minimum technical and scientific merit outlined in the description. The prior work demonstrating feasibility must have been substantially performed by the applicant(s) and/or the Principal Investigator.

PHASE II: The proposed D2P2 solution strategically aligns with key focus areas aimed at advancing affordable, resilient, interoperable technologies inherent or required within the PWSA. This effort to enhance space capabilities comes in response to the nation's growing reliance on space infrastructure while advancing critical services provided to joint forces, enabling truly global joint warfighting operations and all domain command and control. The D2P2 initiative is designed to address these challenges by focusing on key strategic areas:

1. Advanced Space Connectivity and Integration: This encompasses the integration of commercially-sensed data into the transport layer for the benefit of the warfighter at the tactical edge while developing advanced Optical Inter-Satellite Link (OISL) components and technologies to reduce SWaP-C, mitigate atmospheric effects, and provide all optical routing to enhance connectivity between space vehicles and/or domain agnostic terrestrial users.
2. Enhanced Space Systems and Capabilities: This involves advancing the development and application of cyber solutions, networking technologies, in-space processing capabilities, power enhancement for commoditized space vehicle buses, and generic BMC3 hardware and middleware solutions to bolster the overall resilience and capabilities of space systems. Of

particular interest are capabilities and technologies whose application would lower the overall data latency associated with moving time critical information from point of creation to point of employment on operationally relevant timelines.

3. Next-Generation Hardware and Security Measures: The focus here is on implementing seamless multi-level security, small SWaP-C cryptography, affordable cross-domain solutions, and related data and information protection measures to safeguard space assets and operations from potential threats and/or compromise.
4. Precision Timing and Spaceborne Clock Technologies: Addressing the crucial need for high-performance, low SWaP-C clocks for space, ensuring precise timekeeping in satellite operations and supporting PNT while avoiding the need for major user terminal recapitalization. This concerted effort aims to leverage previous feasibility demonstrations, driving innovative solutions that significantly augment existing PNT solutions and require minimal user resource application for success.
5. Radio Frequency Space Data Transport Solutions: Advanced hardware, software and/or firmware solutions for commoditized space vehicles across UHF, L, S, and Ka bands with multi-band transceivers for ground, sea, air, high altitude and sub-orbital platforms. Of particular interest are high duty cycle, low SWaP-C transceiver solutions enabling multi-user, multi-band operations from a single vehicle or set of cross-linked interoperable vehicles.

Successful Phase-II proposals within these strategic areas will culminate in comprehensive end-to-end capability demonstrations in relevant operational laboratory environments. Such demonstrations should substantially improve the Technical Readiness Level(s) of any developing technologies. Subsequently, initial field testing may be conducted to confirm the readiness of proposed capabilities for limited production and operational deployment, aligning with the imperative to enhance the warfighting capability of the joint force.

PHASE III DUAL USE APPLICATIONS: The Phase III transition plan for this initiative involves advancing the technology developed in Phase II towards operational integration, emphasizing its dual-use potential for both military and commercial applications. Building on the proven capabilities and advancements achieved in Phase II, Phase III focuses on refining the technology for seamless integration into operational environments within the Space Force while exploring its applications in commercial sectors. Rigorous testing, validation, and evaluations are conducted to ensure the technology's readiness for integration into established Space Force systems while simultaneously identifying commercial use cases and potential markets. Engagement with government transition programs and commercial stakeholders is pivotal to facilitate the technology's seamless integration across both defense and civilian domains. The overarching objective of Phase III is to transition the technology into operational use within the Space Force, ensuring enhanced security, resilience, and operational efficiency for space-based architectures while exploring its potential for broader commercial utilization.

REFERENCES:

1. https://www.sda.mil/home/work-with-us/resources;

KEYWORDS: Cryptography; Networking; Resilience; Interoperability; Affordability; Mission; Warfighting

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VERSION 3

SF242-D029 TITLE: Space Based Environmental Monitoring (SBEM)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology

OBJECTIVE: To develop and implement cutting-edge Space Based Environmental Monitoring (SBEM) technologies aimed at enabling the Space Systems Command to establish a comprehensive, real-time, and globally responsive environmental monitoring system from space. The end state is to create an integrated network of satellites capable of delivering accurate and actionable environmental data for enhanced situational awareness, resource management, and informed decision-making in both military and civilian sectors.

DESCRIPTION: The Space Systems Command (SSC) is spearheading an ambitious initiative focused on advancing Space Based Environmental Monitoring (SBEM) capabilities to revolutionize global environmental data collection and analysis from space. This endeavor aims to develop and deploy a constellation of state-of-the-art satellites equipped with cutting-edge sensors and instrumentation. The primary objective is to establish a comprehensive, real-time, and responsive environmental monitoring system, delivering high-resolution data on various ecological parameters worldwide.

The project encompasses several key facets:
Technology Innovation: SSC seeks innovative solutions to enhance satellite capabilities, including sensor development, data processing algorithms, and communication systems. The emphasis is on ensuring higher precision, broader coverage, and increased data reliability.

System Integration: The integration of disparate systems into a cohesive network forms a pivotal aspect. This involves satellite constellation management, data fusion, and interoperability to create a seamless ecosystem for collecting, analyzing, and disseminating environmental data.

Data Utilization: SSC aims to harness the collected data for actionable insights. This involves the development of sophisticated analytics tools, predictive models, and decision-support systems. The goal is to enable informed decision-making across diverse sectors, including defense, disaster response, agriculture, and resource management.

Collaborative Partnerships: Collaboration with industry leaders, academia, government agencies, and international entities forms a critical element. SSC endeavors to foster partnerships to leverage expertise, resources, and diverse perspectives, accelerating innovation and global impact.

Operational Efficiency: The project seeks to ensure operational efficiency in satellite deployment, data transmission, and system maintenance. SSC aims to develop streamlined processes and resilient infrastructure for continuous and reliable SBEM operations.

PHASE I: As this is a Direct-to-Phase-II (D2P2) topic, no Phase I awards will be made as a result of this topic. To qualify for this D2P2 topic, the Government expects the applicant(s) to demonstrate feasibility by means of a prior “Phase I-type” effort that does not constitute work undertaken as part of a prior or ongoing SBIR/STTR funding agreement. This "phase" should thoroughly assess scientific and technical merit while establishing the feasibility of ideas with commercial potential. The Offeror must validate the product-market fit between the proposed solution and the warfighting customer, identifying potential end-users within the Department of Defense and exploring integration feasibility and costs with current mission-specific products. The documentation presented should encompass technical reports, test data, prototype designs/models, and achieved performance results aligned with the minimum technical and scientific merit outlined in the description. The prior work demonstrating feasibility must have been substantially performed by the Offeror and/or the Principal Investigator.

VERSION 3

PHASE II: The Phase II effort aims to advance Space Based Environmental Monitoring (SBEM) technology developed in Phase I by integrating advanced sensor technologies and data fusion algorithms to create an interconnected satellite constellation. This Phase II prototype will operate with high-resolution multispectral sensors across visible, infrared, and microwave spectrums, capturing diverse environmental indicators globally. Rigorous testing under simulated and real-world conditions, including vacuum and thermal chamber testing, ensures functionality in extreme space environments. Success criteria involve achieving a 95% accuracy rate in environmental data collection, scalability for at least six satellites, and demonstrating cost-effectiveness compared to traditional methods, enhancing its commercial viability for defense, disaster management, agriculture, and environmental sectors

PHASE III DUAL USE APPLICATIONS: The Phase III dual-use initiative aims to transition the advanced Space-Based Environmental Monitoring (SBEM) technology into commercial markets while addressing specific government and military needs. This phase focuses on optimizing the technology for commercial adoption by environmental monitoring firms, agriculture, and disaster management agencies, ensuring scalability and user-friendly interfaces. Simultaneously, it tailors SBEM technology for government and military applications, collaborating with defense agencies, emergency responders, and environmental bodies to align with operational requirements. Continuous technology refinement and field tests validate the technology's robustness in diverse settings, meeting stringent standards. A comprehensive market penetration strategy facilitates widespread commercial adoption through targeted marketing, industry partnerships, and user training programs, ensuring broader societal impact and strategic relevance

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1. Z. Szajnfarber, T. Beatty, M. Petersen, A. Vasilyeva, D. White, A. Wiegel; “Defining a US Architecture for Environmental Monitoring from Space”.  Massachusetts Institute of Technology


KEYWORDS: Remote Sensing; Environmental Testing; Climate Observation; Data Fusion


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**Defense Health Agency (DHA)**
**2024.2 Small Business Innovation Research (SBIR)**
**Proposal Submission Instructions**

## INTRODUCTION

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

Proposers responding to a topic in this BAA must follow all general instructions provided in the Department of Defense (DoD) SBIR Program BAA. DHA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below. Only Government personnel will evaluate proposals submitted under this solicitation cycle.

**Proposers are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.**

- The DoD Program BAA is located at: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements. Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

Specific questions pertaining to the administration of the DHA SBIR Program and these proposal preparation instructions should be directed to:

DHA SBIR Program Management Office (PMO) Email: usarmy.detrick.medcom-usamrmc.mbx.dhpsbir@health.mil

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 the Topic Q&A: https://www.dodsbirsttr.mil/submissions/login.

## PHASE I PROPOSAL GUIDELINES

The Defense SBIR/STTR Innovation Portal (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. Detailed instructions regarding registration and proposal submission via DSIP are provided in the DoD SBIR Program BAA.

### Technical Volume (Volume 2)

The technical volume is not to exceed **20 pages** and must follow the format and content requirements provided in the DoD SBIR Program BAA. Do not duplicate the electronically-generated Cover Sheet or put information associated with the Technical Volume in other sections of the proposal as these will count toward the 20-page limit.

Only the electronically-generated Cover Sheet and Cost Volume are excluded from the 20-page limit. Technical Volumes that exceed the 20-page limit will be deemed non-compliant and will not be evaluated.

### Cost Volume (Volume 3)

The Phase I Base amount must not exceed $250,000 over a 6-month period of performance. Costs must be clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3.

Please review the updated Percentage of Work (POW) calculation details included in the DoD Program BAA. DHA will occasionally accept deviations from the POW requirements with written approval from the Funding Agreement Officer.

Travel must be justified and relate to the project needs for direct Research Development Test & Evaluation (RDT&E) Technology Readiness Level (TRL) increasing costs. Travel costs must include the purpose of the trip(s), number of trips, origin and destination, length of trip(s), and number of personnel.

**Company Commercialization Report (CCR) (Volume 4)**
Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR Program BAA for full details on this requirement. Information contained in the CCR will be considered by DHA during proposal evaluations.

**Supporting Documents (Volume 5)**
All proposing small business concerns 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
2. Disclosures of Foreign Affiliations or Relationships to Foreign Countries

Please refer to the DoD Program BAA for more information.

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

**PHASE II PROPOSAL GUIDELINES**
Phase II proposals may only be submitted by Phase I awardees. Phase II is the demonstration of the technology found feasible in Phase I. The details on the due date, content, and submission requirements of the Phase II proposal will be provided by the DHA SBIR PMO typically in month five of the Phase I contract.

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 describing feasible approaches for transitioning and/or commercializing the developed technology in their Phase II proposal. This plan shall 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 $1,300,000. Budget costs must be submitted using the Cost Volume format (accessible electronically on the DoD submission site) and shall 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 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. Technical Volumes that exceed the 40-page limit will be deemed non-compliant and will not be evaluated.

**DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)**
The DHA SBIR Program does not participate in the Technical and Business Assistance (formerly the Discretionary Technical Assistance Program). Contractors shall not submit proposals that include Technical and Business Assistance.

The DHA SBIR Program has a Transition Lead who provides technical and commercialization assistance to small businesses that have Phase I and Phase II projects.

**EVALUATION AND SELECTION**
All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD SBIR Program BAA.

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. Non-selected companies may request feedback within 15 calendar days of the non-select notification. The Corporate Official identified in the firm's proposal shall submit the feedback request to the SBIR Office at usarmy.detrick.medcom-usamrmc.mbx.dhpsbir@health.mil. Feedback is provided in an official PDF via email to the Corporate Official identified in the firm proposal within 60 days of receipt of the request. Requests for oral feedback will 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 feedback request.

NOTE: Feedback is not the same as a FAR Part 15 debriefing. Acquisitions under this solicitation are awarded via "other competitive procedures". Therefore, offerors are neither entitled to nor will they be provided FAR Part 15 debriefs.

Refer to the DoD SBIR Program BAA 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:

Ms. Samantha L. Connors SBIR/STTR Chief, Contracts Branch 8
Contracting Officer
U.S. Army Medical Research Acquisition Activity
Email: Samantha.l.connors.civ@health.mil

**AWARD AND CONTRACT INFORMATION**
Phase I awards will total up to $250,000 for a 6-month effort and will be awarded as Firm-Fixed-Price Purchase Orders.

Phase II awards will total up to $1,300,000 for a 24-month effort and will typically be Firm-Fixed-Price contracts. If a different contracting type is preferred, such as cost-plus, the rational as to why must be included in the proposal.

Phase I/Phase II awardees will be informed of contracting and Technical Point of Contact/Contract Officer Representative upon award.

**ADDITIONAL INFORMATION**

**RESEARCH INVOLVING HUMAN SUBJECTS, HUMAN SPECIMENS/DATA, OR ANIMAL RESEARCH**
The DHA SBIR Program highly discourages offerors from proposing animal or human use research during Phase I due to the significant lead time required to prepare documentation and secure approval, which could substantially delay the performance of the Phase I award.

Prior to contract award when an IRB is indicated, proposers must demonstrate compliance with relevant regulatory approval requirements that pertain to proposals involving human subjects, human specimens, or research with animals. If necessary, approvals are not obtained within two months of notification of selection, the decision to award may be terminated.

Offerors are 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 (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. Modifications to previously approved protocols require re-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 Human Research Oversight (OHRO) provides formal authorization. Written approval to begin a research protocol will be issued from the USAMRDC OHRO, under separate notification to the recipient. Written approval from the USAMRDC OHRO is required for any sub-recipient using funds from this award to conduct research involving human subjects. If the Offeror intends to submit research funded by this award to the U.S. Food and Drug Administration, Offerors shall propose a regulatory strategy for review.

*NOTE: Exempt animal or human research use shall also reflect 'yes' on the proposal coversheet for USAMRDC ACURO and OHARO records.

Non-compliance with any provision may result in withholding of funds and or termination of the award.

**FEDERAL FACILITY USE**

The DHA SBIR Program highly discourages small business concerns (SBCs) from subcontracting to a federal facility and/or utilizing for testing due to the significant lead time required to secure approval, which could substantially delay the performance of the award.

Use of federal facilities is prohibited without an approved waiver from the DHA SBIR/STTR Office.

An SBC whose proposed work includes federal facility use is required to provide a written justification, uploaded to the Supporting Documents (Volume 5), that includes the following information:

1. An explanation of why the SBIR/STTR research project requires the use of the federal facility, including data that verifies the absence of non-federal U.S. facilities, in support of the overall mission and research area.
2. Evidence that there is no applicable U.S. facility that has the ability or expertise to perform the specified work.
3. Why the Federal Agency will not and cannot fund the use of the Federal facility or personnel for the SBIR/STTR project with non-SBIR/STTR money.

The DHA SBIR Program has the right of refusal. Companies that fail to meet requirements specified above will be at risk of delay to award or funding.

If the proposal is selected, the U.S. Army Medical Research Acquisition Activity (USAMRAA) will assist in establishing the waiver for DHA SBIR/STTR Office approval. If approved, the proposer will subcontract directly with the federal facility and not a third-party representative.

Transfer of funds between a company and a Military Lab must meet the following APAN 15-01 requirements (the full text of this notice can be found at https://usamraa.health.mil/SiteAssets/APAN%2015-01%20Revised%20Feb%202018.pdf):

(1) The DoD Intramural Researcher must obtain a letter from his/her commanding officer or Military Facility director authorizing his/her participation in the Extramural Research project. This letter must be provided to the Extramural Organization for inclusion in the proposal or application.

(2) The DoD Intramural Researcher must also coordinate with his/her local RM office (or equivalent) to prepare a sound budget and justification for the estimated costs. Where there are no DoD-established reimbursement rates [e.g., institution review board (IRB) fees, indirect cost rates, etc.], the Military Facility's RM office (or equivalent) must provide details of how the proposed rates were determined. The DoD Intramural Researcher must use the budget and justification form enclosed in APAN 15-01 when developing the estimated costs and provide it to the Extramural Organization for inclusion in the proposal or application.

(3) The Extramural Research proposal or application must include a proposed financial plan for how the Military Facility's Intramural Research costs will be supported [i.e., directly funded by DoD, resources (other than award funds) provided by the Awardee to the Military Facility, or award funds provided by the Awardee to the Military Facility (in accordance with the requirements below)].

(4) The DoD Intramural Researcher should also coordinate with his/her technology transfer office.

**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 nonprofit 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, such as Phase III, if the university/research institution is the source of critical knowledge, effort, or infrastructure (facilities and equipment).

***END***

## DHA SBIR 24.2 Topic Index

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| DHA242-001 | Fast and Wide Multiplexing Omics Assay Platform to be Eligible for Far Forward Use and to Meet the Criteria to Get Certification of Waiver (COW) Status from Clinical Laboratory Improvement Amendments (CLIA) |
| DHA242-002 | Robotic End-Effector for Combat Casualty Care |
| DHA242-003 | Hydrogel-based Drug Delivery Product(s) for Traumatic Brain Injury |

DHA242-001 TITLE: Fast and Wide Multiplexing Omics Assay Platform to be Eligible for Far Forward Use and to Meet the Criteria to Get Certification of Waiver (COW) Status from Clinical Laboratory Improvement Amendments (CLIA)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Combat Casualty Care

OBJECTIVE: To develop an in vitro diagnostic (IVD) platform with fast and wide multiplexing capability. This tool should be able to detect at least 25 multi-omics targets in a rapid and automated fashion from single input of minimally invasive biomatrix with an insignificant risk of an erroneous result.

DESCRIPTION: Recent advancements in the field of hardware miniaturization and nanotech based manufacturing industry essentially made a significant change in the conventional molecular testing landscape. The prospect of detecting multi-target profile in the clinical set up with a high precision has becoming more feasible, which is also reflected in the latest list of FDA approved detection kits [1]. Current trend in the commercial pipeline could be highlighted by the following IVD platform, namely FoundationOne CDx (F1CDx), which received FDA approval in 2020; its latest version, namely PGDx is enabled to detect the genetic aberrations linked to multiple types of cancers. These tests deploy Next Gen Sequencing (NGS) platform to detect substitutions, insertions and deletions, and copy-number alterations in 300-500 genes [2]. Such capability, namely one platform that can diagnose multiple diseases is highly beneficial in battlespace since Role 1/ 2 facilities have limited real estate. The advantages of this platform will be magnified should the technology meet the following criteria- “simple laboratory examinations and procedures that have an insignificant risk of an erroneous result.” This is essentially the criteria to get a COW from CLIA testing. None of the available IVD platform that can detect multiple targets can meet the criteria to get CLIA waiver. Present solicitation seeks to bridge this knowledge gap. Note: It’s not necessary for a solicitor to get COW from CLIA within this project timeframe; however, these guidelines should be used as a benchmark to monitor the success criteria.

Present market is dominated by polymerized chain reaction (PCR)-based detection kits that detect a handful of most eligible molecular targets. Diverging from the current position of IVD market, our proposed platform seeks a more holistic approach to detect all possible actionable targets from minimum inputs and within short turnaround time. Our approach is bolstered by a 2019 market analysis that forecasted a significant gain in diagnostic market share in near future by the wide multiplexing tools with “improved sensitivity and specificity compared with traditional sequencing technologies, as well as faster identification.” [3]

Our objective is to develop a prototype of wide multiplexing capability. It should be able to detect at least 25 targets with high sensitivity and specificity as compared to traditional sequencing technology. Moreover, the prototype should have a small footprint and easy to executable protocol. The protocol should have an automated hands-free process that would allow a single input of minimally invasive biomatrix for a nearly error-free detection. This prototype should be developed with the aim to eventually meet the criteria to get a COW from CLIA. Till date, there are only 40 tests that have been approved for COW status at CLIA website http://www.fda.gov/cdrh/clia and none has wide multiplexing capability.

Our 40-gene panel of sepsis biomarker could be used in the prototype; nevertheless, the best candidate prototype should have maximum flexibility, so that the prototype could be easily repurposed or co-diagnose additional diseases including, but not limited to traumatic brain injury (TBI), infection, and other psychological markers.
A web search of SBIR and STTR solicitations (dated January 23, 2024) found no existing solicitations to develop wide multiplexed tool that will be portable, simple, automated, and can detect a wide spectrum of molecules to facilitate diagnose/monitor/predict multiple diseases.

PHASE I: Phase I will demonstrate the feasibility of a fast and wide multiplexing detection platform; the proof-of-concept should explain methodologies to detect fast and wide multiplexing capability from single input of biomatrix of choice. The expectation is that the biomatrix should be minimally invasive, such as blood, saliva, urine etc. Target biomarkers could be curated from the public domain. Use of human or animal subjects is not intended, or expected, to establish/achieve the necessary proof-of-concept in Phase I.

In summary, our expectations from Phase I are the following:

1. A plan to develop a prototype that can detect at least 25 targets. The final product should be flexible to diagnose multiple diseases, such as sepsis, TBI and pathogenic infection.
2. The expected device should be an automated and portable platform that should be readily used in far forward lab or at bedside with an insignificant risk of an erroneous result.
3. The concept is expected to support an end-to-end methodology e.g., an integrated sample collection-to-assay-to-detection protocol.
4. The concept should show a feasible route to develop wide multiplexing capability with high precision as compared to traditional NGS platform is essential. This metrics should be used/ tested from the beginning of protocol design.

PHASE II: The proof-of-concept generated in Phase I should be transformed into a working prototype during Phase II. Phase II should start with a plan to assay the biomatrix of choice to detect a panel of multi-omics biomarkers. A comprehensive testing is expected to determine the feasibility of the platform to be operated with minimum hands-on time and least supervision. Suitable biomatrix should be finalized. The detection mode (e.g., visual inspection vs. digital record etc.) of endpoint reading should be finalized, and this process should be easily interpretable. We encourage to have a data driven analysis of the proposed capability tested using biomatrix that can inform us about the feasibility of next steps.

In summary, our expectation from Phase II is the following:

1. The input and output modus operandi should be finalized.
2. Assay sensitivity and specificity should be characterized. Screening of limit of detection (LOD) profile in presence of potential confounders and contaminates is expected.
3. A turn-around time should be tested. Herein the assay time includes the sample collection, assay and detection.
4. Potential risk factors and mitigation plan should be discussed.
5. Probable assay cost should be estimated.
6. Plan for a path forward to secure FDA approval.

PHASE III DUAL USE APPLICATIONS: The goal of this phase is to secure an FDA approved product that is intended to be suitable for use and potential procurement for primary use in the field/prehospital environment, including bedside, austere/ far forward, Role 1/2 facilities and prolonged care scenarios. At this phase, target diseases and pertinent biomarkers should be determined. Accuracy, reliability, and usability should be assessed. This testing should be controlled and rigorous. Statistical power should be adequate to document final efficacy and feasibility of the assay.

Funding could be solicited from CDMRP and BARDA, who usually support such efforts focused to military health. As mentioned previously, the target disease might include those health issues that are nonexclusive to active-duty members. Realization of a dual-use technology applicable to both the military and civilian use could be achieved via making commercial partners with IVD marker leaders like Roche, Inc, Illumina, Inc., Bio-Rad, Inc. etc.The goal of this phase is to secure an FDA approved product that is intended to be suitable for use and potential procurement for primary use in the field/prehospital environment, including bedside, austere/ far forward, Role 1/2 facilities and prolonged care scenarios. At this phase, target diseases and pertinent biomarkers should be determined. Accuracy, reliability, and usability should be assessed. This testing should be controlled and rigorous. Statistical power should be adequate to document final efficacy and feasibility of the assay.

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REFERENCES:


1. US Food and Drug Administration Website: Nucleic acid-based tests. Page last updated: 11 Sep 2018. Accessed 12 Dec 2023. https://www.fda.gov/medical-devices/in-vitro-diagnostics/nucleic-acid-based-tests
2. Sternberg, A. HITTING THE TARGET: Multigene Tests Gain Foothold in More Clinical Settings. Targeted Therapies in Oncology. June 1, 2020; 9 (8), pp 65. https://www.targetedonc.com/view/hitting-the-target-multigene-tests-gain-foothold-in-more-clinical-settings
3. Global Companion Diagnostics Market Report 2019-2024. News release. BUSINESS WIRE; Page last updated: September 24, 2019. Accessed 12 Dec 2023. https://www.businesswire.com/news/home/20190924005792/en/Global-Companion-Diagnostics-Market-Report-2019-2024---Market-to-Reach-7.3-Billion-by-2024-Registering-Massive-Growth---ResearchAndMarkets.com



KEYWORDS: Fast and wide multiplexing, targeted biomarker quantification, CLIA waiver certificate, Far forward lab, minimally invasive biomatrix, simple protocol, automated hands-free protocol



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DHA242-002 TITLE: Robotic End-Effector for Combat Casualty Care

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Combat Casualty Care

OBJECTIVE: To develop a novel robotic arm manipulator end-effector that attaches to robotic and autonomous systems to perform diagnostics and intervention medical tasks for combat casualty care.

DESCRIPTION: The robotics industry has majorly advanced in the past few decades due to innovation in the ability to automate industrial and manufacturing tasks. This was focused on the design and function of robotic end-effectors to accomplish industrial tasks such as pick & place, lifting, and spot welding. Recent advancements in Artificial Intelligence (AI) and Machine Learning (ML) have opened the doors for Robotic and Autonomous Systems (RAS) to automate many more fields outside of manufacturing. Automation in the medical field is an emerging area, however it is primarily dominated by software based automated solutions. This is because physical interaction with robotic systems is limited to the functionality of the robotic end-effector, which have almost exclusively been developed for industrial and manufacturing purposes. Current robotic end-effectors rely on a two-finger configuration which is beneficial for simplicity and stability of rigid and structured objects. Additionally, the design of an end-effector is to fit a specific use case and not for general purpose use, limiting their ability to perform more than one task. As the Military Health System (MHS) is aiming to modernizing, it is looking to leverage emerging technologies to increase the capability and capacity of its medical care providers across the continuum of care [1,2]. The main issue remains that robotic end-effectors designed for industrial and manufacturing purposes will not be able to complete the complex and diverse set of tasks that are needed for automating aspects of combat casualty care. This topic calls for the development of novel robotic end-effector designs to specifically assist emerging robotic and autonomous solutions to medical tasks. The goal of the topic is to demonstrate the ability for the novel medically-focused robotic end-effectors to successfully perform a range of diagnostic and intervention patient care tasks. The focus of this SBIR topic is on the design and implementation of the robotic end-effector. Successful demonstration of patient care tasks may be fully teleoperated, as software autonomy is not being assessed, only the functionality of the hardware. This topic allows for any novel design of robotic end-effector and is not limiting to any specific type. In other words, rigid multi-fingered, soft robotics, and any other innovative design is welcome. General constraints to keep in mind are that the robotic end-effector should be safe and strong enough for physical interaction with a patient, such as lifting and repositioning an arm or a leg. The end-effector needs to be general purpose enough to interact and use many different medical objects such as those found in a medic's tool kit, and devices found in fixed hospitals. And lastly the end-effector needs to be dexterous and stable enough to use medical objects in completing various patient care diagnostics and intervention tasks.

PHASE I: The goal of Phase I efforts is to provide evidence in the feasibility of the innovative end-effector design. In Phase I researchers should concentrate on software-based design and simulated capabilities of the proposed solution. Researchers will need to present their computer-aided design (CAD) drawings as well as their end-effector successfully performing patient care tasks in robotic simulation environments. It is suggested that performers should prove feasibility in their design accomplishing 3 of the following described prehospital medical tasks for both direct and in-direct human interaction. In-direct tasks include: 1) placing a pulse oximeter on a patient's finger, 2) assisting in a Bag-Valve Mask procedure by placing and holding the mask on the patient's face, 3) assisting in a Bag-Valve Mask procedure by continuously compressing the bag, and 4) lifting an ultrasound probe and maneuvering it across a patient's torso. Direct
human interaction patient care tasks include: 5) lifting a patient's limb and repositioning it, 6) picking up a catheter and performing a Needle Decompression Thoracostomy, 7) picking up a scalpel and applying enough force and precision to perform the cutting steps of a Fasciotomy. In a feasibility proof-of-concept demonstration the performers should showcase their design's ability to perform 3 of these tasks in a

digital simulation environment (e.g. Gazebo etc.). This effort is not concerned with the creation of high-fidelity digital patient assets and rudimentary digital shapes such as cylinders with similar sizes and weights can be substituted for human anatomy.

PHASE II: In Phase II researchers should implement and fabricate the design demonstrated in Phase I's feasibility test. The goal at the end of Phase II is to have a physical robotic end-effector prototype capable of performing patient care procedures. The designed end-effector must be integrated onto an articulated robot arm platform. The choice of articulated arm platform is left to the researchers and can be either commercial-off-the-shelf or custom made (if previously developed, Phase II effort should not be spent on designing and building a custom articulated arm). Common articulated arms include but are not limited to Universal Robotics, Franka Emika, etc. At the conclusion of the Phase II effort the researchers must demonstrate the capability to teleoperate their robotic system (chosen articulated arm integrated with their novel end-effector) performing all seven of the patient care procedures described in the Phase I description. For the Phase II demonstration a manikin will be used in place of a patient and any representative manikin or medical task trainer will suffice to demonstrate the task completion. These tasks can be completed through teleoperation as there is not an expectation of autonomy in the execution of procedures. There is no need for any human subjects testing to demonstrate capability. The prototype system should be ruggedized enough to operate outdoors (i.e., closed prototype with no loose wires or breadboards). Applicants should describe their approach to the regulatory requirements and describe their strategy to obtain clearance / approval for the end product. Phase II topic proposals should include a strategy on how to obtain regulatory/FDA approval. It could be beneficial to target existing FDA approved medical robotic platforms for prototype end-effector integration for future Phase III efforts into commercialization and regulatory approval.

PHASE III DUAL USE APPLICATIONS: In Phase III the focus should be on interoperability and commercialization for Government and civilian use. If the intention of commercialization is for medical purposes, then the goal of Phase III efforts should be to obtain regulatory/FDA approval of the developed device. Phase III provides an opportunity for additional improvements to the system that enable commercialization and for regulatory approval. These include improvements to make the end-effector more compatible with the most widely used commercial and Government used robotic platforms. Additionally Phase III can allow for additional ruggedization of the prototype to enable better use in outdoor and military domains. Phase III is also an opportunity to look beyond the prescribed seven tasks in Phase II and develop additional capabilities for the novel end-effector, including investigating adding autonomy features. For consideration of Government commercialization, the end-effector should target capabilities of accomplishing robotic-assisted diagnostic and intervention tasks in the battlefield prehospital setting as well as fixed hospital care. This includes the ability to perform patient care tasks for tactical combat casualty care, prolonged field care, and care within evacuation vehicles. In the civilian sector there are many paths for commercial use of the developed end-effector. Similar to the Government sector, evacuation care in the civilian sector could utilize the novel medical end-effector for use in en-route care, specifically in long medical transfers. Rural medical facilities are particularly under resourced in both personnel and specific expertise and could benefit from the use of autonomous or teleoperated robotic systems for various diagnostic and medical interventions. Additionally centers for elderly care and 24/7 assisted living could also benefit from autonomous and robotic systems treating and administering care to their patients beyond the capabilities of today's robotic capabilities.

REFERENCES:
1. United States Army Futures Command Concept for Medical 2028, https://api.army.mil/e2/c/downloads/2022/04/25/ac4ef855/medical-concept-2028-final-unclas.pdf
2. United States Army Medical Modernization Strategy, https://www.army.mil/e2/downloads/rv7/about/2022_Army_Medical_Modernization_Strategy.pdf

KEYWORDS: Robotics, End-Effector, Medical, Prehospital, Combat Casualty Care, Automation, Innovation, Modernization

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DHA242-003 TITLE: Hydrogel-based Drug Delivery Product(s) for Traumatic Brain Injury

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Combat Casualty Care

OBJECTIVE: To develop and validate a biodegradable hydrogel drug delivery system for open-skull fracture or penetrating traumatic brain injury (TBI) designed to seal the wounded environment and facilitate the controlled, continuous release of hemostatic agents to stop intracerebral hemorrhage, antimicrobials to prevent infection, and drugs to prevent brain swelling and herniation.

DESCRIPTION: Traumatic brain injury (TBI) is a significant health issue affecting military service members during both wartime and peacetime. Care for TBI will be particularly challenging for military medics as it will extend over a prolonged period, in far-forward, austere settings. Yet, this prehospital phase of care is vitally important as the first link in the chain to prevent death and to limit secondary injuries for TBI combatants. Currently, no therapeutic intervention is available as neuroprotective treatment for TBI. In the battlefield, supportive measures usually include restoration of blood pressure and tissue oxygenation through resuscitation or control of intracranial hypertension with hypotonic saline. However, all these measures require skilled paramedics and reasonable medical settings, which are often not feasible during combat. Future improvement in combat casualty outcomes depends on closing the gap in prehospital care. One approach is to develop therapeutic products that can be readily available for administrating by a Combat Medic and/or self or buddy-administration to mitigate morbidity and mortality from TBI during prolonged field and enroute care.

Hydrogels are stable, highly malleable, and easily transportable matrixes that can potentially carry multiple therapeutics. They are easy to apply and offer a promising solution for the point-of-injury care for TBI. Moreover, they are ideal for extended release of drugs directly at the site of injury, bypassing the systemic route and thus limiting potential adverse effects (Fernandez-Serra, Gallego, Lozano, & Gonzalez-Nieto, 2020; Ma et al., 2020). The desired end-product would be a combination (biologic + drug) therapy product utilizing an FDA-approved biodegradable hydrogel combined with an FDA-approved drug that has demonstrated significant evidence of therapeutic benefit in the preclinical TBI literature. The product target should be for TBI patients presenting with skull fracture or penetrating wounds to the brain. This system should be designed to seal the wounded environment and facilitate the controlled, continuous release of individual or multiple therapeutics including antimicrobials to prevent infection, antioxidants, and anti-inflammatory drugs to prevent cellular damage, brain swelling, and herniation. The release of the drug(s) should be unidirectional, facilitating drug infusion into the injured tissue while mitigating any seepage into re-sutured skin and/or gauze bandages. A successful awardee will design, develop, and demonstrate the utility of a hydrogel-embedded drug formulation for TBI in pre-clinical studies.

PHASE I: Demonstrate the feasibility of the concept by providing proof-of -concept hydrogel-based drug delivery platform for TBI that has the potential to meet the broad needs discussed in this topic description. Currently there are no FDA-approved, field-capable materiel solutions that can be used for open-head wounds or penetrating brain injuries. The proposed studies should consider the ability of the hydrogel to provide the safe, controlled release of known neuroprotective drugs directly to the injured brain. Accompanying the application should be standard protocols and procedures for its use and integration into ongoing programs.

PHASE II: The Performer will validate the feasibility of the proposed product by completing pre-clinical in vivo exploratory studies in established small (i.e., rat) animal models of TBI to (1) demonstrate the safety of the hydrogel product, (2) validate pharmacokinetic and pharmacodynamics (PK/PD) properties of the hydrogel-embedded drug delivery approach, and (3) demonstrate therapeutic efficacy of the hydrogel-embedded drug(s) for TBI. PK/PD evaluation shall include selectivity, bioavailability, biodistribution, half-life, stability, and clearance of the drugs in brain tissue and blood/plasma. Drug candidates of interest include, but are not exclusive to, dexamethasone, acetyl L-carnitine, glyceryl tri-acetate, resveratrol tri-acetate, cyclosporine, n-acetylcysteine, candesartan, and minocycline.

Phase II Deliverables

1. The Performer shall submit to DoD technical data and results of experiments demonstrating proof-of-concept and safety of candidate hydrogel + drug formulation(s) in defined small (i.e., rat) animalmodels of TBI non-GLP laboratory studies.
2. The Performer shall submit a Regulatory Development Plan to include identification of the formalregulatory pathway, records of any informal FDA communications guiding their recommendedpathway, referenced hydrogel 510K device already FDA cleared/approved, novel combination withdrug Target Product Profile (TPP) and/or Indication for Use (IFU), projected FDA meeting types, andtop three risks or questions proposed to settle with FDA interactions. The Performer shall provideevidence of FDA interactions confirming whether the novel combination of previously FDA clearedhydrogel + drug may or may not require additional Phase 1 safety studies and/or additional pre-clinicalstudies required by the Agency prior to further clinical development.

PHASE III DUAL USE APPLICATIONS: The Performer shall focus on transitioning the technology from pre-clinical research, through FDA regulated trials, to operational capability and should demonstrate that this system could be used in a broad range of military and civilian medical facilities including by Combat Medics or by buddy administration in austere medical environments. The Performer shall develop a Transition Plan to demonstrate their strategy to infiltrate civilian markets and align to a military operational requirement. The Performer shall discuss technical risks of the approach, costs, benefits, and plan for further development. The Performer shall interface with the U.S. Army Acquisition Medical Research and Development Command (MRDC) Advanced Development Team early to ensure the product aligns to military-relevant use requirements outlined in the current Concepts of Operations. Performers shall integrate the criteria for transitioning to Advanced Development and into the plan. The Performer's Transition Plan shall also demonstrate need for the product by civilian sector stakeholders. Performer shall conduct analysis for commercial viability, via market research data, for possible use in prehospital setting, to include first responders, paramedics, and ambulance transport, and hospital settings. Phase III will require a detailed plan to test the hydrogel + drug product developed in Phase I-II in a larger animal model (pigs, dogs, macaques, etc.), as well as human studies. All research involving animals shall comply with the applicable federal and state laws and agency policy/guidelines for animal protection. Considerations should include material and process documentation, and verifiable data sets on animal samples. The detailed plan shall cite the FDA interactions from Deliverables in Phase II and discuss the steps required for transition from pilot lots of prototypes towards manufacturing process amenable to (cGMP-compliant) pilot lot production. GLP safety and toxicity studies in animal model systems, studies to evaluate the pharmacokinetics and pharmacodynamics (PK/PD), and study specifics for stability and shelf-life studies shall also be discussed in the plan.

The Performer's transition plan shall propose a Clinical Development Plan for FDA regulated Phase 2 and 3 clinical trials to include optimal dosing concentration and regimen determination demonstrated via PK/PD studies, clinical trial synopsis, targeted TBI population, power analysis, and primary outcome measure for efficacy.

The Performer's transition plan shall discuss Product Development Plan to include manufacturing readiness to support Phase 2 and 3 clinical trials, drug packaging and distribution partnerships, results of release and stability studies completed, and a plan for scaling to GMP certified manufacturing partners if not already established.

Lastly, the Performer's transition plan shall discuss the business case to include commercial partner alliance(s), intellectual property protections, patent status, any licensing agreements and plans for commercialization. Private industry can be sought for production of using Good Manufacturing Practice (GMP) processes, either by the small business or under license. Ideally, the Performer will be the regulatory sponsor for clinical studies necessary to demonstrate selective, targeted delivery to the brain, as well as clinical safety and efficacy. The Performer is encouraged to submit proposals to competitive applications to acquire and leverage additional funding sources (i.e. Congressional Directed Medical Research Program/CDMRP, Joint Warfighter Brain Health (JWBH), Combat Casualty Care Research Program (CCCRP), Medical Technology Enterprise Consortium (MTEC) and/or private investiture) adequate to support all development activities and ensure commercial availability and sustainability for the developed product(s).

REFERENCES:

1. Fernandez-Serra, R., Gallego, R., Lozano, P., & Gonzalez-Nieto, D. (2020). Hydrogels for neuroprotection and functional rewiring: a new era for brain engineering. Neural Regen Res, 15(5), 783-789. doi:10.4103/1673-5374.268891
2. Ma, X., Agas, A., Siddiqui, Z., Kim, K., Iglesias-Montoro, P., Kalluru, J., . . . Haorah, J. (2020). Angiogenic peptide hydrogels for treatment of traumatic brain injury. Bioact Mater, 5(1), 124-132. doi:10.1016/j.bioactmat.2020.01.005

KEYWORDS: Hydrogel, traumatic brain injury, penetrating brain injury, extended drug release, TBI, skull fracture

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VERSION 2

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

## INTRODUCTION

The Defense Logistics Agency Small Business Innovation Program (SBIP) supports three objectives. These 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 AND LETHALITY** by improving life cycle performance through technological advancement, innovation and reengineering as well as mitigating single points-of-failure that threaten the readiness of weapons systems used by our warfighters; **SUPPLY CHAIN INNOVATION AND ASSURANCE** by improving lead times, reducing lifecycle costs, maintaining a secure and resilient supply chain, as well as providing opportunities for the small business industrial base to enhance supply chain operations through technological innovations. This objective also includes supply chain assurance securing the microelectronics supply chain, developing a domestic supply chain for rare earth elements, and adopting industrial base best practices associated with counterfeit risk reduction.

Proposers responding to a topic in this Broad Agency Announcement (BAA) must follow all general instructions provided in the Department of Defense (DoD) SBIR Program BAA. DLA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

**Proposers are encouraged to thoroughly review the DoD Program BAA and register for the Defense SBIR/STTR Innovation Portal (DSIP) Listserv to remain apprised of important programmatic and contractual changes.**

- The DoD Program BAA is located at: https://www.dodsbirsttr.mil/submissions/baa-schedule/active-baa-announcements Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

Specific questions pertaining to the administration of the DLA Program and these proposal preparation instructions should be directed to:

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

This release contains an open topic. As outlined in section 7 of the SBIR and STTR Extension Act of 2022, innovation open topic activities—

(A) Increase the transition of commercial technology to the Department of Defense.
(B) Expand the small business nontraditional industrial base.

(C) Increase commercialization derived from investments of the Department of Defense; and
(D) Expand the ability for qualifying small business concerns to propose technology solutions to meet the needs of the Department of Defense.

Unlike conventional topics, which specify the desired technical objective and output, open topics can use generalized mission requirements or specific technology areas to adapt commercial products or solutions to close capability gaps, improve performance, or provide technological advancements in existing capabilities.

**A small business concern may only submit one (1) proposal to each open topic.** If more than one proposal from a small business concern is received for a single open topic, only the most recent proposal to be certified and submitted prior to the submission deadline will receive an evaluation. All prior proposals submitted by the small business concern for the same open topic will be marked as nonresponsive and will not receive an evaluation.

**PHASE I PROPOSAL GUIDELINES**

The DSIP is the official portal for DoD SBIR/STTR proposal submission. Proposers are required to submit proposals via DSIP; proposals submitted by any other means will be disregarded. Detailed instructions regarding registration and proposal submission via DSIP are provided in the DoD SBIR Program BAA: https://www.dodsbirsttr.mil/submissions/login.

**Technical Volume (Volume 2)**

DLA's objective for the Phase I effort is to determine the merit and technical feasibility of the concept. The Technical Volume is not to exceed 20 pages and must follow the formatting requirements provided in the DoD SBIR Program BAA. 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 volume limit. Any technical data/information that should be in the Volume 2 but is contained in other Volumes will not be considered.

**Content of the Technical Volume**

Refer to the instructions provided in the DoD Program BAA.

**Cost Volume (Volume 3)**

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. Refer to the topic for cost and duration structure. Proposers must utilize the excel cost volume provided during proposal submission on DSIP.

Please review the updated Percentage of Work (POW) calculation details included in section 5.3 of the DoD Program BAA. DLA will occasionally accept deviations from the POW requirements with written approval from the Funding Agreement officer.

**Company Commercialization Report (CCR) (Volume 4)**
Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD Program BAA for full details on this requirement. Information contained in the CCR will be considered by DLA during proposal evaluations.

**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 proposing small business concerns 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
2. Disclosures of Foreign Affiliations or Relationships to Foreign Countries
3. Disclosure of Funding Sources

Please refer to the DoD Program BAA for more information.

Additional DLA-specific supporting documents:

- Optional, a qualified letter of support from a relevant commercial or government agency procuring organization(s) working with DLA, articulating their support 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.

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 Post Award Conference (PAC).
- The Technical Point of Contact (TPOC) and the Program Manager (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).

**DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)**

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

**PHASE II PROPOSAL GUIDELINES**

**Per SBA Policy Directive, 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 Program Management Office (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 may 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.

**EVALUATION AND SELECTION (Phase I and Phase II)**

**Use of Support Contractors in the Evaluation Process**

Only government personnel with active non-disclosure agreements will officially evaluate proposals.

Non-government technical consultants (subsequently referred to as “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.

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.

All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD SBIR Program BAA. 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.
- Only proposals that DLA considers to be "Highly Acceptable" will be funded.

Please note that potential benefit to 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 or virtual meeting.

**<u>The two-part evaluation process is explained below:</u>**

**Part I**: The evaluation of the Technical Volume will utilize the Evaluation Criteria provided in 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 60 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 consultants and advisors who are bound by appropriate non-disclosure requirements.

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.

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.

**AWARD AND CONTRACT INFORMATION**

Typically, the contract period of performance for Phase I should be up to 12 months and the award should not exceed $100,000. However, each topic may have a different threshold. The DLA Contracting Office utilizes a Firm-Fixed-Price (FFP) Contract for DLA Phase I Projects.

The expected budget for Phase II should not exceed $1,000,000 unless approved by the DLA Program Manager, and the duration should not exceed 24 months. Proposals for more than $1,000,000 will not be considered without written PM approval. The DLA Contracting Office utilizes a FFP/Level-of-Effort Contract for DLA Phase II Projects.

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 that DLA determines to be of superior scientific and technical quality 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 to read the SBIR/STTR Policy Directive issued by the Small Business Administration.

**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 ITAR and/or 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.
5) DFARS Clause 252.223-7999 Ensuring Adequate COVID-19 Safety Protocols for Federal Contractors.

**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.

**ADDITIONAL INFORMATION**

**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 website 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.

All attachments sent via email require encryption. The firm will have to purchase External Certificate Authority (ECA) certificates to send and receive encrypted email if they do not have a Common Access Card (CAC) or Personal Identity Verification (PIV) issued. The cost is approximately $100 per year per user. This will be a Cybersecurity Maturity Model Certification (CMMC) requirement for all future contracts.

**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.

(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.

**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 SBIR 24.2 Phase I Topic Index**

**DLA242-003**

**TITLE:** Advancing Scandium Use in Metal Alloys for U.S. Weapon System Production and Sustainment

**Modernization Priorities:** Advanced Materials

**OUSD (R&E) CRITICAL 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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

**OBJECTIVE:**

The Defense Logistics Agency (DLA) seeks to promote responsive, best value supplies of related materials, components, and systems to Department of Defense (DoD) customers and other DoD stakeholders. DLA investigates advancements in technologies and business processes for new and improved materials, more efficient means of their production, and competitive domestic supply chains which will lead to greater innovation in current and future defense systems combined with benefits to other commercial and government applications.

DLA is interested in exploring future defense industrial base uses for scandium (Sc) because of its unique properties as a pure metal and, as an alloying agent, to significantly increase the performance of traditional aluminum (Al) alloys, and therefore expand the use of Al alloys. Further benefits include, substituting aluminum-scandium (Al-Sc) alloys for incumbent expensive materials (e.g., titanium) and/or replacing material forms that are both costly and difficult to source (e.g., forging, complex machined parts, and extrusions), as Al-Sc alloys are highly compatible with additive manufacturing techniques.

Scandium can impart high strength properties to Al alloys which allows for reduced weight designs (compared to traditional Al alloy) and components for a wide range of defense platforms and other military items. Al-Sc alloys exhibit increased resistance to high temperature and corrosion when compared to common Al alloys. Of further interest, is the high weldability of Al-Sc alloy. Alloys with high weldability can reduce manufacturing labor and other costs associated with joining components and structures. Al-Sc alloy can be especially useful when used as a powder or wire in additive manufacturing. Potential DoD applications for Al-Sc alloy include the production and sustainment of missiles, aircraft, space launch vehicles, satellites, solider systems, military ground vehicles, marine applications, and other weapon systems (e.g., small arms and artillery).

While Sc metal has many attractive material characteristics, its cost is frequently considered prohibitive for Al alloying purposes compared to other alloying elements. In addition, the supply of Sc metal and compounds is limited and highly concentrated in a small number of foreign countries including China and Russia. As such, there is reluctance to develop wide scale uses for Al-Sc alloys for many applications including DoD weapon systems and large-scale non-defense applications (e.g., commercial aviation and automotive manufacturing).

In the United States mining operations for Sc ore are being planned and developed to feed a domestic supply chain and, recently, new sources of Sc now exist in Canada (an important member country of DoD's National Technology Industrial Base). There are also established defense industrial base companies and other businesses in both countries that can significantly contribute to development and commercialization of Al-Sc supply chains for both military and commercial applications.

Given the important properties of Sc, and in anticipation of increased affordable domestic supply, DLA is interested in engaging small businesses with the capability to develop and expand expertise and industrial base production capacity of Sc-containing materials, especially in areas relevant to the supply of Al-Sc alloy components for DoD end-uses.

Specific materials, processing and manufacturing areas of interest include:

- Raw material refining
- High purity Sc metals, compounds, and alloys
- Additive manufacturing feedstock
- Additively manufactured DoD systems prototype parts

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

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

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

**DESCRIPTION:**

DLA seeks SBIR project opportunities in new and innovative materials, processing, and manufacturing of Sc compounds, Sc metal, Al-Sc alloy and master alloys, and related areas of additive manufacturing. While Al and Sc are the primary metals of interest for this solicitation, it is anticipated that additional alloying elements may be included to tailor the final alloy properties. Specific areas of interest include:

- Processing mining ores (and/or scrap waste streams) into high purity Sc compounds (ex., Sc-oxide) feedstock for production of pure Sc metal, Al-Sc alloy, master alloys, etc.
- Commercial production of high purity Sc metal (domestic feedstock preferred)
- Commercial production of Al-Sc alloy powder and wire for additive manufacturing
- Demonstrating additively manufactured Al-Sc alloy parts for DoD weapon systems.

DLA seeks opportunities that include strong industry supply chain collaboration with established materials companies relevant to the above areas of interest in Sc materials processing, as well as strong collaboration with traditional or non-traditional DoD weapon systems suppliers. DLA similarly desires SBIR opportunities that include collaboration with interested DoD weapon system program offices and/or relevant DoD RDT&E organizations.

**PROJECT DURATION and COST**: Proposals exceeding these limits will not be evaluated.

**PHASE I**: Not to exceed a duration of 12 months and cost of $100,000.
**PHASE II**: Not to exceed a duration of 24 months and cost of $1,000,000.

**PHASE I:** Phase I will demonstrate proof of concept in one or more of the above areas of interest in scandium materials and processing. A technology development and commercialization roadmap will be produced along with a preliminary business case analysis for transition and industrial scale up. Strong industry supply chain collaboration with established materials companies relevant to the above areas of interest in scandium materials and processing is expected, along with involvement of one or more traditional or non-traditional DoD weapon systems suppliers. Strong support from one or more interested DoD weapon system program offices and/or relevant DoD RDT&E organization required.

**PHASE II:** Depending on Phase I results, Phase II will consist of establishing pilot scale or low-rate production of technologies that are successfully demonstrated in Phase I. Additional activities may include further materials and processing testing, characterization, and data base development of related materials and processes that can be used by future producers of scandium materials of interest (e.g., compounds, metals, alloys, and master alloys as well as related additive manufacturing powders and wire, and fabricators of aluminum scandium end-items). Development of a detailed business case analysis and commercialization plan will be required.

Strong industry supply chain collaboration with established materials companies relevant to the above areas of interest in scandium materials and processing, along with involvement from traditional and/or non-traditional DoD weapon systems suppliers, is required, along with strong support from interested DoD weapon system program offices and/or relevant DoD RDT&E organizations.

Innovative materials and processes, and commercially viable sources of their supply, shall be developed with the goal to readily transition to production in support of DoD and its supply chains.

**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.

**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.

**Transition Plan**

1. Period of Performance: TBD
2. Budget: $ TBD

This Phase of the project should include:

1. Delivery of a production level product to J68 ready for integration into the overall DLA Enterprise system.
2. Develop a sustainment plan to support the delivered system for the lifetime of the program.

**REFERENCES:**

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**KEYWORDS:** Scandium, scandium-aluminum alloy, aerospace materials, domestic supply chain, additive manufacturing

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VERSION 2

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**DLA242-004**

**TITLE:** Research and Testing of Autonomous Material Distribution Robotics Technologies Operating at Defense Logistics Agency (DLA) Warehouses

**National Defense Strategy Area:** Artificial Intelligence, Autonomy

**TECHNOLOGY AREA:** Autonomous Robotics

**BACKGROUND:** Warehouse automation technology automates tedious tasks or assists human workers, freeing them to focus on complex tasks. Advancements in technology are paving the way for trends that support warehouse efficiency, improve accuracy, and enhance safety. The Internet of Things (IoT) connects all devices and systems in the warehouse ecosystem, tracking everything to maximize operational efficiency. Automated warehouse systems with collaborative mobile robots can greatly benefit DLA Warehouse operations by increasing productivity, improving worker satisfaction, reducing, or eliminating injuries, and lowering operating costs. Warehouse automation optimizes space and offers greater efficiency, accuracy, and worker safety. It saves money, enables DLA Warehouses to accommodate Warfighter demand, and reduces manual errors.

**OBJECTIVES:** Develop innovative and ruggedized Autonomous Material Distribution Robotics technologies (e.g., Robotic Arms, Autonomous Guided Vehicles, Autonomous Mobile Robots, Autonomous Tuggers, Autonomous Movers, Autonomous Forklifts, Robotic Lifts, etc.) with state-of-the-art indoor-outdoor navigation capability. These robotics technologies may use a variety of sensors such as Global Positioning System (GPS), Light Detection and Ranging (LiDAR), and Wireless Fiber (Wi-Fi) where applicable, and they should minimize the need for infrastructure modifications such as Augmented Reality (AR) tags to enable autonomous navigation in changing environments.

**Objective 1:** Indoor-Outdoor Autonomous Material Distribution Robotics Technologies. Develop robotics technologies that combine the features of both outdoor and indoor operations; consider the development of various robotics technologies, but not limited to robotic arms, autonomous guided vehicles (AGVs), autonomous mobile robots (AMRs), autonomous tuggers, autonomous movers, autonomous forklifts, robotic lifts, etc. as described below. The goal of this objective is for the vendor to develop a capability for various autonomous material distribution robotics that address the requirements for rugged indoor and outdoor robotics systems that can autonomously distribute material within warehouses, outside warehouses, and between the respective DLA Distribution and DLA Disposition warehouses throughout the DLA enterprise.

**Objective 2:** Indoor Autonomous Material Distribution Robotics Systems. Develop robust autonomous material distribution robotics systems that operate inside warehouses and within warehouse tunnels and navigate the tunnel inclines at the DLA Distribution Center, Hill Air Force Base, UT (DDHU). The indoor autonomous robotics designs allow for the ascent and descent of tunnel inclines with up to 12 in a 100 grade (+/- 12%), the smooth transition between warehouse floors and tunnels, the navigation of sharp turns (180 degrees or more) requiring a minimum turning radius of 1.9 meters, and possess a threshold capability to tow two standard warehouse carts with a total combined weight of 12,000 pounds and a maximum tow capability of up to three standard warehouse carts with a total combined weight of up to 18,000 pounds (i.e., the weight of three loaded carts) given all conditions and requirements described above. The Indoor AGV's state-of-the-art indoor navigation system will continuously operate within DLA Distribution Warehouses, be integrated into warehouse automation systems, and communicate with the emerging DLA Warehouse Management System (WMS) and Warehouse Execution System (WES).

**Objective 3:** Outdoor Autonomous Material Distribution Robotics Systems. Develop innovative and ruggedized outdoor autonomous material distribution robotics system technologies with a state-of-the-art outdoor navigation solution that can be integrated into the DLA warehouse communications systems (i.e., WMS and WES). This integration allows outdoor autonomous material distribution robotics systems to receive tasking in an automated fashion, operate frequently, and report success or failure at tasking. This research seeks to identify and test navigational technology that can be used uninterruptedly, and continuously onboard the various autonomous material distribution robotics systems described to support routine external warehouse operations throughout the DLA enterprise. This research effort must address DLA-identified cybersecurity requirements by testing and evaluating government security controls. This research project will work in external environments at designated DLA Distribution Centers and DLA Disposition Services recycling centers in the United States.

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

1. Support a joint effort between DLA Research and Development (R&D), DLA J5 Distribution Headquarters, and DLA Disposition Services to conduct research and testing of navigation systems integrated into a variety of autonomous robotics systems during outdoor operations between warehouses.
2. Improves outdoor navigation and resilience of robotics systems in challenging conditions.
3. Robotic systems can transport goods between warehouses at a DLA site and operate under challenging conditions.

4. Features navigation systems can implement high-precision measurement data for regular outdoor/indoor navigation use.
5. Can operate indoors using a state-of-the-art indoor navigation system that allows robotics to work within DLA's Distribution and Disposition Services Warehouses continuously and seamlessly transition between the outdoor and indoor warehouse environments.
6. Can be integrated into warehouse communications systems such as a Warehouse Execution System (WES) to receive tasking and report status.
7. Enables robots to operate on inclines and navigate warehouse tunnels, even under challenging conditions. Allows for safe transportation of goods between warehouses at DLA distribution and disposition services sites.
8. Uses process automation that digitizes manual processes and using barcoding and wireless barcode scanners to capture and track data, which is then sent to a central ERP or database for storage and future retrieval.
9. When applicable, autonomous tuggers can transition smoothly between level and elevated warehouse surfaces, navigate sharp turns within the warehouse environment, and tow up to three loaded standard warehouse carts weighing up to 18,000 pounds.
10. Improves indoor and outdoor autonomous robotics systems by using external and internal navigation to create a reliable navigational network. It also ensures the safety of warehouse workers.
11. Provides a reliable navigation system for autonomous vehicles that maintain high operating speeds both indoors and outdoors. Additionally, it must be compatible with a designated government data cloud to store, retrieve, and use high-resolution geospatial data without relying on commercial data cloud.
12. Provides new navigation technology and capable designs for autonomous robotics can revolutionize material distribution and delivery in warehouse operations.
13. Where applicable (e.g., autonomous vehicles and tuggers), integrate a Universal Ball Hitch connection for trailers with automatic coupling by the autonomous vehicle.
14. Operates in outdoor temperatures of 10F through 100F and addresses lost battery performance below 40F with insulation measures.
15. Executes a minimum 7.5-hr duty cycle at the full performance before recharge. 30-minute quick charge from 0% to 50% charge.

**PHASE I:** Not to exceed - 12 months - $100,000
The research and development goals of Phase I provide Small Business Research and Development firms the opportunity to successfully demonstrate how their proposed Outdoor and Indoor autonomous material distribution robotics technology navigation concept of operations (CONOPS) improves the distribution of goods and materials within the respective DLA distribution and disposition enterprises and effectively lessen the time to provide needed supplies to the Warfighter. The selected vendor will conduct a feasibility study to:

1. Address the requirements described above in the Description Section for outdoor autonomous robots operating between warehouses and indoor autonomous robots traversing warehouse tunnel elevations.

2. Identify capability gap(s) and the requirement for DLA to use autonomous robots in the respective DLA Distribution and Disposition Operations environments.
3. Develop the vendor's Concept of Operations (CONOPS) to utilize the autonomous and describe clearly how the requirements develop.
   Note: During Phase I of the SBIR, testing is not required.
4. The vendor must create a CONOPS for autonomous robotic systems that can operate outdoors and indoors and navigate between distribution warehouses under varying weather conditions. It should require little to no operator effort during the process.
5. The deliverables for this project include a final report, including a cost breakdown of courses of action.

**PHASE II:** Not to exceed - 24 months - $1,000,000
Based on the research and the concept of operations developed during Phase I, the research and development goals of Phase II emphasize the execution of the seamless Indoor-Outdoor autonomous robotics systems navigation system following the typical DLA Distribution Warehouse concept of operations for material handling. During Phase II, the vendor will:

1. Address the specific user, functional, and system requirements defined and provided by DLA.
2. Develop a prototype autonomous robotics system (e.g., Robotic Arms, Autonomous Guided Vehicles, Autonomous Mobile Robots, Autonomous Tuggers, Autonomous Movers, Autonomous Forklifts, Robotic Lifts, etc.) for Developmental Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E).
3. Apply gov't cybersecurity controls & obtain necessary certifications to operate prototype equipment in the DLA warehouse with DOD cloud connections.
4. Design the prototype equal to the technology maturity of Technology Readiness Level (TRL) 9 after Phase II.
5. Deliver a final autonomous robotics systems prototype to DLA to demonstrate the successful execution of the CONOPS established in Phase I.

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

**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.

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.

**Transition Plan**

1. Period of Performance: TBD
2. Budget: $ TBD

This Phase of the project should include:

1. Delivery of a production level product to J68 ready for integration into the overall DLA Enterprise system.
2. Develop a sustainment plan to support the delivered system for the lifetime of the program.

**REFERENCES:**

1. A. Dong, W. Hong, "VPH: a new laser radar-based obstacle avoidance method for intelligent mobile robots," WCICA 2004. Fifth World Congress on Intelligent Control and Automation, vol. 5, pp. 4681-4685, 2004.

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**KEYWORDS:** Artificial Intelligence (AI), Autonomy, Robotics, Collaborative Mobile Robots (Cobots), GPS, Laser Scanning, Wireless Fiber, Wi-Fi, Smart Warehouse, Material Distribution.

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VERSION 2

**DLA242-005**

**Title:** AI-Powered Obsolescence for Product Prediction

**National Defense Strategy Area**: Trusted AI and Autonomy

Technology Area(s): Information Systems

**Background:** As part of DLA's strategic plan, one primary effort is to ensure mission readiness with equipment vital to the warfighter. DLA and the DoD face significant challenges in managing its vast and diverse equipment inventory. Obsolescence, driven by technological advancements, component shortages, and evolving geopolitical landscapes, can greatly impact operational effectives and readiness. Traditional methods of identifying obsolescence are quite often reactive and rely on manual analysis, leading to delays in product procurement and inefficient resource allocation. Obsolescence refers to the gradual loss of usefulness or value of a product or system due to advancements in technology, changes in needs, or deterioration of material. In the context of national defense, it can have significant implications for various aspects of military capabilities. Obsolescence not only applies to equipment and physical items, but also in outdated Commercial-off-the-shelf (COTS) software and operating systems that are now susceptible to cyberattacks.

**Objective:** The Defense Logistics Agency (DLA) is seeking proposals regarding the use of AI/ML powered systems to predict obsolescence of DoD products within the DLA supply network. These predictions should plan to impact the overall DoD supply chain. By leveraging machine learning algorithms to analyze diverse data sources such as, including, but not limited to technical specifications, maintenance records, market trends, and geopolitical factors be able to identify equipment and support parts at risk from becoming obsolete. This proactive approach empowers DLA and the DoD to make informed decisions about sustainment, modernization, and lifecycle management, optimizing resource allocation and ensuring mission readiness. DLA's goal is to use AI/ML to address and predict a multitude of issues presented by obsolescence.

**Description:** The successful proposal should include, best practices, as well as innovation and the use of AI/ML to predict obsolescence of products within the DLA network.

DLA J68 R&D will provide the Platform used to develop the prototype (ARTET)

Develop your phase I proposal with an end-goal in mind. A Phase III transition is the goal.

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)

**PROJECT DURATION and COST**: Proposals exceeding these limits will not be evaluated.

**PHASE I**: Not to exceed a duration of 12 months and cost of $100,000. (Firm Fixed Price)

VERSION 2

**PHASE II**: Not to exceed a duration of 24 months and cost of $1,000,000. (Firm Fixed Price/Level Of Effort)

**Phase I: Proof of Concept, (TRL 3)**

This Phase of the project should include plans to:

1. Identify all Cyber and physical security requirements and develop a plan to meet these requirements prior to commencing a Phase II effort.
2. Identify the J6 Sponsor the champion the Phase II and III efforts.
3. Identify the required data from various sources, including technical manuals, maintenance logs, procurement records, market research reports, and any material related to product development and lifespan.
4. Develop machine learning algorithms to analyze the collected data and identify patterns and trends that indicate potential impacts and suggesting mitigation strategies.
5. Develop a plan that will enable DLA to simulate different scenarios and assess the impact of obsolescence on specific equipment and product categories or operational capabilities.
6. Identify the paths required to make the system continuously learn and improve its predictive accuracy over time, adapting to changing market conditions and technological advancements.
7. Establish the framework to build a collaborative library (database) of parts at risk for obsolescence and suitable replacement parts or companies that could assist in reengineering the part.
8. Use AI/ML to implement strategies to extend the life of existing systems through reverse engineering and alternative sourcing to create for the development of a comprehensive obsolescence management program.

**Phase II: Working Lab level Prototype (TRL 6)**

This Phase of the project should include a prototype that:

1. Confirm the J6 Sponsor the champion the Phase II and III efforts.
2. Develop the prototype on the DLA J68 Platform
3. Integrate all required Cyber and Physical security requirements.
4. Integrate data from various sources, including technical manuals, maintenance logs, procurement records, market research reports, and any material related to product development and lifespan.
5. Employ machine learning algorithms to analyze the collected data and identify patterns and trends that indicate potential impacts and suggesting mitigation strategies.
6. Enable DLA to simulate different scenarios and assess the impact of obsolescence on specific equipment and product categories or operational capabilities.

7. Have the system continuously learn and improve its predictive accuracy over time, adapting to changing market conditions and technological advancements.
8. Build a collaborative library (database) of parts at risk for obsolescence and suitable replacement parts or companies that could assist in reengineering the part.
9. Use AI/ML to implement strategies to extend the life of existing systems through reverse engineering and alternative sourcing to create for the development of a comprehensive obsolescence management program.

**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.

**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.

**Transition Plan**

1. Period of Performance: TBD
2. Budget: $ TBD

This Phase of the project should include:
1. Delivery of a production level product to J68 ready for integration into the overall DLA Enterprise system.
2. Develop a sustainment plan to support the delivered system for the lifetime of the program.

**References:**

1. A.K. Dass and S.D. Lokhande, “Machine Learning Based Prediction of Obsolescence Risk”, International Journal of Intelligent Systems and Applications in Engineering, 11(4), pp. 293-301, 2023.

**Keywords:** Obsolescence, Artificial Intelligence (AI), Machine Learning (ML), Commercial-Off-The-Shelf (COTS).

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VERSION 2

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**DLA242-006**

**Title:** Securing a Digital Twin with Zero Trust

**National Defense Strategy Area:** Advanced Computing and Software; Integrated Sensing and Cyber

**Technology Area(s):** Information Systems

**Background:** Zero Trust is a cybersecurity paradigm that shifts from what is considered traditional “castle-and-moat” approach to a more dynamic and granular system. Within this new shift in cybersecurity, Zero Trust relies on a fixed perimeter to keep attacks out. Zero Trust assumes no implicit trust and continually verifies every user, device, and application before granting access to resources. As part of the National Defense Strategy the US Department of Dense has implemented a Zero Trust strategy with goals to reduce attack surfaces, enable effective data sharing, and improve risk management. Zero Trust is a critical component of modern national defense strategies, offering enhanced security resilience against evolving cyber threats. With the emergence of Industry 5.0 which highlights the importance of information usage, processing, and data analysis has led rise of digital twin technology. Digital Twins are gaining traction across industries and the Department of Defense offering valuable insights into physical systems and business processes. However, they introduce a new attack vector, exposing sensitive data and potentially compromising the physical systems they represent to include the data. Traditional security approaches often struggle to adapt to the dynamic nature of digital twins and the diverse streams they receive.

**Objective:** DLA’s goal is to leverage Zero Trust principles to secure the digital twin and data it receives from the physical machine. The Defense Logistics Agency (DLA) is seeking proposals to leverage Zero Trust principles to secure digital twins and the data they receive from physical machines. This concept may implement continuous verification, least privilege access, and network segmentation to safeguard the digital twin and physical machines and other critical technology from cyberattacks. DLA’s goal is to leverage Zero Trust principles to secure the digital twin and data it receives from the physical machine.

**Description:** The successful proposal should include, best practices, as well as innovation and the use of Zero Trust to secure the Digital Twin and its data.

DLA J68 R&D will provide the Platform used to develop the prototype (ARTET)

Develop your phase I proposal with an end-goal in mind. A Phase III transition is the goal.

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)

**PROJECT DURATION and COST**: Proposals exceeding these limits will not be evaluated.

**PHASE I**: Not to exceed a duration of 12 months and cost of $100,000.
**PHASE II**: Not to exceed a duration of 24 months and cost of $1,000,000.

**Phase I: Proof of Concept, (TRL 3)**

This Phase of the project should include a plan to:

1. Identify all Cyber and physical security requirements and develop a plan to meet these requirements prior to commencing a Phase II effort.
2. Identify the J6 Sponsor to champion the Phase II and III efforts.
3. Develop a plan to continuously authenticate all users and devices attempting to access the digital twin or its associated data, regardless of prior authorization.
4. Develop a plan to grant users and devices only the minimum access required to perform their specific tasks, minimizing potential damage in case of compromise.
5. Develop a plan to Isolate the digital twin and its data within a secure network segment, restricting unauthorized access and lateral movement.
6. Identify the method for encrypting data at rest and in transit to ensure confidentiality and preventing unauthorized data access.
7. Employ advanced analytics to detect suspicious activity and potential threats within the digital twin environment.

**Phase II: Working Lab level Prototype (TRL 6)**

This Phase of the project should include a prototype that:

1. Confirm the J6 Sponsor to champion the Phase II and III efforts.
2. Develop the prototype on the DLA J68 Platform
3. Integrate all required Cyber and Physical security requirements.
4. Integrate methods to continuously authenticate all users and devices attempting to access the digital twin or its associated data, regardless of prior authorization.
5. Grant users and devices only the minimum access required to perform their specific tasks, minimizing potential damage in case of compromise.
6. Isolate the digital twin and its data within a secure network segment, restricting unauthorized access and lateral movement.
7. Encrypting data at rest and in transit to ensure confidentiality and preventing unauthorized data access.
8. Employ advanced analytics to detect suspicious activity and potential threats within the digital twin environment.

**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.

**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.

**Transition Plan**

1. Period of Performance: TBD
2. Budget: $ TBD

This Phase of the project should include:

1. Delivery of a production level product to J68 ready for integration into the overall DLA Enterprise system.
2. Develop a sustainment plan to support the delivered system for the lifetime of the program.

**References:**


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**KEYWORDS:** Cybersecurity, Zero Trust, Digital Twin, Operational Technology (OT).

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VERSION 2

**DLA242-007**

**TITLE:** Terrestrial and Satellite Enabled Tracking Device

**MODERNIZATION PRIORITY:** Space Technology, Advanced Infrastructure & Advanced Manufacturing

**TECHNOLOGY AREA(S):** Materials

**OBJECTIVE:** Develop a shipment tracking capability that can utilize both terrestrial and satellite IoT network on a global roaming basis.

**DESCRIPTION:** The Defense Logistics Agency (DLA) is looking to increase trans-shipment cargo tracking capability from contiguous United States (CONUS) to outside contiguous United States (OCONUS). Shipment tracking devices generally communicate via cellular IoT protocols using terrestrial communications network for persistent tracking from original point of departure to end destination. However, there are global locations where terrestrial networks are not available. With the upcoming new generation of satellite based IoT communications networks, DLA is looking to execute an SBIR program to attempt to analyze a way forward in establishing an IoT device that may roam either on a terrestrial or satellite network on a global roaming basis.

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)

**PROJECT DURATION and COST**: Proposals exceeding these limits will not be evaluated.

**PHASE I**: Not to exceed a duration of 12 months and cost of $100,000. (Firm Fixed Price)
**PHASE II**: Not to exceed a duration of 24 months and cost of $1,000,000. (Firm Fixed Price/Level Of Effort)

**PHASE I:** The research and development goals of Phase I are to provide eligible Small Business firms the opportunity to successfully evaluate upcoming satellite based IoT networks and demonstrate the feasibility of current IoT tracking to utilize both terrestrial and satellite IoT networks on a global roaming basis. The main effort will be to conduct preliminary studies to propose details of design and manufacture of tracking devices that can utilize both terrestrial and satellite IoT network, showing feasibility and benefit to the Department of Defense (DoD).

A plan to demonstrate the manufacture of these tracking device must also address implementation approaches for near term insertion into DoD. Relationships with potential customers such as the DLA Troop Support Class IV Construction and Equipment Major Subordinate Command will be included in the Phase I effort 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 a cost-effective tracking device that can utilize both terrestrial and satellite IoT networks on a global roaming basis. Tasks to be accomplished include material design and formulation, development of wire drawing schedules to manage manufacturing processes, and meet the specifications and standards, provided by the industrial base. 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. 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, Original Equipment Manufacturer, or other suitable partners 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.

**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.

**Transition Plan**

1. Period of Performance: TBD
2. Budget: $ TBD

This Phase of the project should include:

1. Delivery of a production level product to J68 ready for integration into the overall DLA Enterprise system.
2. Develop a sustainment plan to support the delivered system for the lifetime of the program.

**COMMERCIALIZATION:** The vendor will pursue commercialization of cost-effective scalable shipment tracking device that can utilize both terrestrial and satellite IoT network on a global roaming basis developed in prior phases, as well as potential commercial sales of any parts or other items.

**KEYWORDS**
Terrestrial Tracking Device, Satellite Enabled Tracking Device, Trans-shipment cargo Tracking Terrestrial Communication Network, Global Roaming, Satellite based IoT Communications Network

VERSION 2

**REFERENCE**


1. (PDF) A Survey on Technologies, Standards and Open Challenges in Satellite IoT (researchgate.net)
2. A Survey on Technologies, Standards and Open Challenges in Satellite IoT | IEEE Journals & Magazine | IEEE Xplore



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VERSION 2

**DLA242-008**

**TITLE:** Pallet Level Tracking for End-to-End Total Asset Visibility

**MODERNIZATION PRIORITY:** Integrated Sensing and Cyber;

**TECHNOLOGY AREA(S):** Materials

**OBJECTIVE:** Develop a shipment agnostic approach for a pallet level tracking device in a cost-effective scalable solution that is mobile and reusable with the capability to geolocate independently without any pre-association from any infrastructure or parent device.

**DESCRIPTION:** The Defense Logistics Agency (DLA) is looking to increase trans-shipment pallet cargo tracking capability from contiguous United States (CONUS) to outside contiguous United States (OCONUS). Containerized shipment loads in-transit are frequently transloaded at distribution locations where the palletized cargo is unloaded and redistributed into new containers for continued transit to end locations. DLA is looking to execute a Small Business Innovation Research project attempting to analyze a way forward in the establishment of a tracking capability at the pallet level, that maintains location as it continues to its end destination even when the pallet is separated from its original container and reloaded multiple times to various containers.

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)

**PROJECT DURATION and COST:** Proposals exceeding these limits will not be evaluated.

**PHASE I**: Not to exceed a duration of 12 months and cost of $100,000. (Firm Fixed Price)
**PHASE II**: Not to exceed a duration of 24 months and cost of $1,000,000. (Firm Fixed Price/Level Of Effort)

**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 a pallet level tracking device once the project is awarded. The main effort will be to conduct preliminary studies to propose details of design and manufacture of pallet level tracking solutions, showing feasibility and benefit to the Department of Defense (DoD). A plan to demonstrate the manufacture of pallet level tracking device must also address implementation approaches for near term insertion into DoD. Relationships with potential customers such as the DLA Troop Support Class IV Construction and Equipment Major Subordinate Command will be included in the Phase I effort 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 a cost-effective scalable pallet level tracking device. Tasks to be accomplished include material design and formulation, development of wire drawing schedules to manage manufacturing processes, and meet the specifications and standards, provided by the industrial base. 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. 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, Original Equipment Manufacturer, or other suitable partners 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.

**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.

**Transition Plan**

1. Period of Performance: TBD
2. Budget: $ TBD

This Phase of the project should include:
1. Delivery of a production level product to J68 ready for integration into the overall DLA Enterprise system.
2. Develop a sustainment plan to support the delivered system for the lifetime of the program.

**COMMERCIALIZATION:** The vendor will pursue commercialization of cost-effective scalable pallet level tracking device developed in prior phases, as well as potential commercial sales of any parts or other items.

**KEYWORDS**

Pallet Level Tracking Device, Trans-Shipment Pallet Cargo Tracking, Autonomous Geolocation

**REFERENCES**

VERSION 2

1. Defense Acquisition Innovation Repository: Pallet Management System: A Study of the Implementation of UID/RFID Technology for Tracking Shipping Materials Within the Department of Defense Distribution Network (nps.edu)

2. Applied Sciences | Free Full-Text | Design of a Distributed Wireless Sensor Platform for Monitoring and Real-Time Communication of the Environmental Variables during the Supply Chain of Perishable Commodities (mdpi.com)

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**Defense Threat Reduction Agency (DTRA)**
**DoD 2024.2 Small Business Innovation Research (SBIR) Program**
**Proposal Submission Instructions**

## INTRODUCTION

The Defense Threat Reduction Agency (DTRA) mission is to enable the DoD, the U.S. Government, and International Partners to counter and deter Weapons of Mass Destruction (WMD) Chemical Biological, Radiological, Nuclear) and Improvised Threat Networks. The DTRA SBIR program is consistent with the purpose of the Federal SBIR/STTR Program, i.e., to stimulate a partnership of ideas and technologies between innovative small business concerns and through Federal-funded research or research and development (R/R&D).

The approved FY24.2 topics solicited for the Defense Threat Reduction Agency (DTRA) Small Business Innovation Research (SBIR) Program are included in these instructions followed by the full topic description. Offerors responding to this Broad Agency Announcement (BAA) must follow all general instructions provided in the related Department of Defense Annual Program BAA and submit proposals by the date and time listed in this release. Specific DTRA requirements that add to or deviate from the DoD Annual Program BAA instructions are provided below with references to the appropriate section of the DoD document.

**Proposers are encouraged to thoroughly review the DoD Annual Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.**
• The DoD Annual Program BAA is located at: https://www.defensesbirsttr.mil/SBIRSTTR/Opportunities/#announcements. Be sure to select the tab for the appropriate BAA cycle.
• Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

The DTRA Small Business Innovation Research (SBIR) Program is implemented, administered, and managed by the DTRA SBIR/STTR Program Office. Specific questions pertaining to the administration of the DTRA SBIR program and these proposal preparation instructions should be directed to:

Mr. Mark D. Flohr
DTRA SBIR/STTR Program Manager
Mark.D.Flohr.civ@mail.mil
Tel: (571) 616-6066

Defense Threat Reduction Agency
8725 John J. Kingman Road
Stop 6201
Ft. Belvoir, VA 22060-6201

For technical questions about specific topic requirements during the pre-release period, contact the DTRA Technical Point of Contact (TPOC) for that specific topic. To obtain answers to technical questions
during the formal BAA open period, visit: https://www.dodsbirsttr.mil/submissions/login. For questions regarding the Defense SBIR/STTR Innovation Portal, contact DSIP Support at: dodsbirsupport@reisystems.com.

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

DTRA 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 entire DoD announcement and DTRA instructions carefully prior to submitting your proposal as there have been significant updates to the requirements.

Proposers responding to a topic in this BAA must follow all general instructions provided in the Department of Defense (DoD) SBIR Program BAA. DTRA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

**Proposers are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.**

- The DoD Program BAA is located at: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements. Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

Specific questions pertaining to the administration of the DTR SBIR Program and these proposal preparation instructions should be directed to: Mr. Mark Flohr, DTRA SBIR/STTR Program Manager; (mark.d.flohr.civ@mail.mil).

**PHASE I PROPOSAL GUIDELINES**

The Defense SBIR/STTR Innovation Portal (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. Detailed instructions regarding registration and proposal submission via DSIP are provided in the DoD SBIR Program BAA.

**Technical Volume (Volume 2)**

The technical volume is not to exceed a 20-page limit and must follow the formatting requirements provided in the DoD SBIR Program BAA. Any pages in the technical volume over 20 pages will not be considered in proposal evaluations.

**Content of the Technical Volume**

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/learningsupport/firm-templates.

Offerors should follow the DoD SBIR Program BAA guidelines regarding Technical Volume content.

**Cost Volume (Volume 3)**

The Phase I Base amount must not exceed $200,000. For the Cost Volume, The Defense Threat Reduction Agency requires the use of a Microsoft excel spread sheet which is available on the DSIP portal. Note: The DTRA Cost Volume template will be accessible once the Cost Volume is initiated.

Important: when completing the cost volume, enough information should be provided to allow the agency to understand how you plan to use the requested funds if a contract is awarded. Itemized costs of any subcontract or consultant should be provided to the same level as for the prime small business. If an unsanitized version of costs cannot be provided with the proposal, the Government may request it during negotiations if selected. Refer to the instruction provided in the DoD Annual SBIR program BAA for additional details on the content of the Cost Volume.
Note: Cost for travel funds must be justified and related to the needs of the project.

The Phase I Base amount, notwithstanding the amount allocated for TABA, must not exceed $200.00.00. All costs must be clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3. [DTRA requires the use of an excel spreadsheet for the Cost Volume. The cost template becomes visible to the offeror when the Cost Volume is initiated.]

Please review the updated Percentage of Work (POW) calculation details included in the DoD Program BAA. For SBIR projects, DTRA normally will not accept any deviation to the POW requirements however if discovered during review in Contracting the offeror may be allowed to revise the cost proposal to be in line with the POW requirements.

Page Limit, Cost and Duration:

| Project Phase | Technical Vol Page Limit | Cost | Duration |
|---|---|---|---|
| Phase I | 20 pages | $200,000.00 | 7 Months |
| Phase II | 40 pages | $1,300,000.00 | 24 Months |

**Company Commercialization Report (CCR) (Volume 4)**
Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR Program BAA for full details on this requirement. Information contained in the CCR will not be considered by DTRA during proposal evaluations.

**Supporting Documents (Volume 5)**
Volume 5 is provided for proposing small business concerns to submit additional documentation to support the Coversheet (Volume 1), Technical Volume (Volume 2), and the Cost Volume (Volume 3). Please refer to the DoD Program BAA for more information as to additional supporting documents or information that may be included in Volume 5.

All proposing small business concerns 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
2. Disclosures of Foreign Affiliations or Relationships to Foreign Countries

   Note 1: Offerors having any concerns pertaining to mandatory requirements number 2 as stated above should provide a mitigation plan addressing the concerns.

   Note 2: A completed proposal submission in DSIP does NOT indicate that the mandatory supporting documents have been uploaded. It is the responsibility of the proposing small business concern to ensure that the mandatory documents listed above have been included with the proposal submission.

**DIRECT TO PHASE II PROPOSAL GUIDELINES**
The Defense Threat Reduction Agency does not participate in the Direct to Phase II (DP2) proposal submission program.

**PHASE II PROPOSAL GUIDELINES**
Phase II proposals may only be submitted by Phase I awardees.
Those small business concerns submitting a Phase II proposal should plan to submit a fully developed proposal into the DSIP proposal system within thirty (30) days after the end of the Phase I period of performance. The small business concern may or may not be automatically notified of the recommended proposal due date.

The Phase II proposal Technical Volume should generally follow the outline and structure of the Phase I to include benefits or lessons learned from the Phase I effort.

DTRA plans on a Phase II project not to exceed $1,300,000.00 notwithstanding TABA, and two (2) years duration.

**DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)**
In accordance with the Small Business Act (15 U.S.C. 632), DTRA will authorize the recipient of a Phase I or Phase II SBIR award to purchase Discretionary Technical & Business Assistance services, such as access to a network of scientists and engineers engaged in a wide range of technologies, or access to technical and business literature available through on-line data bases, for the purpose of assisting in areas such as:
• making better technical decisions concerning such projects;
• solving technical problems which arise during the conduct of such projects;
• minimizing technical risks associated with such projects;
• developing/ commercializing new commercial products/processes resulting from such projects; and,
• meeting cyber security requirements.

If you are proposing use of Discretionary Technical and Business Assistance (TABA), you must provide a cost breakdown in the Cost Volume under "Other Direct Costs (ODCs)" and provide a one-page description of the vendor you will use and the Technical and Business Assistance you will receive. For the Phase I project, the amount for TABA may not exceed $6,500 per award. For the Phase II project, the TABA amount may be less than, equal to, but not more than $50,000 per project. The description should be included in Volume 5 of the proposal.

Approval of Discretionary Technical and Business Assistance is not guaranteed and is subject to review of the contracting officer.

For Discretionary Technical and Business Assistance, small business concerns may propose one or more vendors. Additionally, business-related services aimed at improving the commercialization success of a small business concern may be obtained from an entity, such as a public or private organization or an agency or other entity established or funded by a State that facilitates or accelerates the commercialization of technologies or assists in the creation and growth of private enterprises that are commercializing technology.

**EVALUATION AND SELECTION**
All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD SBIR Program BAA.

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. DTRA has a single Evaluation Authority (EA) for all proposals received under this solicitation. The EA either selects or rejects Phase I and Phase II proposals based upon the results of the review and evaluation process plus other considerations including limitation of funds, and investment balance across all the DTRA topics in the solicitation. To provide this balance, a lower rated proposal in one topic could be selected over a higher rated proposal in a different topic. DTRA reserves the right to select all, some, or none of the proposals in a particular topic.

**Notifications.**

Following the EA decision, the DTRA SBIR/STTR office will release notification e-mails of selection or non-selection status for a Phase I award within 90 days of the closing date of the BAA. The E-mails will be sent to the addresses provided for the Principal Investigator and Corporate Official.

Offerors may request a debriefing of the evaluation of their not selected proposal and should submit this request via email to: dtra.belvoir.RD.mbx.sbir@mail.mil and include “SBIR 24.2 / Topic XX Debriefing Request” in the subject line. Debriefings are provided to help improve the offeror’s potential response to future solicitations. Debriefings do not represent an opportunity to revise or rebut the EA decision.

For selected offers, DTRA will initiate contracting actions which, if successfully completed, will result in contract award. DTRA Phase I awards are issued as fixed-price purchase orders with a maximum period of performance of seven-months. DTRA may complete Phase I awards without additional negotiations by the contracting officer or without opportunity for revision for proposals that are reasonable and complete.

**DTRA Support Contractors**

Select DTRA-employed support contractors may have access to contractor information, technical data or computer software that may be marked as proprietary or otherwise marked with restrictive legends. Each DTRA support contractor performs under a contract that contains organizational conflict of interest provisions and/or includes contractual requirements for nondisclosure of proprietary contractor information or data/software marked with restrictive legends. These contractors require access while providing DTRA such support as advisory and assistance services, contract specialist support, and support of the Defense Threat Reduction Information Analysis Center (DTRIAC). The contractor, by submitting a proposal or entering into this contract, is deemed to have consented to the disclosure of its information to DTRA’s support contractors.

The following are, at present, the prime contractors anticipated to access such documentation: Broadleaf Inc. (contract specialist support); Kent, Campa and Kate, Inc. (contract closeout support), ARServices (Program Management Advisory and Assistance Services A&AS), Systems Planning and Analysis, Inc. (Subject Matter Expertise A&AS), Amentum (A&AS), Polaris Consulting (Small Business Program Support), Seventh Sense Consulting, LLC (Acquisition Support), Savantage Solutions (Accounting and Financial Systems Support); TekSynap Corporation and Kapili Services, LLC (DTRIAC). This list is not all inclusive (e.g., subcontractors) and is subject to change.

**Protests.**

Refer to the DoD SBIR Program BAA 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:
(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the Government Accountability Office (GAO), shall be served on the Contracting Officer (addressed to Mr. Herbert Thompson, Contracting Officer, as follows) by obtaining written and dated acknowledgment of receipt from (if mailed letter) Defense Threat Reduction Agency, ATTN: AL-ACQ (Mr. Herbert Thompson), 1680 Texas Street, Kirtland AFB, NM 87117. If Federal Express is used for the transmittal, the appropriate address is: Defense Threat Reduction Agency, ATTN: AL-ACQ (Mr. Herbert Thompson), 8151 Griffin Avenue SE, Building 20414, Kirtland AFB, NM 87117-5669.

**AWARD AND CONTRACT INFORMATION**

DTRA plans on Phase I projects for a seven (7) month period of performance with six months devoted to the research and the final month for the final report. The award size of the Phase I contract is no more than $200,000.00 notwithstanding a maximum of $6,500.00 for Discretionary Technical and Business Allowance (TABA). For a Phase II project, DTRA plans on a 24-month period of performance. The award size of a Phase II contract is no more than $1,300,000.00 notwithstanding a maximum of $50,000.00 for Discretionary Technical and Business Allowance (TABA) for the entire project.

**ADDITIONAL INFORMATION**

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.

The technology within some DTRA 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.**

NOTE: Export control compliance statements found in these 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.

**Cyber Security**

Any Small Business Concern receiving an SBIR award is required to provide adequate security on all covered contractor information systems. Specific security requirements are listed in DFARS 252.204.7012, and compliance is mandatory.

**Feedback**

In an effort to encourage participation in, and improve the overall SBIR award process, offerors may submit feedback on the SBIR solicitation and award process to: dtra.belvoir.RD.mbx.sbir@mail.mil for consideration for future SBIR BAAs.

***END***

**DTRA SBIR 24.2 Topic Index**

DTRA242-001 TITLE: Statistical Analysis of Neutron Relative Biological Effectiveness

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Biotechnology; Directed Energy

OBJECTIVE: To develop a statistical or computational model to accurately calculate neutron relative biological effectiveness for lethality based on historical data

DESCRIPTION: In a nuclear detonation, gamma and neutron radiation is released. This radiation can have detrimental effects on a human body. Methods to calculate casualties, fatalities, and performance capabilities due to radiation effects require combining the gamma and neutron doses. This is done by multiplying the neutron dose by a factor called the neutron relative biological effectiveness (RBE), and adding that value to the gamma dose. Neutron RBE is part of every radiation injury calculation which is important to many areas of the government from NIAID to COCOMS. It is then important to have an accurate neutron RBE value. Unfortunately, experimentally measuring neutron RBE is very difficult. Neutron RBE is dependent on many biological and physical factors such as tissue type, energy, gamma to neutron ratio, and dose rate. This makes comparing experimental data sets challenging. There have been tens of thousands of experiments probing neutron RBE dating back from the 1950s producing a large dataset. Although these experimental setups differ or their methods are lacking compared to modern abilities, they all are probing the same physical and biological processes. We believe that this data should not be disregarded, and applying modern machine learning or statistical or other computational techniques to this historical data, a model can calculate neutron RBE accurately. Based on time limits of SBIR, we would limit the scope to calculating neutron RBE to lethality endpoint.

PHASE I: Phase I will focus on collecting experimental data in a searchable database that will aid in the model development. Offerors should be able to understand the previous experiments and how they differ from each other. Phase I deliverables will include a final report and a demonstration of the architecture. The report should include statistical analysis of the experimental data.

PHASE II: Phase II effort will focus on the model construction from the collected data. Phase II deliverable will be a prototype demonstration and a final report. The demosntration will showcase calculating lethal neutron RBE value with confidence intervals. The final report should include explanation on the model including advanatages, disadvantages and assumptions made, and it can include suggestions for experimental data that can improve the results. The performer will include details about user interfaces (if applicable), any associated executables, and software requirements.

PHASE III DUAL USE APPLICATIONS: The performer should refine the model based on feedback from the demonstration. The data need to be updated according to the newest research. Maintenance and update will be performed in phase III.

REFERENCES:


1. Amy Creel, Tyler Dant, Rachel Jennings, Darren Oldson, Aaron Parks, Kiran Sewsankar, Christina Wagner. HENRE 4.0 Technical Reference Manual (DTRA-TR-23-011). Fort Belvoir: DTRA, 2023.
2. Bruce A. Carnes, Douglas Grahn. Neutron Issues in the JANUS Mouse Program. Argonne, Illinois: Biological and Medical Research Division, Argonne National Laboratory, 1990.
3. Daniela L. Stricklin, Jama VanHorne-Sealy, Carmen I. Rios, Lisa A. Scott Carnell, Lanyn P. Taliaferro. "Neutron Radiobiology and Dosimetry." Radiation Research 195 (2021): 480-496.
4. Daniela Stricklin, Kevin Kramer, Dave Crary, Robert Prins. Review of Deterministic Neutron RBEs for Survivable Personnel Radiation Exposures from Nuclear Detonation Simulations (DTRA-TR-19-001). Fort Belvoir: DTRA, 2019.

5. Hall, Eric J. Radiobiology for the Radiologist. Hagerston, MD: Harpers & Row, 1978.
6. James J. Conklin, Richard I. Walker. Military Radiobiology. San Diego, CA: Academic Press, 1987.
7. Robert E. George, Raymond L. Chaput, David M. Verrelli, Edward L. Barron. "The Relative Effectiveness of Fission Neutrons for Minature Pig Performance Decrement." Radiation Research 48 (1971): 332-345.
8. Strike, T. A. Acute Mortality of Mice and Rats Exposed to 14 MeV Neutrons. Bethesda, MD: Armed Forces Radiobiology Research Institue, n.d.

KEYWORDS: Relative Biological Effectiveness, lethal dosage, Radiation Exposures, NUDET simulations, radiobiology, deep learning, statistical analysis

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DTRA242-002 TITLE: Understanding Fragment Impact on Responding Surfaces

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Advanced Materials

OBJECTIVE: Develop techniques for characterization of dust and debris from fragment impacts on responding structures.

DESCRIPTION: Real world CWMD strike kinetic weapons often encounter responding structures such as concrete walls.  Fragments from weapons striking responding walls generate dust and debris.  It has been shown that dust and debris quench the late-time chemistry that is necessary for agent defeat. The mass, geometry and velocity of fragments are anecdotally believed to change the amount of dust and debris generated; however, no good data sets exist to develop models. Well-characterized experiments and accompanying modeling and simulation (M&S) are needed to determine the amount of dust and debris generated in weapon strike scenarios. Uncertainty quantification and statistical analysis is critical in understanding the stochastic fragmentation process and the accompanying debris generation.

This topic looks to develop new diagnostics, experimental techniques, and modeling to understand fragment impact on responding surfaces such as walls made from concrete, dry wall, geo-materials, or other materials found in target sets as required. This effort would address the impact, fragment-structure interaction, and response including ejected dust and debris. The goal of this effort is the characterization of dust and debris from building surfaces as a function of different impacts. This effort should be able to scale from single lab size fragments and velocities to generic fielded weapons with multiple fragments and post detonation weapon environments.

Prior and concurrent efforts by DTRA and others can and should be utilized for efforts but expectation for this topic is that novel diagnostics, M&S, and experimental techniques will be developed to optimize understanding of fragment impact.

This effort will be linked with other efforts on understanding the effect of dust and debris on the late-time chemistry.

PHASE I: Initial M&S, diagnostics, and experiments
• Initial experiments and modeling of fragmentation – expectation is Phase I will be at the laboratory scale with characterized materials to scope out techniques.
• Develop plans for more complex scenarios with different materials.

PHASE II: Prototype M&S program characterized with complex conditions
• Model able to provide statistical range (particle size, velocity, direction) of dust and debris ejected from a provided generic fragment size and velocity.
• Model capable of multiple impacts from different fragments – incorporating pre-damaged scenarios.
• Model the interaction of the ejected solid with the surrounding environments.
• Develop experimental technique(s) to validate model over a range of fragment and impact velocities that can be used to evaluate weapon effects.

PHASE III DUAL USE APPLICATIONS: Full-scale tests and accompanying model perditions
• Capability to predict dust and debris from various weapons and target scenarios.
• Diagnostics and testing protocol for characterizing dust and debris in full-scale weapon testing.
• Linking this effort with Agent Defeat mission and planning codes such as IMEA.
• Marketing of capability across DoD/DOE.

REFERENCES:


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10. Wu, C.T., Wu, Y., Crawford, J.E. & Magallanes, J.M. Three-dimensional concrete impact and penetration simulations using the smoothed particle Galerkin method. Int. J. Impact Eng. 106, 1–17 (2017);
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12. Meyers, M.A., Dynamic Behavior of Materials. J. Wiley, 1994


KEYWORDS: Dust; Debris; M&S; Responding Surfaces; Testing; Fragment Impact; Diagnostics; Concrete

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**Missile Defense Agency (MDA)**
**24.2 Small Business Innovation Research (SBIR)**
**Direct to Phase II (DP2) Proposal Instructions**

## Introduction

The Missile Defense Agency's (MDA) mission is to develop and deploy a layered Missile Defense System (MDS) to defend the United States, its deployed forces, allies, and friends from missile attacks in all phases of flight.

The MDA SBIR Program is implemented, administered, and managed by the MDA SBIR/Small Business Technology Transfer (STTR) Program Management Office (PMO), located within the Innovation, Science, & Technology directorate.

Offerors responding to a topic in this Broad Agency Announcement (BAA) must follow all general instructions provided in the Department of Defense (DoD) SBIR Program BAA. MDA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

Specific questions pertaining to the administration of the MDA SBIR Program and these proposal preparation instructions should be directed to:

**Missile Defense Agency**
**SBIR/STTR Program Management Office**
**MDA/DVR**
**Bldg. 5224, Martin Road**
**Redstone Arsenal, AL 35898**
**Email: sbirsttr@mda.mil**

PLEASE NOTE: Please read the following MDA Direct to Phase II (DP2) proposal instructions carefully prior to submitting your proposal. Proposals not conforming to the terms of this announcement will not be considered for negotiation and/or award. 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. 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, but not limited to, 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 MDA instructions carefully prior to submitting your proposal. Please go to https://www.sbir.gov/about#policy-directive to read the SBIR/STTR Policy Directive issued by the Small Business Administration.

## Federally Funded Research and Development Centers (FFRDCs) and Support Contractors

Only Government personnel with active non-disclosure agreements will evaluate proposals. Non-Government technical support contractors and FFRDCs (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.

## 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.

### Ownership Eligibility

Prior to award, MDA may request business/corporate documentation to assess ownership eligibility as related to the requirements of SBIR/STTR 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 offeror shall provide all necessary documentation for evaluation prior to SBIR 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.

### 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 Identification number to be used for submissions at any of the participating agencies in the SBIR or STTR program. For more information, please visit the SBA's Firm Registration Page: http://www.sbir.gov/registration.

### Organization Conflicts of Interest (OCI)

The basic OCI rules for Contractors that support development and oversight of SBIR topics are covered in 9.505-1 through FAR 9.505-4 as the means of avoiding, neutralizing, or mitigating organizational conflicts of interest.

All applicable rules under the FAR 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.

In addition, FAR 3.101-1 states that Government business shall be conducted in a manner above reproach and, except as authorized by statute or regulation, with complete impartiality and with preferential treatment for none. The general rule is to avoid strictly any conflict of interest or even the appearance of a conflict of interest in Government-contractor relationships. An appearance of impropriety may arise where an offeror may have gained an unfair competitive advantage through its hiring of, or association with, a former Government official if there are facts indicating the former Government official, through their former Government employment, had access to non-public, competitively useful information. (See Health Net Fed. Svcs, B-401652.3; Obsidian Solutions Group, LLC, B-417134, 417134.2). The existence of an unfair competitive advantage may result in an offeror being disqualified and this restriction cannot be waived.

It is MDA policy to ensure all appropriate measures are taken to resolve OCI's arising under FAR 9.5 and unfair competitive advantages arising under FAR 3.101-1 to prevent the existence of conflicting roles that might bias a contractor's judgment and deprive MDA of objective advice or assistance, and to prevent contractors from gaining an unfair competitive advantage.

**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 this project. 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)).

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 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.

**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 https://www.bis.doc.gov/index.php/regulations/export-administration-regulations-ear.

All MDA SBIR topics are subject to ITAR and/or EAR. If selected for award negotiations, your company will be required to submit a Technology Control Plan (TCP) during the contracting negotiation process.

**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) (see Attachment), DFARS 252.204-7000 (Disclosure of Information), DFARS clause 252.204-7012 (Safeguarding Covered Defense Information and Cyber Incident Reporting), DFARS clause 252.204-7020 (NIST SP 800-171 DoD Assessment Requirements), MDA clause H-09 (Organizational Conflict of Interest) (see Attachment), MDA clause H-27 (Foreign Persons) (see Attachment), and MDA clause H-28 (Distribution of Control Technical Data) (see Attachment). 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. All proposed universities will need to provide written acceptance of the Flow-Down Clauses in both SBIR and STTR proposals.

**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.

**Rights in Noncommercial Technical Data and Computer Software – SBIR Program (DFARs 252.227-7018 Class Deviation 2020-O0007 Revision 1)**

Use this link for full description of Data Rights:
https://www.acq.osd.mil/dpap/policy/policyvault/USA001352-23-DPC.pdf

**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

## DP2 Proposal Submission Guidelines and Requirements

**Proposal Submission**

The MDA SBIR 24.2 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 24.2 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. Any proposal received after the 12:00pm EDT deadline on June 12, 2024 will not be evaluated or considered for award.

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: 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.

**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.

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 Federal Acquisition Regulation (FAR) 33.106(b), and in accordance with FAR clause 52.233-3 Protest after Award, any protests after award should be submitted to Candace Wright via email: sbirsttr@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**),
  - Disclosures of Foreign Affiliations or Relationships to Foreign Countries (required),
  - Quality Management Questionnaire (**required – use “other” upload category**),
  - Letters of Support (**optional**),
  - MDA SBIR/STTR TABA Form (**optional – use “other” upload category**).
- 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.

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 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 $2,000,000 (or $2,010,000 if TABA is included – use of the MDA Phase II TABA form is required if applying for TABA). Proposals whose cost volumes exceed $2,000,000 (or $2,010,000 if TABA is included) will not be evaluated or considered for award. Phase II Period of Performance is generally 24 months. MDA will not accept any deviation to the percentage of work requirements.

**Volume 4 – Company Commercialization Report (CCR) (Required)**

The Company Commercialization Report (CCR) allows companies to report funding outcomes resulting from prior SBIR and STTR awards. The Company Commercialization Report (CCR) is required for DP2 proposals. The information contained in the CCR will not be considered by MDA during proposal evaluations.

Small businesses must complete the CCR by logging into their account at https://www.sbir.gov. To view or print the information currently contained in the Company Registry Commercialization Report, navigate to My Dashboard > My Documents. To create or update the commercialization record, from the company dashboard, scroll to the "My Commercialization" section, and click the create/update Commercialization tab under "Current Report Version". Please refer to the "Instructions" and "Guide" documents contained in the DSIP Dashboard for more detail on completing and updating the CCR.

Once the report is certified and submitted on SBIR.gov, click the "Company Commercialization Report" PDF under the My Documents section of the dashboard to download a PDF of the CCR. This PDF of the CCR must be uploaded to Volume 4: Company Commercialization Report in the Firm Information section of DSIP by the Firm Admin. All other firm users will have read-only access to the CCR from the proposal submission page, in order to confirm that the CCR has been uploaded by the Firm Admin to complete the Volume 4 requirement.

**Volume 5 – Supporting Documents**
MDA will only accept the following documents as part of Volume 5:

- Volume 5:
  - Contractor Certification Regarding Provision of Prohibited Video Surveillance and Telecommunications Services and Equipment (**required**),
  - Disclosures of Foreign Affiliations or Relationships to Foreign Countries (required),
  - Quality Management Questionnaire (**required – use "other" upload category**),
  - Letters of Support (**optional**),
  - MDA SBIR/STTR TABA Form (**optional – use "other" upload category**).

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.

**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.

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

**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 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.

**MDA Proposal Evaluations and Selection**
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.

Proposing firms will be notified of selection or non-selection status for a Direct to Phase II award within 90 days of the closing date of the BAA. The email will be distributed to the "Corporate Official" and "Principal Investigator" listed on the proposal coversheet and will originate from the sbirsttr@mda.mil email address. MDA cannot be responsible for notification to a company that provides incorrect information or changes such information after proposal submission.

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 instructions for requesting proposal feedback. Only firms that receive a non-selection notification are eligible for written feedback. Refer to the DoD STTR Program BAA for procedures to protest the Announcement.

**<u>Attachment – Standard MDA Mandatory Flowdown Local Clauses</u>**

## H-08 PUBLIC RELEASE OF INFORMATION (MAR 2020)

a. In addition to the requirements of National Industrial Security Program Operations Manual (DoD 5220.22-M), all foreign and domestic contractor(s) and its subcontractors are required to comply with the following:

1) Any official MDA information/materials that a contractor/subcontractor intends to release to the public that pertains to any work under performance of this contract, the Missile Defense Agency (MDA) will perform a pre-publication review prior to authorizing any release of information/materials.

2) At a minimum, these information/materials may be technical papers, presentations, articles for publication, key messages, talking points, speeches, and social media or digital media, such as press releases, photographs, fact sheets, advertising, posters, videos, etc.

b. Subcontractor public information/materials must be submitted for approval through the prime contractor to MDA.

c. Upon request to the MDA Procuring Contracting Officer (PCO), contractors shall be provided the "Request for Industry Media Engagement" form (or any superseding MDA form).

d. At least 45 calendar days prior to the desired release date, the contractor must submit the required form and information/materials to be reviewed for public release to MDAPressOperations@mda.mil, and simultaneously provide courtesy copy to the appropriate PCO. (Additional distribution emails can be added by the Program Office to ensure proper internal coordination and tracking of PR requests.)

e. All information/materials submitted for MDA review must be an exact copy of the intended item(s) to be released, must be of high quality and are free of tracked changes and/or comments. Photographs must have captions, and videos must have the intended narration included. All items must be marked with the applicable month, day, and year.

f. No documents or media shall be publically released by the Contractor without MDA Public Release approval.

g. Once information has been cleared for public release, it resides in the public domain and must always be used in its originally cleared context and format. Information previously cleared for public release but containing new, modified or further developed information must be re-submitted.

**H-09 ORGANIZATIONAL CONFLICT OF INTEREST (Apr 2020)**

a. Purpose: The purpose of this clause is to ensure that:

(1) the Contractor is rendering impartial assistance and advice to the Government at all times under this contract and related Government contracts;

(2) the Contractor's objectivity in performing work under this contract or related Government contracts is not impaired; and

(3) the Contractor does not obtain an unfair competitive advantage by virtue of its access to non-public Government information, or by virtue of its access to proprietary information belonging to others.

b. Scope: The Organizational Conflict of Interest (OCI) rules, procedures and responsibilities described in FAR 9.5 "Organizational and Consultant Conflicts of Interest", FAR 3.101-1 "Standards of Conduct – General, DFARS 209.5 "Organizational and Consultant Conflicts of Interest," and in this clause are applicable to the prime Contractor (including any affiliates and successors-in-interest), as well as any co-sponsor, joint-venture partner, consultant, subcontractor or other entity participating in the performance of this contract. The Contractor shall flow this clause down to all subcontracts, consulting agreements, teaming agreements, or other such arrangements which have OCI concerns, while modifying the terms "contract", "Contractor", and "Contracting Officer" as appropriate to preserve the Government's rights.

c. Access to and Use of Nonpublic Information: If in performance of this contract the contractor obtains access to nonpublic information such as plans, policies, reports, studies, financial plans, or data which has not been released or otherwise made available to the public, the Contractor agrees it shall not use such information for any private purpose or release such information without prior written approval from the Contracting Officer.

d. Access to and Protection of Proprietary Information: The Contractor agrees to exercise due diligence to protect proprietary information from misuse or unauthorized disclosure in accordance with FAR 9.505-4. The Contractor may be requested to enter into a written non-disclosure agreement with a third party asserting proprietary restrictions, if required in the performance of the contract.

e. In accordance with FAR 3.101-1, the Contractor shall also take all appropriate measures to prevent the existence of conflicting roles that might bias the Contractor's judgement, give the Contractor an unfair competitive advantage, and deprive MDA of objective advice or assistance that can result from hiring former Government employees. (See Health Net Fed. Svcs, B-401652.3).

f. Restrictions on Participating in Other Government Contract Efforts.

g. OCI Disclosures: The Contractor shall disclose to the Contracting Officer all facts relevant to the existence of an actual or potential OCI, using an OCI Analysis/Disclosure Form which the Contracting Officer will provide upon request. This disclosure shall include a description of the action the Contractor has taken or plans to take to avoid, neutralize or mitigate the OCI.

h. Remedies and Waiver:

(1) If the contractor fails to comply with any requirements of FAR 9.5, FAR 3.101-1, DFARS 209.5, or this clause, the Government may terminate this contract for default, disqualify the Contractor from subsequent related contractual efforts if necessary to neutralize a resulting organizational conflict of interest, and/or pursue other remedies permitted by law or this contract. If the Contractor discovers and

promptly reports an actual or potential OCI subsequent to contract award, the Contracting Officer may terminate this contract for convenience if such termination is deemed to be in the best interest of the Government, or take other appropriate actions.

(2) The parties recognize that the requirements of this clause may continue to impact the contractor after contract performance is completed, and that it is impossible to foresee all future impacts. Accordingly, the Contractor may at any time seek an OCI waiver from the Director, MDA by submitting a written waiver request to the Contracting Officer. Any such request shall include a full description of the OCI and detailed rationale for the OCI waiver.

**H-27 FOREIGN PERSONS (Jun 2010)**

1. "Foreign National" (also known as Foreign Persons) as used in this clause means any person who is NOT:

a. a citizen or national of the United States; or

b. a lawful permanent resident; or

c. a protected individual as defined by 8 U.S.C.1324b(a)(3).

"Lawful permanent resident" is a person having 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 and such status not having changed.

"Protected individual" 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."

2. Prior to contract award, the contractor shall identify any lawful U.S. permanent residents and foreign nationals expected to be involved on this project as a direct employee, subcontractor or consultant. For these individuals, in addition to resumes, 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 a contract. Supplemental information provided in response to this clause will be protected in accordance with Privacy Act (5 U.S.C. 552a), if applicable, and the Freedom of Information Act (5 U.S.C. 552(b)(6)). After award of the contract, the Contractor shall promptly notify the Contracting Officer and Contracting Officer's Representative with the information above prior to making any personnel changes involving foreign persons. No changes involving foreign persons will be allowed without prior approval from the Contracting Officer. This clause does not remove any liability from the contractor to comply with applicable ITAR and EAR export control obligations and restrictions. This clause shall be included in any subcontract."

**H-28 DISTRIBUTION CONTROL OF TECHNICAL INFORMATION (AUG 2014)**

a. The following terms applicable to this clause are defined as follows:

1. DoD Official. Serves in DoD in one of the following positions: Program Director, Deputy Program Director, Program Manager, Deputy Program Manager, Procuring Contracting Officer, Administrative Contracting Officer, or Contracting Officer's Representative.

2. Technical Document. Any recorded information (including software) that conveys scientific and technical information or technical data.

3. Scientific and Technical Information. Communicable knowledge or information resulting from or pertaining to the conduct or management of effort under this contract. (Includes programmatic information).

4. Technical Data. As defined in DFARS 252.227-7013.

b. Except as otherwise set forth in the Contract Data Requirements List (CDRL), DD Form 1423 the distribution of any technical documents prepared under this contract, in any stage of development or completion, is prohibited outside of the contractor and applicable subcontractors under this contract unless authorized by the Contracting Officer in writing. However, distribution of technical data is permissible to DOD officials having a "need to know" in connection with this contract or any other MDA contract provided that the technical data is properly marked according to the terms and conditions of this contract. When there is any doubt as to "need to know" for purposes of this paragraph, the Contracting Officer or the Contracting Officer's Representative will provide direction. Authorization to distribute technical data by the Contracting Officer or the Contracting Officer's Representative does not constitute a warranty of the technical data as it pertains to its accuracy, completeness, or adequacy. The contactor shall distribute this technical data relying on its own corporate best practices and the terms and conditions of this contract. Consequently, the Government assumes no responsibility for the distribution of such technical data nor will the Government have any liability, including third party liability, for such technical data should it be inaccurate, incomplete, improperly marked or otherwise defective. Therefore, such a distribution shall not violate 18 United States Code § 1905.

c. All technical documents prepared under this contract shall be marked with the following distribution statement, warning, and destruction notice identified in sub-paragraphs 1, 2 and 3 below. When it is technically not feasible to use the entire WARNING statement, an abbreviated marking may be used, and a copy of the full statement added to the "Notice To Accompany Release of Export Controlled Data" required by DoD Directive 5230.25.

1. DISTRIBUTION - [PCO, Insert the appropriate distribution statement and complete the statement, if necessary, to include the applicable controlling office.]

2. WARNING - This document contains technical data whose export is restricted by the Arms Export Control Act (Title 22, U.S.C., Sec 2751, et seq.) or the Export Administration Act of 1979 (Title 50, U.S.C., App. 2401 et seq), as amended. Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25

3. DESTRUCTION NOTICE - For classified documents follow the procedures in DOD 5220.22-M, National Industrial Security Program Operating Manual, February 2006, Incorporating Change 1, March 28, 2013, Chapter 5, Section 7, or DoDM 5200.01-Volume 3, DoD Information Security Program: Protection of Classified Information, Enclosure 3, Section 17. For controlled unclassified information

follow the procedures in DoDM 5200.01-Volume 4, Information Security Program: Controlled Unclassified Information.

d. The Contractor shall insert the substance of this clause, including this paragraph, in all subcontracts.

**MDA SBIR 24.2 Direct to Phase II Topic Index**

MDA242-D001 TITLE: Continuous Adaptive Digital Operations Planning

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software; Mission Readiness &Disaster Preparedness; Sustainment & Logistics

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 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: Use new and evolving digital technologies to revolutionize the operations planning process, resulting in always up to date and ready to execute plans that maintain commander's intent and utilize available resources most effectively and efficiently.

DESCRIPTION: Joint doctrine describes an Operation Plan (OPLAN) as a complete and detailed plan that identifies the force requirements, functional support, and resources to execute the plan. An OPLAN contains a full description of the concept of operations (CONOPS), all applicable annexes, a time-phased force and deployment list (TPFDL) and a transportation-feasible notional time-phased force and deployment data (TPFDD), as well as analysis of the impact of a potentially contested environment on the joint deployment and distribution enterprise (JDDE).

The initial development of an OPLAN is a detailed and time-consuming process involving subject matter experts (SMEs), modeling and simulation, and detailed analysis. Once fully developed, plans are on the shelf for future use and are reviewed and updated periodically to maintain their relevance. In the event of a conflict, the current plan will be used to inform and guide tactical operations and strategy. The problem is that even though plans go through periodic review and update processes, this is not done frequently enough to maintain currency with a rapidly changing real world. The less current an OPLAN is, the less valuable it will be in the event of a conflict.

The baseline assumptions underlying any OPLAN are constantly changing. Details such as red intelligence estimates, blue inventories, asset maintenance and availability, force levels, and available transportation and logistics support are always changing and impact current plans. Global political events and conflicts can rapidly alter strategic considerations and lead to changes in commander's guidance and intent. A responsive, automated, near real-time system to update OPLANs as underlying data changes and the ability to alter plans based on updated guidance is needed to ensure our deployed forces and commanders at all levels always have the best plans available to deter the enemy and ensure our forces can engage most effectively and efficiently if conflict ensues.

This topic seeks innovations in digital operations planning. The desire is to research and develop tools and processes that enable the continual review and update of OPLANs such that they maintain currency and maximum relevancy. This is a multifaceted problem that involves model maintenance and both automated and analyst driven data updates, continuous assessment of the current plan as inputs change, automated optimization and analysis informing whether updates are recommended, and the ability to trade off and measure best choices across multiple metrics while considering levels of change to the currently accepted plan. New metrics and new constraints may be introduced and ways to incorporate these while maintaining and updating the plan are needed.

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like "Phase I" component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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: Create a full prototype capability implementing the tools and demonstrating the processes required to enable digital OPLAN maintenance, review, and updates. Work with project sponsors to perform an example study using this new technology with representative data and models.

Key Technical Objectives:
- Automation of Routine Tasks: Implement automation for routine planning tasks such as data entry, report generation, and scheduling, reducing the time and effort required for these activities.
- Integration of Data Sources: Integrate diverse data sources, both internal and external, to provide a comprehensive and real-time view of relevant information. This can include integrating databases, Internet of Things devices, or other systems to ensure data accuracy and timeliness.
- Predictive Analytics: Utilize predictive analytics to forecast trends, demands, and potential operational challenges. This can enable proactive decision-making and allow for adjustments to plans before issues arise.
- Geospatial Analysis: Implement geospatial analysis tools to visualize data on maps.
- User Experience (UX) Optimization: Prioritize the user experience of digital planning tools. A user-friendly interface improves efficiency and reduces the learning curve for team members, leading to faster adoption and more effective use.
- Scalability: Ensure that the digital planning infrastructure is scalable to accommodate growing data volumes and user loads. Scalability is crucial for handling increased operational demands without a significant decrease in performance.
- Machine Learning Integration: Explore the integration of machine learning algorithms to analyze historical data and patterns. This can assist in decision-making processes, providing insights that might not be immediately apparent from manual analysis.
- Feedback Loops and Iterative Improvement: Implement mechanisms for collecting feedback from users and operational outcomes. Use this feedback to make iterative improvements to the digital planning processes and tools continuously.

PHASE III DUAL USE APPLICATIONS: Scale-up the capability from the prototype utilizing the new processes and software technologies developed in Phase II into a mature, fieldable capability. Work with DoD integrators to integrate the technology into a system level testbed for analyst use.

REFERENCES:


1. Joint Publication 5-0, Joint Planning, 01 December 2020. https://www.jcs.mil/Doctrine/Joint-Doctrine-Pubs/5-0-Planning-Series
2. On How Simulations Can Support Adaptive Thinking in Operations Planning.pdf. (https://www.sto.nato.int/publications/STO%20Meeting%20Proceedings/STO-MP-MSG-133/MP-MSG-133-18.pdf
3. Plan Maintenance for Continuous Execution Management https://apps.dtic.mil/sti/tr/pdf/ADA523659.pdf


KEYWORDS: CONOPS; Digital; OPLAN; Modelling; Simulation; Planning; Continuous; Automation; Operational; Processes


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MDA242-D002 TITLE: Nanosecond Quantum Timing in Threat Vehicle Form Factor Nanosecond Timing

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Hypersonics; Emerging Threat Reduction

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 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 nanosecond atomic clock in .25L or less form factor with 10 ns or less loss per day.

DESCRIPTION: A source of secure and accurate timing is a crucial need for government vehicles and sensors. Exquisite timing is needed for navigation, communication, and cyber security. Insertion of a timing solution can be complex since it not only affects the platform it is installed on, but communications with all outside entities. The Government requires onboard clocks able to operate through extreme flight conditions and usable across multiple platforms. The onboard clocks must be capable of very high precision and serve as a duplicative timing source to Global Positioning Systems.

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like "Phase I" component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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: Complete a detailed prototype design incorporating government performance requirements. Coordinate with the Government during prototype design and development to ensure that the delivered products would be relevant to an ongoing missile defense architecture and data types and structures.

PHASE III DUAL USE APPLICATIONS: Scale-up the capability from the prototype utilizing the new technologies developed in Phase II into a mature, full scale, fieldable capability. Work with missile defense integrators to integrate the technology into a missile defense system level test-bed and test in a relevant environment.

REFERENCES:


1. Schmittberger, Bonnie L., and David R. Scherer. "A review of contemporary atomic frequency standards." arXiv preprint arXiv:2004.09987 (2020).
2. P. Guo, H. Meng, L. Dan and J. Zhao, "Wafer-Level Assembly of Physics Package for Chip-Scale Atomic Clocks," in IEEE Sensors Journal, vol. 22, no. 7, pp. 6387-6398, 1 April1, 2022, doi: 10.1109/JSEN.2022.3151407.
3. Bandi, Thejesh N. "A Comprehensive Overview of Atomic Clocks and their Applications." Biology, Engineering, Medicine and Science Reports 9.1 (2023): 1-10.


KEYWORDS: quantum; clock; timing; encryption; navigation; PNT; communication


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MDA242-D003 TITLE: Novel Production Processes for High Strength Ablative Insulators

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Hypersonics; Advanced 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 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 new processes for producing high strength, ablative insulators rapidly with low scrap rates. This effort focuses specifically on high temperature, fiber reinforced matrix composites.

DESCRIPTION: High temperature, fiber reinforced composites are frequently used as ablative insulators for various aerospace applications. Ablative insulators, like carbon-phenolic and silica-phenolic, are traditionally produced by involute lay-up with manually intensive processes with low reproducibility. Conventional methods of production require highly skilled labor with weak control of production parameters. Recent advances in automation for various additive manufacturing processes provide new opportunities to eliminate production variability for ablative insulators while increasing production rates. The primary application of this technology is propulsion, but a secondary application is for thermal protection systems for aeroshells.

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like “Phase I” component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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 scalable, automated processes to produce high strength, ablative insulators with scrap rates lower than 5%. Minimization of custom production equipment is also desired. The proposed process must be capable of producing fiber reinforced composites with fiber ply angles from 0° to 90°. The mechanical and thermal properties of the ablative insulators produced by the proposed process must meet or exceed those of conventional production processes. Proposers must have demonstrated experience producing fiber reinforced polymer matrix composites and must specify any size limitations, such as length, width, or thickness, to the proposed production process.

PHASE III DUAL USE APPLICATIONS: Partner with a system manufacturer to produce fiber reinforced ablative insulators.

REFERENCES:


1. Automated fiber placement: A review of history, current technologies, and future paths forward. https://www.sciencedirect.com/science/article/pii/S2666682021000773?via%3Dihub
2. Chemical Erosion of Carbon-Phenolic Rocket Nozzles with Finite-Rate Surface Chemistry. https://arc.aiaa.org/doi/abs/10.2514/1.B34791
3. Experimental Studies on the Effect of Ply Orientation on the Thermal Performance of Silica Phenolic Ablative Material. https://arc.aiaa.org/doi/abs/10.2514/6.2007-418


KEYWORDS: Propulsion


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MDA242-D004 TITLE: Pulsed Laser Lethality Effects for Missile Defense

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Directed Energy; Hypersonics

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 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, test and deliver a system capable of characterizing, displaying, recording and transferring data collected regarding material properties and environmental conditions present during tests of pulsed laser interactions with materials. Transferred data would be used by other external systems.

DESCRIPTION: The Government is interested in diagnostic equipment that can measure material properties such as temperature gradients, rates of ablation, vibration, plasma properties (e.g. reflectivity of plasma and material from a laser pulse) and atmospheric vapor composition during material interaction testing with high energy pulsed laser systems with pulse widths ranging from hundreds of pico to micro-seconds. Typical test configurations would be material coupon tests in small wind tunnel chambers where diagnostic equipment is typically outside the chamber and separated by a window, or static environments where diagnostic equipment could be in near proximity of the material coupons. The static environments could be in a lab or outside at a range.

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like "Phase I" component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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: The proposer would design, build, test and deliver the prototype system able to collect data during Department of Defense tests of high energy micro-second pulsed lasers against various materials. The system must be able to collect material property data including temperature gradients, reflectivity and ablation on a per laser pulse basis. The system must also be able to capture the environmental conditions around the materials and be able to detect and characterize vaporized materials and plasmas. The system would be capable of processing the data and generating user selectable plots of the data over a single or multiple tests. Raw and processed data must be transferrable via removable media and standard high speed computer data ports. The system would capture data for at least 15 tests, each of up to one minute in duration. The pulse width and rep rates must be configurable based on the laser under test.

This Direct to Phase II effort would include two design reviews with the Government, and a pre-test review. The proposer would conduct a test at their preferred location with a Government or Government-approved witness and a system demonstration at a location of the governments choosing within the contiguous United States. At completion of the effort, the proposer would provide a final report, the system used during the demonstration and any software required for operation.

PHASE III DUAL USE APPLICATIONS: Potential use as a diagnostic test tool for continuous wave laser testing. Aid to understand re-entry vehicle performance. Tool to assess hypersonic material testing and performance.

REFERENCES:

1. Shin, Joonghan, and J. Mazumder. "Plasma diagnostics using optical emission spectroscopy in laser drilling process." Journal of laser Applications 28.2 (2016).
2. Eliceiri, Matthew, Anthony Mark, Darren Luke, Xun Zhu, Kaushik Iyer, and Costas P. Grigoropoulos. "Comprehensive analysis and probing of plasma emitted by the laser ablation of aluminum." Applied Physics A 128, no. 12 (2022): 1068.
3. Application of spectral-domain optical coherence tomography technique to in-process measure hole depth during femtosecond laser drilling in different alloys. https://pubs.aip.org/aip/adv/article/13/3/035006/2879532/Application-of-spectral-domain-optical-coherence

KEYWORDS: High Energy Laser; High Energy Pulsed Laser; Pulsed Laser; HEL test equipment; pulsed laser diagnostics

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MDA242-D005 TITLE: Over-the-Horizon Radar (OTHR) Operational Fusion

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Sensing and Cyber; Integrated Network Systems-of-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 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 implement algorithms for fusing OTHR tracks with Overhead Persistent Infrared (OPIR) data to generate real-time attributable tracks of long-range airborne weapons over the entire mission cycle from carrier aircraft takeoff thru intercept or impact.

DESCRIPTION: The Government has developed OTHR processing and tracking algorithms. This topic seeks to develop integrated means of correlating and fusing these OTHR tracks using OPIR source data and infrastructure, significantly enhancing the continuity and quality of the composite track data.

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like "Phase I" component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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, demonstrate, and assess integrated means of correlating and fusing OTHR tracks using OPIR source data and infrastructure, significantly enhancing the continuity and quality of the composite track data as well as providing a developmental path for the Government's C2BMC integration and distribution. Specifically, plan and implement tasks to achieve the following objectives:
1. Develop algorithms for correlating OTHR and OPIR tracks

2. Demonstrate improved geo-registration of OTHR tracks using OPIR data
3. Demonstrate these algorithms using real-world data
4. Demonstrate track quality including correlation, continuity, and spurious generation.
5. Implement algorithms in and port to tailor coding to assure real-time processing capability.
6. Demonstrate correlation and attribution performance over span of threats types and mission scenarios
7. Assess BMDS military utility improvements to existing OTHR and OPIR stand-alone capabilities

PHASE III DUAL USE APPLICATIONS: Support integration of Government-approved capabilities from Phase II into the Government's C2BMC lab enterprise.

REFERENCES:


1. Track-to-Track fusion with cross-covariances from radar and IR/EO sensor, University of Connecticut; 22nd International Conference on Information Fusion; Ottawa, Canada - July 2-5, 2019
2. The Missile Defense System. https://www.mda.mil/global/documents/pdf/bmds.pdf


KEYWORDS: over-the-horizon radar; OTHR; overhead persistent infrared; OPIR; correlation; fusion


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MDA242-D006 TITLE: Innovative Concepts in the Missile Defense Domain for Space Superiority

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Microelectronics; Space Technology

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 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: Provide novel and innovative space technologies enabling the Missile Defense Agency (MDA) mission of developing and deploying a layered Missile Defense System to defend the United States, its deployed forces, and friends from missile attacks in all phases of flight. Specific to this topic, the MDA seeks improved defensive sensing capabilities by increasing effectiveness of new and existing sensors against current and emerging threats.

DESCRIPTION: The mission of the MDA 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. Critical to meeting this mission is the continued development of technologies that enable space superiority for purposes of missile defense. This solicitation seeks to identify advanced space sensing technologies that enable the MDA mission.

The MDA is seeking proposals for advanced space technologies that provide increased assurance of space domain superiority through advancements in sensing techniques, multi-phenomenology data fusion, and additional processing technologies that can improve birth to death tracking, earlier indications and warnings, and threat discrimination.

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like "Phase I" component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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: MDA seeks sensing technologies that support the MDA mission as applicable to operating within the space domain. This Phase II solicitation has multiple themes and would consider UNCLASSIFIED proposals submitted against any of these identified theme focus areas. Please submit proposals that are based on your best skills, experience and capability to deliver innovative technology to support the MDA mission.

Specific to this topic, the MDA seeks proposals addressing the need for sensing technologies capable of
- improving multi-phenomenology data fusion,
- improving birth-to-death tracking capabilities,
- increasing effectiveness in threat indications and warnings,
- exploiting advanced neuromorphic processes in data fusion and processing
- improving intelligent discrimination of offensive targets

PHASE III DUAL USE APPLICATIONS: Phase III work could apply to providing proliferated low earth orbit communication systems and space based processing that allows the effective and efficient distribution of overhead sensor data. Improving the industrial base to provide more effective optical satellite communications, with more power for the satellite bus and high performance clocks will enhance Phase III development.

REFERENCES:

1. Missile Defense Agency SBIR and STTR Programs. https://www.mda.mil/business/SBIR_STTR_programs.html
2. OUSD(R&E) Critical Technology Areas https://www.cto.mil/usdre-strat-vision-critical-tech-areas


KEYWORDS: Space Systems; Space Sensors; Battle Management; Edge Processing; Data Fusion; Indications & Warning; Track Management; Track Hand-off; Multi-domain sensing; Neuromorphic;


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MDA242-D007 TITLE: Deployable Modular Integrated Sensor System (DMISS)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Integrated Sensing and Cyber; Advanced Infrastructure & Advanced Manufacturing; Advanced 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 the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop an innovative sensor system that deploys from existing missile test target mechanical deployment interfaces with the primary goal of test scene data collection.

DESCRIPTION: Missile test targets house existing mechanical deployment systems, which could be repurposed to support small fly-along systems to collect data on a target scene. This topic seeks innovative designs for a DMISS that prioritizes the use of low-cost or commercial off deployment mechanism and meet all existing test target electrical and mechanical interface requirements. Once deployed from the target, the DMISS should be capable of orienting itself to collect data on multiple objects throughout the course of the mission and telemeter the data to another instrumented object or flight vehicle for transmission to ground. The proposed DMISS should incorporate a variety of sensor types (e.g., spectrometer, Infrared(IR)/Visible(VIS) camera, etc.) and support multiple sensor configurations to meet mission-specific needs. The deployed DMISS should exhibit a minimal Radar Cross Section (RCS) and IR signature and survive to collect and transmit data during re-entry.

The Direct to Phase II effort would involve the design and construction of a working prototype of the DMISS concept, demonstrate proper fit and operation with the mechanical deployment system interface. Demonstrate proper operation of the suite of sensors available for the prototype and navigation/control system via test or analysis. Develop a data collection plan and demonstrate its proper operation. The system should obtain TRL 6 upon Direct to Phase II completion.

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like "Phase I" component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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: Design, construct, test, and build a working flight-ready prototype of the DMISS based on the Phase I effort. The DMISS system must have its own ejection mechanism with the ability to maneuver once ejected from the flight vehicle. Additionally, it must be able to move and point its on-board sensors to multiple objects of interest. An Interface Control Document, detailing mechanical and electrical interfaces, would be developed to enable the use of multiple low size, weight, and power sensors in the RF, IR, and Vis areas. Ground testing must show the functionality of the system and be environmentally tested to simulate the flight environments.

PHASE III DUAL USE APPLICATIONS: Integrate the finalized DMISS prototype into future government mission planning. Verify and conduct tests to demonstrate the DMISS can provide support for different mission types depending on the different sensors required and translating and pointing to different locations to meet mission requirements. Conduct flight/ground test analyses to ensure all data can be collected from the DMISS sensors and transmitted to the launch vehicle.

REFERENCES:

1. U.S. Missile Defense Agency. November 3, 2015. Ballistic Missile Defense System. Retrieved from http://www.mda.mil/index.html
2. U.S. Department of Defense. Undated. Ballistic Missile Defense Review. Retrieved from http:/www.defense.gov/bmdr


KEYWORDS: Deployable; Sensors

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MDA242-D008 TITLE: Thermal Protection Material for Terminal High Altitude Area Defense (THAAD) Interceptor

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Materials

OBJECTIVE: Demonstrate performance of advanced ceramic nanofiber-based thermal protection system (TPS) materials in the simulated operating environment.

DESCRIPTION: The THAAD missile operates in extreme environments. The Government is seeking new lightweight materials that would allow the interceptor to survive and succeed in even more dynamic engagements. This topic aims to demonstrate performance of alternative form-factor variants of nanofibers to enable new improvements to interceptor thermal protection system. Specifically, this topic seeks the demonstration of the ability to produce castable, rigid structures from nanofibers.

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like "Phase I" component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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: Demonstrate performance of advanced ceramic nanofiber-based TPS materials in the simulated operating environment.
a. Guided by computational models of the thermal effects within the aeroshell of THAAD interceptors and temperature survivability thresholds of internal components, verify the enhanced performance over current state-of-the-art, identify any potential areas for integration risk, and resolve this risk.
b. Technical Objective 1 would include tests that accurately account for the mechanical loads relevant to THAAD interceptor fly-out trajectories.
c. Demonstrate performance of alternative form-factor variants of nanofibers to enable new improvements to interceptor TPS.
a. Pilot line would be constructed and operated in a typical "factory floor" environment.
b. Ensure that industrial pilot line has sufficient output capacity to promptly supply the Government contractors with TPS materials for their own testing needs.

Develop and deliver report on costs and engineering pathway to scale output to achieve any given amount of ceramic nanofiber material. The report would include every major capital expenditure consideration (cost of manufacturing space, construction costs, diminishing labor costs associated with mass production, etc.). The report would operate on user-friendly input options for convenience while also providing complete transparency on its formulas. Thus, it would enable an accurate extrapolation of actions to achieve Phase III demands, delivered in a format that stakeholder representatives would find useful.

PHASE III DUAL USE APPLICATIONS: Insulating material used for other interceptors that operate in an extreme environment. Insulating material for other mechanical structures such as space craft. Insulating material for any structure that needs to take into account the weight of an insulating material relative to the thermal protection provided.

REFERENCES:

1. Jing Zhang, Xi Zhang, Lifeng Wang, Junxiong Zhang, Rong Liu, Qilong Sun, Xinli Ye and Xiaomin Ma - "Fabrication and Applications of Ceramic-Based Nanofiber Materials Service in High-Temperature Harsh Conditions—A Review" 1 February 2023
2. Andrei Stanishevsky, Joshua Wetuski, Michael Walock, Inessa Stanishevskaya, Helene Yockell-Lelievre, Eva Kostakova and David Lukas - "Ribbon-like and spontaneously folded structures of tungsten oxide nanofibers fabricated via electrospinning" 10 Aug 2015


KEYWORDS: ceramic insulator; lightweight insulation


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MDA242-D009 TITLE: DACS COPV Helium Pressurant Measurement

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Mission Readiness &Disaster Preparedness;

OBJECTIVE: Develop and demonstrate an accurate and effective means of measuring the pressure in the Terminal High Altitude Area Defense (THAAD) Divert and Attitude Control System (DACS) Composite Overwrapped Pressure Vessel (COPV).

DESCRIPTION: The THAAD DACS COPV is pressurized with helium during assembly. The THAAD Missile Product Office (THR) is seeking a precise, non-invasive, non-destructive means of verifying the integrity of the COPV by measuring the pressure within the COPV upon DACS installation and whenever MRs are returned for Stockpile Reliability Testing (SRT).

PHASE I: 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. Proposal must show, as appropriate, a demonstrated technical feasibility or nascent capability. 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 = maturity and what have you already done/validated.

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 like "Phase I" component and/or other validation in a relevant environment, and/or at a much higher TRL level (5 or higher) and describe the potential commercialization applications. The documentation provided must validate that the proposer has completed development of technology in previous work or research completed.)

IRAD work, previous Phase I/Phase II work: Documentation should include the most relevant information including, but not limited to: technical reports, test data, prototype designs/models, and/or 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 accurate and effective means of measuring the pressure in the THAAD DACS COPV. The means of measuring pressure must be non-destructive and non-invasive to the DACS system and capable of being used without removal of the COPV from the DACS, or removal of the DACS from the MR. The method of measurement should be capable of measuring the pressure initially put into the COPV when filled with helium (pre-MR assembly) and capable of measuring the pressure within the COPV during MR SRT, or other post-production activity. The means of measurement should not result in the loss of helium from the COPV and should be precise enough to determine the capability of the COPV to provide pressurant to support a worst-case THAAD Missile engagement. The method of measurement should be demonstrated within the THAAD DACS assembly facility and the THAAD test area used for SRT.

PHASE III DUAL USE APPLICATIONS: This concept has the potential for applicability to other types (i.e. other than helium) of pressurant systems. The concept could also be developed for application to other Government programs.

REFERENCES:

1. Hongliang Zhou, Weibin Lin, Xiaocheng Ge, and Jian Zhou, "A Non-Intrusive Pressure Sensor by Detecting Multiple Longitudinal Waves" 5 August 2016
2. Prof. Ahmet Can Sabuncu, Mr. Mengqiao Yang, Prof. John M Sullivan Jr, "BYOE: Determining Pressure inside Thin Walled Vessels using Strain Measurements" June 2020

KEYWORDS: COPV; DACS; pressurant; pressure; helium

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# National Geospatial-Intelligence Agency (NGA)
# 24.2 Small Business Innovation Research (SBIR)
# Proposal Submission Instructions

## INTRODUCTION

NGA is a Department of Defense (DoD) combat support agency and a member of the U.S. Intelligence Community (IC). NGA develops imagery and map-based intelligence solutions for U.S. national defense, homeland security, and safety of navigation. NGA's mission is to "provide timely, relevant, and accurate geospatial-intelligence in support of national security." Today, NGA manages the National System for Geospatial-Intelligence (NSG), which provides the foundation for correlating U.S. intelligence activities to the location of the Earth.

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. Additional information pertaining to the NGA mission and high-level course can be obtained by viewing the agency's website at https://www.nga.mil and NGA's strategy documents at https://www.nga.mil/about/strategy.html.

NGA Research supports the NSG and National Security Strategy by solving hard defense and intelligence problems for the IC and DoD in three broad areas: Foundational GEOINT; Advanced Phenomenologies; and Analytic Technologies. NGA Research works with customers on early concepts through to advanced developments in operating systems and environments.

Offerors responding to a topic in this BAA must follow all general instructions provided in the DoD SBIR Program BAA, as applicable. NGA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

Specific questions pertaining to the administration of the NGA SBIR Program and these proposal preparation instructions should be directed to:

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

Proposers responding to a topic in this BAA must follow all general instructions provided in the DoD SBIR Program BAA. NGA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

**Proposers are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.**

- The DoD Program BAA is located at: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements. Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

Specific questions pertaining to the administration of the NGA Program and these proposal preparation instructions should be directed to: sbir@nga.mil.

## DIRECT TO PHASE II PROPOSAL GUIDELINES

The Defense SBIR/STTR Innovation Portal (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. Detailed instructions regarding registration and proposal submission via DSIP are provided in the DoD SBIR Program BAA.

### Technical Volume (Volume 2)

The technical volume consists of two parts: Part A – Feasibility Documentation, and Part B – Technical Proposal. Each part is not to exceed twenty (20) pages, for a technical volume maximum page count of 40 pages. The Government will not consider pages in excess of these page count limitations. Number all pages of your proposal consecutively and follow the formatting requirements provided in the DoD SBIR Program BAA.

### Content of the Technical Volume

The offeror shall not propose option period(s).

#### Part B – Technical Proposal

**(6) Commercialization Strategy.** In addition, the Commercialization Strategy shall also address Section 508 compliance as noted below:

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 to ensure that all services associated with this Topic Area are accessible by as many users as possible and to drive modernization, innovation, and enhance mission support.

As part of the offeror’s proposal, the offeror should include an outline of specifically how Section 508 compliance will be achieved in the design of the ICT product. The proposal for Phase II 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.

### Cost Volume (Volume 3)

The Phase II amount must not exceed $1,000,000 for up to a twenty-four (24)-month period of performance. Costs must be separated and clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3.

Please review the updated Percentage of Work (POW) calculation details included in the DoD Program BAA. NGA will not accept any deviation to the POW requirements.

**Company Commercialization Report (CCR) (Volume 4)**
Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR Program BAA for full details on this requirement. Information contained in the CCR will be considered by NGA during proposal evaluations.

**Supporting Documents (Volume 5)**
All proposing small business concerns are REQUIRED to submit the following documents in Volume 5:

1. Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment
2. Disclosures of Foreign Affiliations or Relationships to Foreign Countries

Please refer to the DoD Program BAA for more information.

**PHASE II PROPOSAL GUIDELINES**
Phase II proposals may only be submitted by Phase I awardees. Small business concerns shall provide a proposal no later than 30 calendar days prior to the expiration of their NGA Phase I contract period of performance to be considered for a Phase II award. For improved continuity, NGA encourages Phase I awardees to submit their Phase II proposals 60 days prior to the expiration of their NGA Phase I contract period of performance.

Sequential Phase II proposals (for related work after completion of the initial NGA Phase II or Direct to Phase II contract) will normally be required within 30 calendar days of: 1) NGA's review of the provider's prototype and final report, 2) NGA's determination that additional work is desired and funding is available; and 3) NGA's determination that the required work is not suitable for a Phase III contract. NGA expects to complete these actions within 30 calendar days of final report receipt. The precise proposal due date will be annotated in Section F of the original Phase II or Direct to Phase II contract.

NGA may entertain Phase II proposals to continue related work on non-NGA Phase I contracts of interest, subject to the original government contracting entity's approval. There are no pre-established due dates for these proposals.

Phase II proposal format, content, and submission instructions are identical to those described in the "DIRECT TO PHASE II PROPOSAL INSTRUCTIONS" above, except that the Technical Volume will only contain a Technical Proposal of up to 20 pages. Do not submit Part A – Feasibility Documentation.

**DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)**

NGA does not provide TABA.

**EVALUATION AND SELECTION**
All Phase I proposals will be evaluated in accordance with the evaluation criteria listed in the DoD SBIR Program BAA.

The individual named as the Corporate Official on the Proposal Cover Sheet will receive an email for each proposal submitted from the NGA Contracting Officer/Specialist with their official notification of proposal selection or non-selection within 90 days of the closing date of the BAA or the timely submission date of their Phase II proposal. The notices will be binned into 3 categories: (1) proposals selected for award, (2) proposals not selected for award, and (3) disqualified proposals.

Refer to the DoD SBIR Program BAA 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: Joylene Burton at Joylene.U.Burton@nga.mil and Gregory Whaley at Gregory.L.Whaley@nga.mil.

**AWARD AND CONTRACT INFORMATION**

Unless otherwise stated in the individual topic announcement:

- Phase I awards are capped at $100,000 each over a maximum nine (9)-month period of performance.
- Phase II awards are capped at $1,000,000 each over a maximum 24-month period of performance.

NGA caps sequential Phase II contracts (those proposed near the completion of the initial Phase II or Direct to Phase II contract) at the then current Small Business Administration (SBA) "without seeking SBA approval" ceiling over a maximum 24-month period of performance. See https://www.sbir.gov/about for the most recent information.

NGA typically provides a firm fixed price contract for its awards within 180 days of the proposal due date. The type of contract is at the discretion of the Contracting Officer.

**ADDITIONAL INFORMATION**

**CONTROLLED UNCLASSIFIED INFORMATION (CUI)**

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

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

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

During performance of this contract, if the government provides the offeror a dataset that is not publicly released, the offeror must be CUI Compliant to receive it. For more information on this compliance please see DFARS Clauses 252.204.7008 and 252.204-7012, NIST Special Publication SP 800-171 and the National Archives and Records Administration (NARA) website (https://www.archives.gov/cui/about).

See each individual topic for guidance.

**NON-DISCLOSURE AGREEMENTS (NDA)**

Subject to any vetting of uncleared individuals involved in the project per the DoD SBIR Program BAA, all eligible contractor and subcontractor personnel requiring access to Protected Information and Computer Software shall sign an NDA prior to accessing such information. See 5X52.209-9003, Protection of Information and Nondisclosure Agreements (JUN 2009) below for additional details.

**INFORMATION HANDLING**

Contractor personnel will comply with the NGA, DoD, and IC policies and regulations (to include, but not limited to, the CoNGA Security Classification Guide) to properly mark (to include portion marking) classified and unclassified documentation, media, etc.

Markings will be in accordance with the lowest security classification possible to ensure the confidentiality and integrity for the greatest release to partners in accordance with NGA and mission partner marking guides for classified information.

Information management will be in accordance with applicable security policy and regulations, and NGA compliance documents.

All Government-furnished information released to the Contractor or created in the performance of this contract will be destroyed or returned by the Contractor to NGA upon contract termination or when no longer required for contract performance. The determination to destroy or return will be at the direction of the NGA CO or COR.

**CLASSIFIED WORK PERFORMANCE SECURITY REQUIREMENTS (Not applicable to UNCLASSFIED ONLY contracts)**

Contractor personnel performing Top Secret/Sensitive Compartmented Information (TS/SCI) work on the SBIR contract are required to have active TS/SCI clearances for access to NGA facilities, when performing duties within TS/SCI environments, and for access to TS/SCI NGA computer systems. Contractors are subject to a Counterintelligence Polygraph as requested by the Government. NGA will sponsor TS/SCI security clearances, NGA Badges, Common Access Cards (CAC) and other items (example: parking hangtag) for required contract personnel.

Contractors must abide by the DD Form 254 - Contract Security Classification Specification and applicable security policies and regulations.

Contractor personnel shall follow all applicable NGA, IC, and DoD information security and operational security policies and guidance when accessing and transmitting data over networks during performance of agreement requirements.

The contractor shall inform the Government when its employees no longer support the contract (see DD254). The Government desires notification prior to the day the individual no longer supports the contract, but requires notification no later than the day support ends. If contractor personnel will no longer be supporting NGA via an NGA contract, any debriefing paperwork, notifications, and/or requests for further direction from the COR or Industrial Security shall be turned into the NGA Workforce Support Center, NGA Site Security Office, or the COR. If contract personnel are unable to turn these items into the NGA Workforce Support Center, NGA Site Security Office, or COR then it is the contractor's security office's responsibility to collect the items from the individual. If the contractor debriefs the employee, the contractor shall send a copy of the debriefing statement, plus any Government items (i.e. NGA Badge, CAC, Courier Card, parking hangtags, etc.) within four (4) business days (timeline may be extended with authorized documented exceptions by NGA Security) to an NGA Site Security Office or the NGA Workforce Support Center.

All classified work performed at a non-NGA facility must be approved by the COR.

Cleared contractor personnel may be authorized to hand-carry contract-related classified information as authorized by the COR. Contract personnel will obtain NGA courier authorization prior to hand-carry of contract-related classified data. Contract personnel will be limited to hand-carry classified information between the contractor facilities and NGA facilities only.

Any classified work performed at collaborator sites must be performed in either an NGA accredited SCIF or an Other Government Agency (OGA) SCIF that has either a Memorandum of Agreement (MOA), Memorandum of Understanding (MOU), Joint Use Agreement or Co-Use Agreement with NGA for this contract.

Contract personnel are forbidden from bringing in prohibited, unauthorized, and/or Portable Electronic Devices (PEDs) items into any NGA installation or any office/working location covered under this agreement. A list of PEDs includes but is not limited to cell phones, cameras, two-way pagers, laptops, recorders (digital, tape, etc.), flash drives, or any other kind of removable media, without prior approval and approval paperwork from NGA. See NGA instructions/regulations/policy for a full list of prohibited and unauthorized items. Security violation repercussions will be determined on the severity of the violation.

**DISCLOSURE OF INFORMATION**

(1) 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-

(a) The Contracting Officer has given prior written approval;
(b) The information is otherwise in the public domain before the date of release; or
(c) 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).

(2) 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.

(3) 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.**

**Clauses**

**52.204-7 System for Award Management.**

As prescribed in 4.1105(a)(1), use the following provision:

SYSTEM FOR AWARD MANAGEMENT (OCT 2018)

(a) Definitions. As used in this provision—

"Electronic Funds Transfer (EFT) indicator means a four-character suffix to the unique entity identifier. The suffix is assigned at the discretion of the commercial, nonprofit, or Government entity to establish additional System for Award Management records for identifying alternative EFT accounts (see subpart 32.11) for the same entity.

*Registered in the System for Award Management (SAM)* means that–

(1) The Offeror has entered all mandatory information, including the unique entity identifier and the EFT indicator, if applicable, the Commercial and Government Entity (CAGE) code, as well as data required by the Federal Funding Accountability and Transparency Act of 2006 (see subpart 4.14) into SAM

(2) The offeror has completed the Core, Assertions, and Representations and Certifications, and Points of Contact sections of the registration in SAM;

(3) The Government has validated all mandatory data fields, to include validation of the Taxpayer Identification Number (TIN) with the Internal Revenue Service (IRS). The offeror will be required to provide consent for TIN validation to the Government as a part of the SAM registration process; and

(4) The Government has marked the record "Active".

*Unique entity identifier* means a number or other identifier used to identify a specific commercial, nonprofit, or Government entity. See www.sam.gov for the designated entity for establishing unique entity identifiers.

(b)

(1) An Offeror is required to be registered in SAM when submitting an offer or quotation, and shall continue to be registered until time of award, during performance, and through final payment of any contract, basic agreement, basic ordering agreement, or blanket purchasing agreement resulting from this solicitation.

(2) The Offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "Unique Entity Identifier" followed by the unique entity identifier that identifies the Offeror's name and address exactly as stated in the offer. The Offeror also shall enter its EFT indicator, if applicable. The unique entity identifier will be used by the Contracting Officer to verify that the Offeror is registered in the SAM.

(c) If the Offeror does not have a unique entity identifier, it should contact the entity designated at www.sam.gov for establishment of the unique entity identifier directly to obtain one. The Offeror should be prepared to provide the following information:

(1) Company legal business name.

(2) Tradestyle, doing business, or other name by which your entity is commonly recognized.

(3) Company physical street address, city, state, and Zip Code.

(4) Company mailing address, city, state and Zip Code (if separate from physical).

(5) Company telephone number.

(6) Date the company was started.

(7) Number of employees at your location.

(8) Chief executive officer/key manager.

(9) Line of business (industry).

(10) Company headquarters name and address (reporting relationship within your entity).

(d) Processing time should be taken into consideration when registering. Offerors who are not registered in SAM should consider applying for registration immediately upon receipt of this solicitation. See https://www.sam.gov for information on registration.

(End of Provision)

**52.204-27 Prohibition on a ByteDance Covered Application.**

As prescribed in 4.2203, insert the following clause:

PROHIBITION ON A BYTEDANCE COVERED APPLICATION (JUN 2023)

(a) *Definitions.* As used in this clause—

*Covered application* means the social networking service TikTok or any successor application or service developed or provided by ByteDance Limited or an entity owned by ByteDance Limited.

*Information technology*, as defined in 40 U.S.C. 11101(6)—

(1) Means any equipment or interconnected system or subsystem of equipment, used in the automatic acquisition, storage, analysis, evaluation, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency, if the equipment is used by the executive agency directly or is used by a contractor under a contract with the executive agency that requires the use—

(i) Of that equipment; or

(ii) Of that equipment to a significant extent in the performance of a service or the furnishing of a product;

(2) Includes computers, ancillary equipment (including imaging peripherals, input, output, and storage devices necessary for security and surveillance), peripheral equipment designed to be controlled by the central processing unit of a computer, software, firmware and similar procedures, services (including support services), and related resources; but

(3) Does not include any equipment acquired by a Federal contractor incidental to a Federal contract.

(b) *Prohibition*. Section 102 of Division R of the Consolidated Appropriations Act, 2023 (Pub. L. 117-328), the No TikTok on Government Devices Act, and its implementing guidance under Office of Management and Budget (OMB) Memorandum M-23-13, dated February 27, 2023, "No TikTok on Government Devices" Implementation Guidance, collectively prohibit the presence or use of a covered application on executive agency information technology, including certain equipment used by Federal contractors. The Contractor is prohibited from having or using a covered application on any information technology owned or managed by the Government, or on any information technology used or provided by the Contractor under this contract, including equipment provided by the Contractor's employees; however, this prohibition does not apply if the Contracting Officer provides written notification to the Contractor that an exception has been granted in accordance with OMB Memorandum M-23-13.

(c) *Subcontracts*. The Contractor shall insert the substance of this clause, including this paragraph (c), in all subcontracts, including subcontracts for the acquisition of commercial products or commercial services.

(End of clause)

**5X252.204-7000-90 PUBLIC RELEASE OF INFORMATION (MAR 2023)**

(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 completing an NGA Form 5230-1 and without Contracting Officer approval, when submission of such information is 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.

(End of Clause)

**5X52.209-9003: PROTECTION OF INFORMATION AND NONDISCLOSURE AGREEMENTS (JUN 2009)**

(a) Definitions. As used in this clause only:

(1) Protected Information and Computer Software means, unless specifically excluded by paragraph below, all information and computer software, in any form or media, that in the course of performing work under this contract are disclosed to the Contractor, its subcontractors, or their employees, or to which those persons otherwise are given access to, by:

(i) NGA,

(ii) Other government agencies,

(iii) Foreign governments, or

(iv) Other contractors while directly supporting NGA, which is accompanied by written legends identifying use or disclosure restrictions or disclosed under circumstances that the Contractor knows are subject to use or disclosure restrictions established in writing by the Government.

(2) Protected Information and Computer Software does not include information that:

(i) Has been released to the general public through no action of the undersigned in breach of this agreement or through no action of any other party in breach of any other obligation of confidentiality owing to the Government or the owner of the protected information or computer software;

(ii) Has been lawfully obtained by the recipient outside the course of the performance of this contract;

(iii) Has been properly licensed or provided directly by the owner (or other authorized source) of the information or computer software to the recipient to the extent so licensed or provided;

(iv) Is owned by the recipient or was developed independently of the disclosure hereunder; or

(v) Has been disclosed to the recipient by the Government with explicit authorization to use or disclose the information for another purpose, to the extent so authorized.

(b) Use and disclosure restrictions. The Contractor shall use and disclose Protected Information and Computer Software only as necessary for the performance of the requirements of this contract. Protected Information and Computer Software may not be used or disclosed for any other purpose, including bid or proposal preparation or business marketing, without the written approval of the Contracting Officer. Furthermore, unless otherwise directed by the Contracting Officer, the Contractor shall comply with all restrictions set forth in any legends, licenses or instructions provided to the Contractor or accompanying Protected Information and Computer Software or other written directives of the Government known to the Contractor. The use and disclosure obligations imposed by this paragraph shall expire as follows:

(1) There shall be no expiration date for the following Protected Information and Computer Software:

(i) Technical data or computer software containing Limited Rights, Restricted Rights, Government Purpose Rights, Special License Rights, or Unlimited Rights legends;

(ii) information or software marked Limited Distribution (LIMDIS);

(iii) information or software marked Source Selection Information;

(iv) contract proposal information marked pursuant to FAR 52.215-1(e) limiting its use for proposal evaluation purposes only;

(v) information and computer software marked Contractor Proprietary or a similar legend;

(vi) data known by the Contractor to be protected by the Privacy Act; and

(vii) information and software marked Controlled Unclassified Information (CUI) or For Official Use Only (FOUO).

(2) For other information or software accompanied at time of disclosure by a written legend identifying use or disclosure restriction time periods, the expiration date shall be as stated in or derived from the legend.

(3) For all other Protected Information and Computer Software, the expiration date shall be 3 years from the date the information or software is first disclosed to the Contractor.

Notwithstanding the above obligations, the Contractor is not in breach of this agreement if the Contractor uses or discloses Protected Information and Computer Software in response to an order of a court or administrative body of competent jurisdiction, but only to the extent permitted by that authority and only if the Contractor gives the Contracting Officer, to the extent practical, notice of the tribunal's order before the use or disclosure is made that allows NGA a reasonable time to object to the order.

(c) Unauthorized Use or Disclosure. The Contractor shall immediately notify the Contracting Officer of any unauthorized use or disclosure known by the Contractor of Protected Information and Computer Software in violation of the obligations contained in this clause.

(d) Disposition. At the conclusion of performance of work under this contract, the Contractor shall immediately return to the Government all Protected Information and Computer Software in its possession. Furthermore, if an employee of the Contractor who has had access to Protected Information and Computer Software is terminated or reassigned and thus is no longer performing work under this contract, the Contractor shall immediately return all Protected Information and Computer Software in the employee's possession. Moreover, if a Contractor's employee is dedicated to support a specific NGA Office or Directorate or NGA program under this contract, but is subsequently reassigned to support another NGA Office or Directorate or NGA program under this contract, the Contractor shall immediately return all Protected Information or

Computer Software in the employee's possession previously furnished by the prior NGA Office or Directorate or NGA program. In lieu of returning Protected Information and Computer Software, the Contracting Officer or Contracting Officer's representative may authorize the destruction of the information or the transfer of the information to another employee of the Contractor working under the contract. Finally, this clause shall not be interpreted as preventing the Contractor from retaining records required by statutes or other clauses of this contract, such as FAR 52.215-2 Audit and Records--Negotiations.

(e) Third party beneficiaries. This clause is executed for the benefit of the Government and the owners of Protected Information and Computer Software. The Government and the owners of Protected Information and Computer Software (and their delegatees, successors and assignees) are third party beneficiaries of the obligations contained in this clause who, in addition to any other legal rights they may have, are intended to have the rights of direct action against the Contractor or any person to whom the Contractor has disclosed or released Protected Information and Computer Software, to seek damages from any breach of this clause, or to otherwise enforce this clause.

(f) Duration. The above obligations imposed by this clause shall survive the termination or completion of this contract.

(g) Classified Information. This clause is in addition to and in no manner abrogates requirements, obligations or remedies regarding the protection of classified information and does not supersede the requirements of any laws, regulations, other directives or nondisclosure agreements regarding classified information.

(h) Other Restrictions. This agreement does not abrogate any other obligations currently placed upon the Contractor or which may be imposed upon the Contractor in the future by the Government or other persons; or remedies afforded those persons regarding those obligations.

(i) Nondisclosure agreements. The Contractor shall require and ensure that each of its employees who may receive or be given access to Protected Information and Computer Software signs the nondisclosure agreement provided by attachment to this contract prior to the employee performing work under this contract covered by the nondisclosure agreement. The Contractor shall maintain copies of signed nondisclosure agreements for a period of at least three years after final payment under this contract. At the direction of the Contracting Officer, the Contractor shall make those agreements available for inspection by the Contracting Officer and will furnish the Contracting Officer copies of those agreements at no additional cost to the Government if requested by the Contracting Officer.

(j) The Contractor shall include the substance of this clause in all subcontracts under this contract in which subcontractors may be disclosed or granted access to Protected Information and Computer Software.

(End of Clause)

**5X52.227-9000 UNAUTHORIZED USE OF NGA NAME, SEAL AND INITIALS (JUN 2006)**

(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.

(End of Clause)

**5X52.232-9000: Submission of Invoice-Federal Payment Center (FPC) (OCT 2017) – For use in contracts paid by the FPC vendor pay office.**

(a) The contractor shall prepare each invoice in accordance with the Prompt Payment Act and email one copy of the invoice to the DOD/FPC Scott AFB, IL at FMFOINSP@nga.mil. The DOD/FPC at Scott AFB, IL requires an email copy, but will accept a hard copy that is mailed to Federal Payment Center, P.O. Box 25767, Scott AFB, IL 62225.

(b) At the same time of submission of the invoice to the FPC vendor pay office, the contractor shall fax or email one copy to **[Contracting Officer]**, and one copy to **[Contracting Officer Representative]**. The contractor shall ensure that the invoice submitted to the payment office is the same invoice that is submitted to the CO and the COR without alteration.

(c) Upon receipt of the invoice, the COR will complete the receiving report and submit via the RRPT database tool. A copy of the completed receiving report shall also be provided to the Contracting Officer shown on the face of this contract/order.

(d) Contractors wishing to check the payment status of their vouchers may do so by calling FPC Vendor Support at 636-321-5251. In addition, questions may be directed to the Contracting Officer’s Representative (COR). In the absence of a COR, contact the Procurement Contracting Officer (PCO), whose name and contact information appear on the face page of this contract/order.

(End of Clause)

**5X52.237-9001 CONTRACTOR IDENTIFICATION (JAN 2012)**

The contractor shall ensure that contractor personnel, including their sub-contractor personnel, identify themselves as contractor personnel, by introducing themselves or being introduced as contractor personnel when:

(1) attending meetings with Government personnel or contractors performing under a contract awarded to support NGA requirements,

(2) answering government telephones,

(3) providing any type of written or electronic mail correspondence, and

(4) working in any other situation where their actions could be construed as an official Government act or representation of the Government.

The contractor shall ensure that contractor personnel possess and properly display Government-issued identification badges when on NGA property or when attending NGA meetings not located on NGA property.

The contractor will ensure that contractor personnel, when performing in a contractor capacity, refrain from using their retired or reserve component military rank or title in all written and verbal communications.

The Government may include the results of the contractor's ability to adhere to this clause in quality assurance surveillance plans and award fee plans as part of the overall administration of this contract.

(End of Clause)

**5X52.37-9000 Contractor Employee Data for Access to NGA Facilities or Sensitive Systems (OCT 2005)**

1. This clause defines the contractor's responsibilities for providing accurate contractor data, and providing updates to that data, for NGA's Human Capital Management System (HCMS). NGA requires that all contractors provide initial and timely updates to HCMS data for all personnel performing under this contract who have access to NGA facilities or sensitive systems, as determined by the contracting officer.

2. The Contractor shall:

a. Provide the Contracting Officers Representative (COR) a Point of Contact (POC) for providing and maintaining contractor personnel data for the HCMS database. The POC shall be provided to the COR, in writing, within 10 days of contract award (or modification inserting this clause). For contracts with an on-site Project Lead or Program Manager, this person shall serve as the POC.

b. Provide the COR initial HCMS data for their personnel within 10 days of contract award or modification. The information that is to be provided for HCMS shall include: persons full legal name, social security number, citizenship status, NGA contract number, prime contractor name, NGA location and organization where the person will be working, and a 24/7 emergency contact point for the contractor.

c. Notify the COR of all contractor data changes within 10 days of the change. Changes include new or departing contractor personnel and any change to information provided in paragraph b above. If the contract number under which a contractor or its personnel work changes, the POC for the contract receiving the personnel shall notify the COR within 10 days of the change.

d. Provide response to all inquiries made by NGA as to the validity and completeness of contractor data records in the HCMS database within two weeks of date of request.

e. Ensure all employees attend in-processing and out-processing briefings.

(End of Clause)

**5X52.246-9000 - Contractor Compliance with all applicable National Geospatial-Intelligence Agency (NGA) and U.S. Government installation regulations, directives,**

**instructions, rules, policies and procedures. (MAR 2023)**

A. The Contractor shall comply with, and shall ensure that its personnel, to include subcontractors, comply with all applicable NGA regulations, directives, instructions, rules, policies and procedures. The Contractor may request copies from the Contracting Officer's Representative (COR), the Contracting Officer or their designated representative(s).

B. The Contractor shall comply with, and shall ensure that its personnel, to include subcontractors, comply with regulations, directives, instructions, rules, policies, procedures and other applicable requirements issued by the U.S. Government Installation Commander where NGA is a tenant activity, including, but not limited to, those relating to force protection, security, health and safety. The Contractor may request copies from the Contracting Officer's Representative (COR), the Contracting Officer or their designated representative(s).

C. The Contractor shall institute and implement an effective program to ensure their employees and subcontractors, comply with all applicable requirements in accordance with paragraphs A and B above as well as paragraphs E and H below.

D. The specific requirements covered in paragraphs A, B, E, and H may be specified in the Performance Work Statement, elsewhere in the contract, or in NGA and/or Government installation regulations, directives, instructions, rules, policies and procedures. Specific requirements may include, but are not limited to categories such as:

- Security in/out processing
- Personnel in/out processing
- Facility access, parking, and in/out processing
- Information technology access and in/out processing
- PeopleSoft access, updates and in/out processing
- Periodic and special training requirements

E. Facility Access and Badging. The following criteria must be met in order to be issued an NGA IC badge and to gain access to an NGA-controlled facility:

(1) NGA IC badges will only be issued to those contractors who provide direct charge support on an active TS/SCI NGA contract, even when seated at corporate locations outside of NGA Government facilities. Green badges must be used at least once during a one-month period at an NGA Government facility. Failure to use an NGA IC badge may result in suspension or termination of the badge for lack of activity. The badges will expire at the end of the supported contract. Note: NGA IC badges will not be issued to any contractor who does not need access to an NGA facility, i.e., Corporate VIPs, etc. Infrequent visitors must report to the Visitor's Center.

(2) Notwithstanding the above, NGA badges will be issued to contractors, who are required by contract, to gain access to an NGA facility in the event of an emergency or when after-hours access is required. The Government POC or Contracting Officer's Representative (COR) coordinates the submission of an application for an NGA badge; establishment of a PeopleSoft

record of SCI accesses; completion of NGA Form 5212- 7A, “Request for Identification/Building Access Picture Badge”; and submission of the application to the appropriate Site Security Office for approval. (Reference NGA Instruction 5210.8, Physical Security Program)

F. The Contracting Officer may direct the Contractor, at its own expense, to remove and replace any Contractor personnel who fail to comply with or violate applicable requirements of this clause. Such action may be taken at the Government’s discretion without prejudice to its rights under any other provision of this contract, including the Termination for Default clause.

G. The Contracting Officer may include the results of the Contractor’s ability to adhere to this clause in past performance reports, quality assurance surveillance plans and award fee plans as part of the overall administration of this contract.

H. NGA Inspector General.

(1) The contractor must report to the NGA Inspector General (IG), DoDIG, or Intelligence Community IG any and all possible violations of federal law or illegal intelligence activities related to this contract by individuals charging directly or indirectly to this contract.

(2) The IG shall have access to any individual charging directly or indirectly to this contract whose testimony is needed for the performance of the IG’s duties. In addition, the IG shall have direct access to all records, reports, audits, reviews, recommendations, documents, e-mails, papers, or other material that relate to this contract with respect to which the IG has responsibilities. Failure on the part of any contractor to cooperate with the IG shall be grounds for administrative action by the Director, Office of Contract Services, including contractual remedies.

(3) NGA contractors and contractor personnel may report suspected instances of improper conduct through the NGA IG Hotline. Contractors shall make their employees aware of this Hotline: 571-557-4849, secure 578-4849, or toll free 1-800-380-7729 or by contacting the OIG at IG@nga.mil or secure at IG@nga.ic.gov.

(4) The contractor agrees to include the substance of this clause in all subcontracts exceeding the simplified acquisition threshold except those for commercial products or commercial services and those where the NGA association must be protected.

(5) This requirement is supported in the Federal Acquisition Regulation (FAR) clause 52.203-13, which requires timely disclosure to the Government of credible evidence of violation of law, and timely and complete response to OIG requests for documents and access to employees and information.

(6) This requirement is supported in NGA policy. NGAI 7410.1 requires all personnel, to include contractors, to cooperate fully with NGA OIG audits, inspections, and investigations.

(End of Clause)

***END***

# OSD-NGA SBIR 24.2 Topic Index

OSD242-D001 TITLE: KLV-Enhanced Orthomosaic Image Generation from Full Motion Video (FMV)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Advanced Computing and Software

OBJECTIVE: Develop an algorithm to build accurate georegistered orthomosaic images from full motion video (FMV) by leveraging a combination of the video stream and Key-Length-Value (KLV) metadata stream. The method must work under typical FMV collection use cases including changing zoom levels, changing imaging modalities, rapid slewing, on-screen display obscuring pixels, and occasional data corruption.

DESCRIPTION: FMV, as a critical component of intelligence, surveillance, and reconnaissance (ISR) operations, generates video feeds with embedded KLV metadata containing essential geospatial and temporal information. The KLV metadata typically conforms to the MISB 0601 standard [1]. This SBIR topic focuses on harnessing this metadata to improve the accuracy of orthomosaic images [2]. Recognizing that neither the video stream nor the metadata stream alone suffices for accurate orthomosaic computations, this SBIR effort specifically addresses the challenges associated with the fusion of video and KLV metadata to build orthomosaics under typical operating conditions.

The KLV metadata stream offers crucial platform and camera pose information, guiding the georegistered mosaic construction process. However, its accuracy falls short for pixel-level alignment. While image-based mosaicking achieves subpixel alignment accuracy, it often lacks a holistic geospatial context and proves inadequate in scenarios involving rapid camera movements, zooming, or changes in image modality (e.g., electro-optical (EO) to infrared (IR)). The primary objective of this SBIR topic is to effectively fuse information from the KLV metadata, onscreen metadata and video sources, aiming to construct the most accurate georegistered orthomosaic.

In addition to KLV, metadata is frequently visually presented as on-screen text for FMV operators. In situations where KLV metadata is absent but on-screen metadata is available, the use of Optical Character Recognition (OCR) algorithms is highly recommended to extract metadata values directly from the images. Furthermore, algorithms developed under this SBIR initiative should ensure that on-screen text does not corrupt the appearance of the constructed mosaic [3].

Given that FMV operators often switch between multiple sensing modalities (e.g., EO and IR), the mosaicking algorithm should seamlessly operate across dominating modalities. The resulting mosaic should feature distinct output layers for each modality within the input FMV, avoiding the blending of images across modalities.

Using the constructed mosaic in mensuration workflows requires the mosaic to be orthorectified. For accurate orthorectification in nonplanar terrain, a Digital Elevation Model (DEM) is needed [4]. Recognizing that accurate and up-to-date DEMs may not exist at the resolution of the FMV, offerors may need to derive or update a higher resolution DEM directly from the video stream to ensure improved accuracy in orthorectification processes. This SBIR effort aims to address these challenges comprehensively, advancing the capabilities of orthomosaic generation in the context of dynamic FMV scenarios.

PHASE I: This topic is intended for technology proven ready to move directly into a Phase II. Therefore, a Phase I award is not required. The offeror is required to provide detail and documentation in the Direct-to-Phase II proposal, which demonstrates accomplishment of a Phase I-like effort, including a feasibility study. This includes a review of the scientific and technical merit and feasibility of proposed ideas. The offeror should be able to demonstrate existing capabilities for working with KLV metadata encoded in

FMV and video mosaic construction. The offeror should also demonstrate experience with OCR applied to imagery and orthorectification.

PHASE II: Implement a prototype system for constructing georegistered orthomosaic images from FMV input that combines KLV metadata and video stream image registration. Demonstrate improved accuracy and reliability over using either metadata or image registration alone. Demonstrate robustness in FMV with EO imagery modality with short IR interruptions (insertions), fast slewing or zooming cameras, FMV with on-screen metadata but no KLV, intermittent data corruption, and complex scene terrain not captured in available DEMs. All prototype development is considered Controlled Unclassified Information (CUI), subject to DFARS Clause 252.204.7012 and DoDI 5200.48. Phase II may require classified (SECRET) work to evaluate algorithms on operational data.

PHASE III DUAL USE APPLICATIONS: Technology enabling accurate orthomosaic generation from aerial video would be widely applicable across the government and commercial sectors. The technology may be adapted to other airborne or satellite sensors providing both imagery and metadata. Military applications include national security, targeting, and intelligence. Commercially, it will apply to urban planning, environmental monitoring, search and rescue, and all other domains that benefit from orthomosiacs from video.

REFERENCES:

1. Motion Imagery Standards Board (MISB). https://nsgreg.nga.mil/misb.jsp
2. Zhang, Jiguang, et al. "Aerial orthoimage generation for UAV remote sensing." Information Fusion 89 (2023): 91-120.
3. Dawkins, Matthew, Amitha Perera, and Anthony Hoogs. "Real-time heads-up display detection in video." 2014 11th IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS). IEEE, 2014.
4. Bannari, Abderrazak, et al. "Multi-scale analysis of DEMS derived from unmanned aerial vehicle (UAV) in precision agriculture context." 2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS. IEEE, 2021.


KEYWORDS: Orthomosaic Generation, Full Motion Video (FMV), KLV Metadata, Mosaicking, On-Screen Text Removal, OCR, Geospatial Analysis.

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