

DEPARTMENT OF THE NAVY (DON)
19.3 Small Business Innovation Research (SBIR)
Direct to Phase II Announcement and Proposal Submission Instructions

IMPORTANT

- DON is soliciting proposals against three distinct types of topics:
 - Technology Acceleration – N193-A01 through N193-A03
 - Standard – N193-138 through N193-149
 - Direct to Phase II – N193-D01 – N193-D03

Each set of topics has a separate and unique set of proposal submission instructions.

The following instructions apply to Direct to Phase II (DP2) topics only.

- DON provides notice that Other Transaction Agreements (OTAs) may be used for Phase II awards.
- Discretionary Technical Assistance (DTA) was renamed Discretionary Technical and Business Assistance (TABA) for the SBIR 19.2 BAA.
- The optional Supporting Documents Volume (Volume 5) is available for the SBIR 19.3 BAA cycle. The optional Supporting Documents Volume is provided for small businesses to submit additional documentation to support the Technical Volume (Volume 2) and the Cost Volume (Volume 3). Volume 5 is available for use when submitting Phase I and Phase II proposals. DON will not be using any of the information in Volume 5 during the evaluation.

INTRODUCTION

The Director of the DON SBIR/STTR Programs is Mr. Robert Smith. For program and administrative questions, contact the Program Managers listed in Table 1; **do not** contact them for technical questions. For technical questions about a topic, contact the Topic Authors listed for each topic during the period **23 August 2019 through 23 September 2019**. Beginning **24 September 2019**, the SBIR/STTR Interactive Technical Information System (SITIS) (<https://sbir.defensebusiness.org/>) listed in Section 4.15.d of the Department of Defense (DoD) SBIR/STTR Program Broad Agency Announcement (BAA) must be used for any technical inquiry. For general inquiries or problems with electronic submission, contact the DoD SBIR/STTR Help Desk at 1-800-348-0787 (Monday through Friday, 9:00 a.m. to 6:00 p.m. ET) or via email at sbirhelpdesk@u.group.

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

<u>Topic Numbers</u>	<u>Point of Contact</u>	<u>SYSCOM</u>	<u>Email</u>
N193-D01 and N193-D02	Ms. Donna Attick	Naval Air Systems Command (NAVAIR)	donna.attick@navy.mil
N193-D03	Mr. Shadi Azoum	Naval Information Warfare Systems Command (NAVWAR)	shadi.azoum@navy.mil

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

During government fiscal years (FY) 2012 through 2022, the Department of Defense (DoD) including the Department of the Navy (DON) may issue an award to a small business concern (SBC) under Phase II of the SBIR program with respect to a project, without regard to whether the small business concern was provided an award under Phase I of an SBIR program with respect to such project. Prior to such an award, the head of the agency, or their designee, must issue a written determination that the SBC 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 SBCs 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 topics.

Each eligible 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 SBC 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 SBC 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 SBCs to submit a Full DP2 Proposal. Demonstrating proof of feasibility is a requirement for a DP2 award. The SBC must submit a Phase I Feasibility Proposal to be considered for selection to submit a Full DP2 Proposal.

STEP TWO: Prepare and Submit a Full DP2 Proposal. If selected, the cognizant SYSCOM Program Office will contact the SBC directly to provide instructions on how to submit a Full DP2 Proposal.

DON SBIR reserves the right to refuse to make any awards under this DP2 BAA. All awards are subject to availability of funds and successful negotiations. Proposers are to read the topic requirements carefully. The Government is not responsible for expenditures by the proposer prior to award of a contract. For 19.3 topics designated as DP2, DON will accept only Phase I Feasibility Proposals (described below).

DP2 PROPOSAL SUBMISSION REQUIREMENTS

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

- **Eligibility.** Each proposing firm 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 section 4.2 of the DoD SBIR/STTR Program BAA
 - During the Phase II award, primary employment of the principal investigator (PI) must be with the SBC 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 SBC
 - Register in the System for Award Management (SAM) as defined in section 4.16 of the DoD SBIR/STTR Program BAA. To register, visit www.sam.gov
- **Proposal Cover Sheet (Volume 1).** As specified in DoD SBIR/STTR BAA section 5.4(a).
 - **Technical Volume (Volume 2).** Technical Volume (Volume 2) must meet the following requirements:
 - Not to exceed **50** 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*

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

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

The Technical Volume (Volume 2) should include the following sections:

- Phase I Proof of Feasibility (NTE 35 pages)
 1. Introductory Statement
 2. Phase I Proof of Feasibility
 3. Assertions
 4. Commercialization Potential/Transition Plan Summary
- Snapshot of Proposed Phase II Effort (NTE 15 pages)
 1. Description of Proposed DP2 Technical Effort and Objectives
 2. DP2 Work Plan
 3. Key Personnel Resume – should be submitted for the Principal Investigator and up to 4 additional individuals. Resumes are limited to one page per person, and should be limited to only information relevant to the work to be performed under the project
 4. Subcontractors/Consultants
 5. Order of Magnitude Cost Estimate Table

It is recommended that proposers follow the DP2 Phase I Feasibility Template as a guide for structuring the DP2 Phase I Feasibility proposal. The template is located on https://www.navysbir.com/links_forms.htm.

Disclosure of Information (DFARS 252.204-7000)

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

- **Cost Volume (Volume 3).** Cost information for the proposed effort must be answered in the Cost Volume of the DoD Submission system (at <https://sbir.defensebusiness.org>), however, no separate cost volume upload for the DON SBIR Phase I Feasibility Proposal is required. Include a cost estimate in the Order of Magnitude Cost Estimate Table in the Technical Volume (Volume 2). Please refer to the table below for guidance. 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).

Base		Option One		Total (NTE)
Cost (NTE)	POP (NTE)	Cost (NTE)	POP (NTE)	
\$800,000	24 mos.	\$300,000	12 mos.	\$1,100,000

- **Company Commercialization Report (Volume 4).** As specified in DoD SBIR/STTR BAA section 5.4(e).
- **Supporting Documents Volume (Volume 5).** DoD has implemented a Supporting Documents Volume (Volume 5). The optional Volume 5 is provided for small businesses to submit additional documentation to support the Technical Volume (Volume 2) and the Cost Volume (Volume 3). Volume 5 is available for use when submitting Phase I and Phase II proposals. DON will not be using any of the information in Volume 5 during the evaluation. Volume 5 must only be used for the following documents:
 - Letters of Support relevant to this project
 - Additional Cost Information - The “Explanatory Material” field in the online DoD Cost Volume (Volume 3) is to be used to provide sufficient detail for subcontractor, material, travel costs, and Discretionary Technical and Business Assistance (TABAs), if proposed. If additional space is needed these items may be included within Volume 5.
 - SBIR/STTR Funding Agreement Certification
 - Technical Data Rights (Assertions) - If required, must be provided in the table format required by DFARS 252.227-7013(d) and (e)(3) and be included within Volume 5.
 - Allocation of Rights between prime and subcontractor
 - Disclosure of Information (DFARS 252.204-7000) (see Technical Volume 2 above)

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

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

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

DON SBIR PHASE I PROPOSAL SUBMISSION CHECKLIST

- **Subcontractor, Material, and Travel Cost Detail.** In the Cost Volume (Volume 3), proposers must provide sufficient detail for subcontractor, material and travel costs. Enter this information in the “Explanatory Material” field in the online DoD Volume 3. Subcontractor costs must be detailed to the same level as the prime contractor. Material costs must include a listing of items and cost per item. Travel costs must include the purpose of the trip, number of trips, location, length of trip, and number of personnel. When a proposal is selected for award, be prepared to submit further documentation to the SYSCOM Contracting Officer to substantiate costs (e.g., an explanation of cost estimates for equipment, materials, and consultants or subcontractors).
- **Performance Benchmarks.** Proposers must meet the two benchmark requirements for progress toward Commercialization as determined by the Small Business Administration (SBA) on June 1 each year. Please note that the DON applies performance benchmarks at time of proposal submission, not at time of contract award.

Discretionary Technical and Business Assistance (TABA). If TABA is proposed, the information required to support TABA (as specified in the TABA section below) must be added in the “Explanatory Material” field of the online DoD Volume 3. If the supporting information exceeds the character limits of the Explanatory Material field of Volume 3, this information must be included in Volume 5 as “Additional Cost Information” as noted above. Failure to add the required information in the online DoD Volume 3 and, if necessary, Volume 5 will result in the denial of TABA. TABA may be proposed for a DP2 effort, but the total value may not exceed \$25,000 under this DP2 contract.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The SBIR Policy Directive section 9(b) allows the DON to provide TABA (formerly referred to as DTA) to its awardees. The purpose of TABA is to assist awardees in making better technical decisions on SBIR/STTR projects; solving technical problems that arise during SBIR/STTR projects; minimizing technical risks associated with SBIR/STTR projects; and commercializing the SBIR/STTR product or process, including intellectual property protections. Firms may request to contract these services themselves through one or more TABA provider 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 \$1,600,000 or lower limit specified by the SYSCOM). The amount proposed for TABA cannot include any profit/fee application by the SBIR/STTR awardee and must be inclusive of all applicable indirect costs. A Phase II project may receive up to an additional \$25,000 for TABA as part of one additional (subsequent) Phase II award under the project for a total TABA award of up to \$50,000 per project.

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

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

TABA must **NOT**:

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

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

- Phase II: The value of the TABA request must be included in the Order of Magnitude Cost Estimate Table in the Snapshot of Proposal Phase II Effort section of the Technical Volume (Volume 2). The detailed request for TABA (as specified above) must be included as a note in the Order of Magnitude Cost Estimate Table and be specifically identified as “Discretionary Technical and Business Assistance”.

Proposed values for TABA must **NOT** exceed:

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

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

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

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

EVALUATION AND SELECTION

The DON will evaluate and select Feasibility and DP2 proposals using the evaluation criteria in Sections 6.0 and 8.0 of the DoD SBIR/STTR Program BAA respectively, with technical merit being most important, followed by qualifications of key personnel and commercialization potential of equal importance. As noted in the sections of the aforementioned Announcement on proposal submission requirements, proposals exceeding the total costs established for the Base and/or any Options as specified by the sponsoring DON SYSCOM will be rejected without evaluation or consideration for award. Due to limited funding, the DON reserves the right to limit awards under any topic.

Approximately one week after the DP2 BAA closing, e-mail notifications that proposals have been received and processed for evaluation will be sent. Consequently, the e-mail address on the proposal Cover Sheet must be correct.

Selected Phase I Feasibility proposers will be notified to submit Full DP2 Proposals. SYSCOM-specific Full DP2 Proposal guidance will be provided at the time of this notification.

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

Protests of the Phase I Feasibility evaluations and DP2 selections and awards must be directed to the cognizant Contracting Officer for the DON Topic Number, or filed directly with the Government Accountability Office (GAO). Contact information for Contracting Officers may be obtained from the DON SYSCOM Program Managers listed in Table 1. If the protest is to be filed with the GAO, please refer to instructions provided in section 4.11 of the DoD SBIR/STTR Program BAA.

CONTRACT DELIVERABLES

Contract deliverables are typically progress reports and final reports. Required contract deliverables must be uploaded to <https://www.navybirprogram.com/navydeliverables/>.

AWARD AND FUNDING LIMITATIONS

Awards. The DON typically awards a Cost Plus Fixed Fee contract for DP2; but, may consider other types of agreement vehicles, such as an Other Transaction Agreement (OTA) as specified in 10 U.S.C. 2371/10 U.S.C. 2371b and related implementing policies and regulations. DP2 awards can be structured in a way that allows for increased funding levels based on the project's transition potential. To accelerate the transition of SBIR/STTR-funded technologies to Phase III, especially those that lead to Programs of Record and fielded systems, the Commercialization Readiness Program was authorized and created as part of section 5122 of the National Defense Authorization Act of Fiscal Year 2012. The statute set-aside is 1% of the available SBIR/STTR funding to be used for administrative support to accelerate transition of SBIR/STTR-developed technologies and provide non-financial resources for the firms (e.g., the DON STP).

TOPIC AWARD BY OTHER THAN THE SPONSORING AGENCY

Due to specific limitations on the amount of funding and number of awards that may be awarded to a particular firm per topic using SBIR/STTR program funds (see above), Head of Agency Determinations are now required (for all awards related to topics issued in or after the SBIR 13.1/STTR 13.A solicitations) before a different agency may make an award using another agency's topic. This limitation does not apply to Phase III funding. Please contact the original sponsoring agency before submitting a Phase II proposal to an agency other than the one that sponsored the original topic. (For DON awardees, this includes other DON SYSCOMs.)

TRANSFER BETWEEN SBIR AND STTR PROGRAMS

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

ADDITIONAL NOTES

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: <http://www.onr.navy.mil/About-ONR/compliance-protections/Research-Protections/Human-Subject-Research.aspx>. This webpage provides guidance and lists approvals that may be required before contract/work can begin.

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).

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. Thus, a Phase III award is any contract, grant, or agreement where the technology is the same as, derived from, or evolved from a Phase I or a Phase II SBIR/STTR award and given to the firm that received the Phase I/II award. This covers any contract, grant, or agreement issued as a follow-on Phase III award or any contract, grant, or agreement award issued as a result of a competitive process where the awardee was an SBIR/STTR firm that developed the technology as a result of a Phase I or Phase II award. The DON will give Phase III status to any award that falls within the above-mentioned description, which includes assigning SBIR/STTR Technical Data Rights to any noncommercial technical data and/or noncommercial computer software delivered in Phase III that was developed under SBIR/STTR Phase I/II effort(s). Government prime contractors and/or their subcontractors must follow the same guidelines as above and ensure that companies operating on behalf of the DON protect the rights of the SBIR/STTR firm.

NAVY SBIR 19.3 Direct to Phase II Topic Index

N193-D01	DIRECT TO PHASE II - On Demand Training Solutions for Maintenance Technicians
N193-D02	DIRECT TO PHASE II - Multiple UAV Launch, Recovery, and Storage Module for Deployment at Sea
N193-D03	DIRECT TO PHASE II – Resilient Tactical Communications Using Interference Mitigation Techniques

N193-D01

TITLE: DIRECT TO PHASE II - On Demand Training Solutions for Maintenance Technicians

TECHNOLOGY AREA(S): Air Platform, Human Systems

ACQUISITION PROGRAM: PMA-205, Naval Aviation Training Systems

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

OBJECTIVE: Adaptive training environments with deployable training for maintenance are applicable to general and commercial aviation communities. Further, programs for training aviation maintainers, which includes high school magnet programs through college degree programs, would benefit from this type of interactive and standardized training. It is likely that similar technology would transition to other maintenance type trades, include automobile mechanics as well. Finally, with space exploration and commercialization advancing, providing just-in-time training for complex, unique, and rarely used tasks are likely to be in high-demand training in the future.

DESCRIPTION: It is all too common for a Sailor to go through "A" school and "C" school, receive advanced training and earn a Navy Enlisted Classification (NEC), only to spend years away from the system he was taught to maintain, performing unrelated work. This is often the case when Sailors go to shore duty, and then return to an operational unit where the skills they once had have become eroded. While the Navy is working toward extending first shore tours to provide more experience to maintainers early in their careers, providing on demand training capabilities throughout the training pipeline to include operational tours is critical for minimizing skill decay and ensuring proficiency at the time skills are required. [Ref 6] Further complicating the matter is a pendulum shift to increase pilots' monthly flight hours to increase readiness. As noted by Deputy Commandant for Aviation Lt. Gen. Steven Rudder: "While there's still no direct link between low readiness rates and causation to Class A mishap rates, we continue to believe a true metric of health of naval aviation is aircrew flight hours. Well trained, practiced aviators react to malfunctions and difficult circumstances far better and are much less likely to make mistakes, which in turn allow them to react in a fluid situation or unforeseen event."

Rear Adm. Roy Kelley, commander of Naval Air Forces Atlantic, said, "Class C mishaps, which involve \$50,000 to \$500,000 in damages to aircraft or a nonfatal injury, have doubled in the Navy since 2012." [Ref 6] Ensuring that maintainers have the tools required to react to maintenance issues is a crucial part of addressing the cause-or-effect relationship maintenance has in mishap incidence. Previous efforts by the Navy to invest in readiness-builders, including increased inventory of spares, maintenance, and logistics, have shown positive gains. [Ref 6] However, investment in ready relevant training solutions and capabilities for assessing performance of skills are necessary. This topic seeks the development of a training environment that will provide refresher training normally left up to the operational command. Naval Aviation Squadrons face this training problem whenever sailors return from shore duty, and an elegant system for refresher training would save training dollars and improve readiness. Initiatives like Sailor 2025 are scratching the surface by identifying updates to schedules for formal, milestone training and providing tools that allow maintainers to focus on topic-based training and standardized recurring refresher training at the squadron level. Introduction of training at this level fills a gap associated with infrequent maintenance tasks, complex maintenance repairs, and emerging recurring maintenance trends. It is possible that the resulting technology may be incorporated into the Navy Marine Corp Internet (NCMI) arena and will therefore need to meet Information Assurance (IA) requirements as illustrated in the Refs 4 & 5. Additional information will be provided to performers during the Phase II.

This Direct to Phase II SBIR topic addresses refresher training for aircraft maintenance technicians who have completed tours of duty away from the system for which an NEC was earned. Specifically, the Navy seeks an approach that combines the benefits of hands-on training, computer-based instruction support and performance

assessment into a single, immersive solution. Further, a solution that incorporates objective assessment of proficiency based on training performance and job experiences would expand the use of the system to support readiness tracking, management of personnel, and refinement of training curricula. Training curricula will be explored as part of the Phase II in coordination with transition partners and will be made available during Phase II.

PHASE I: Design a proof-of-concept technology that integrates benefits of hands on training, computer based instruction support and performance assessment. The proposed design should integrate (1) job aiding solutions that delivers expert systems advising maintainers on diagnostic and repair procedures in context, and (2) a training technology solution leveraging computer-based training, hands on training opportunities, and performance assessment, to develop sailor knowledge of diagnostic strategies and system components. During development, adhere to the Risk Management Framework guidelines [Refs 4 & 5] to support information assurance compliance.

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. It must have developed a concept for a workable prototype or design to address at a minimum the basic requirements of the stated objective. The below actions would be required in order to successfully satisfy the requirements of Phase I:

- Determined the technical feasibility of integrating (1) job aiding solutions that deliver expert systems advising maintainers on diagnostic and repair procedures in context, and (2) a training technology solution leveraging computer-based training and hands-on training opportunities.
- Determined the technical feasibility of applying integrated performance assessment capabilities.
- Demonstrated a training solution that integrates hands-on training, computer-aided instruction and performance assessment to develop sailor knowledge of diagnostic strategies and system components.
- Determined the feasibility of the technology meeting Risk Management Framework guidelines [Ref 4] to support cybersecurity compliance.

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, but feasibility documentation **MUST NOT** be 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 proposer and/or the principal investigator (PI). Read and follow all of the DON SBIR 19.3 Direct to Phase II BAA Instructions. Phase I Proposals will **NOT** be accepted for this BAA.

PHASE II: Develop a prototype of the integrated training system. Consider and adhere to the Risk Management Framework guidelines during the development to support information assurance compliance. [Refs 4-5]

PHASE III DUAL USE APPLICATIONS: Develop hardened system architecture and complete the Risk Management Framework process to gain cybersecurity accreditation for system deployment. Integrate transition-specific content for initial training capability transition.

Adaptive training environments with deployable training for maintenance are applicable to general and commercial aviation communities. Further, programs for training aviation maintainers, which include high school magnet programs through college degree programs, would benefit from this type of interactive and standardized training. It is likely that similar technology would transition to other maintenance type trades, include automobile mechanics. Finally, with space exploration and commercialization advancing, providing just-in-time training for complex, unique, and rarely used tasks are likely to be in high-demand in the future.

REFERENCES:

1. Dzikovska, M. O., Steinhauser, N., Farrow, E., Moore, J.D., and Campbell, G.E. "BEETLE II: Deep natural language understanding and automatic feedback generation for intelligent tutoring in basic electricity and electronics." *International Journal of Artificial Intelligence in Education: Volume 24, Issue 3, September 2014*, pp. 284-332. <https://link.springer.com/article/10.1007%2Fs40593-014-0017-9>
2. Durlach, P.J., & Lesgold, A.M. (Eds.) "Adaptive Technologies for Training and Education." Cambridge, UK: Cambridge University Press, 2012, pp. 289-302. <https://www.cmu.edu/dietrich/sds/ddmlab/papers/Gonzalez2012.pdf>
3. De Crescenzo, Francesca, Fantini, Massimiliano, Persiani, Franco, Di Stefano, Luigi, Azzari, Pietro, and Salti, Samuele. "Augmented Reality for Aircraft Maintenance Training and Operations Support." *IEEE Computer Graphics and Applications, Volume 31, Issue 1, Jan-Feb 2011*. http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5675633&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D5675633
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KEYWORDS: Maintenance Training; Maintenance Readiness; Just in Time Training; Adaptive Training; Mixed Methods Training; Performance Assessment

Questions may also be submitted through DOD SBIR/STTR SITIS website.

N193-D02 TITLE: DIRECT TO PHASE II - Multiple UAV Launch, Recovery, and Storage Module for Deployment at Sea

TECHNOLOGY AREA(S): Air Platform, Ground/Sea Vehicles

ACQUISITION PROGRAM: NAE Chief Technology Office

OBJECTIVE: Develop technology for autonomously launching, recovering, storing, and recharging multiple small, unmanned aerial vehicles (UAVs) on a moving unmanned surface vehicle (USV) in rough water. Develop the technology for use in a variety of different missions on different types of surface vehicles.

DESCRIPTION: Currently, the Navy utilizes Unmanned Aerial Vehicles (UAVs) in a number of situations where having a human pilot is dangerous, inefficient, or otherwise undesirable. As the technology to control multiple UAVs improves, groups of UAVs will be deployed into a wider range of potential missions. One potential application is for use in counter-small boat applications. In this scenario, once identification and initial classification of a potential threat is completed, the UAVs would be tasked to fly to the expected location of the potential threats. Once there, they would perform further identification and communication with the rest of the naval forces. At the end of operations, they would return to their home USV for stowage and recharging. Additionally, they may also be replaced and returned to base if their battery charge is low.

This topic focuses on the design of a modular system that stores the UAVs when not in use, and performs the necessary actions to prepare them for launch and recovery after mission completion. Currently, the Navy does not have a system in place to operate multiple UAVs from a USV or small manned vessel efficiently. While there are a variety of UAVs of different sizes, each comes with its own launch, recovery, and storage equipment taking up valuable deck space. Further, these systems require some level of human involvement. From manually setting up the launching system to actually steering the UAV into the air, none of the systems currently in use by the Navy is fully autonomous for launch and recovery operations. The new system should automate launch, recovery, storage, and recharging of multiple UAVs for use in a variety of missions, including the counter-small boat application described previously. This system should provide a convenient means of storing multiple UAVs, and must utilize one or several of the Joint Military Intermodal Containers (JMVIC) for attachment to a USV or any other vessel for transporting the system, given the JMVIC's open hardware interfaces.

There could potentially be several different types of UAVs stored in the system; however, it can be assumed that only one type at a time would be stored, but the type of UAV could change between missions. All possible types will be capable of performing vertical take-off and landings (VTOL) and be battery operated. An example of one possible set of characteristics for the possible UAVs is the ability to fly at 60 knots out a distance of 5 nautical miles, hover on station for 10 minutes, and then return home. However, the exact performance characteristics may change. Regardless of the UAV type, the system should store at least 3 UAVs.

The system should also use open, modular interfaces to connect to the mission computer. This connection is how the system receives information on when to launch UAVs and how many to launch. It receives this request and then autonomously performs the steps necessary to prepare the UAVs for launch. This could be one at a time or multiple at once. The system will then interface with the mission controller to acknowledge that the UAV(s) is ready for launch. Additionally, it must provide any relevant status to the mission controller, such as number of UAVs currently stored. The mission controller, mission execution, and UAV flight controls are not part of this solution and could be a counter-small boat mission or a variety of other options.

As the UAVs conclude their missions, due to low battery or mission completion, the mission controller will steer the UAVs back towards the system. The controller and the system again interact using open interfaces so the controller and system can successfully recover the UAVs. At this point, the UAVs are then stored and recharged for use in later missions.

All portions of the system, particularly launching and recovering, should be operable while the surface vessel or USV is underway and on rough seas. Because of the wide range of possible missions, it is important that the system is capable of launching and recovering different numbers of UAVs at different times. In other words, the launch and recovery solution should not be an all-or-nothing system where all the UAVs are in use or are all stored. Different UAVs may be coming and going at different times as the mission dictates. Additionally, this system must operate completely autonomously, as there are cases where it would be located on other unmanned vehicles. Finally, the system should be able to integrate with and operate from a USV or small manned vessel that is deployable from a parent ship.

A definitive requirements guide is in development. Use the following MIL-STDs for guidance purposes until specific requirements documentation is available; MIL-STD-810, particularly 505.6, 506.6, 507.6, 508.7, 509.6, 514.7, 516.7; MIL-STD-1568; MIL-STD-7179; MIL-STD-889 [Refs 3–7].

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. It must have 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 successfully satisfy the requirements of Phase I:

- Designed and developed a system to perform end-to-end handling of multiple UAVs (recovery, storage, recharging, and launching again) in naval environments
- Determined and demonstrated the technical feasibility of a system capable of performing all aspects of end-to-end handling of multiple UAVs (recovery, storage, recharging, and launching again) in naval environments, including

rough sea states and a moving host vessel.

FEASIBILITY DOCUMENTATION: Proposers interested in participating in Direct to Phase II must include in their responses to this topic Phase I feasibility documentation that substantiates the scientific and technical merit and Phase I feasibility described in Phase I above has been met (i.e., the small business must have performed Phase I-type research and development related to the topic, but feasibility documentation **MUST NOT** be solely based on work performed under prior or ongoing federally funded SBIR/STTR 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 proposer and/or the principal investigator (PI). Read and follow all of the DON SBIR 19.3 Direct to Phase II BAA Instructions. Phase I Proposals will **NOT** be accepted for this BAA.

PHASE II: Based upon the work documented in the Phase I Proposal, build a system prototype and prove the end-to-end handling of multiple UAVs (launching, recovery, storage, recharging, and launching again) in realistic environments such as wave pools, motion simulators, or on water. The system prototype should also demonstrate its ability to integrate on to small vessels and/or USVs.

PHASE III DUAL USE APPLICATIONS: Perform final testing that involves integration into the rest of the Multi-Domain Autonomous Defense Against Surface Swarms (MADASS) effort and demonstration on an actual USV. Ensure that this testing demonstrates and verifies the full mission capability of the system. Transition the completed system for use on appropriate platforms.

This technology will provide a convenient way to store, launch, and recover groups of rotary wing UAVs; therefore, search and rescue, disaster response, entertainment, recording, sports, or other applications requiring a large number of UAVs would benefit from the development of this technology.

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KEYWORDS: Unmanned Aerial Vehicles; UAV; Launch and Recovery; Autonomy; Modular Storage; Open Interface; Unmanned Surface Vehicle; USV

Questions may also be submitted through DOD SBIR/STTR SITIS website.

N193-D03 TITLE: DIRECT TO PHASE II – Resilient Tactical Communications Using Interference Mitigation Techniques

TECHNOLOGY AREA(S): Air Platform, Battlespace, Electronics

ACQUISITION PROGRAM: Multifunctional Information Distribution System (MIDS) Program of Record, ACAT 1C

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

OBJECTIVE: Develop and demonstrate an Interference Mitigation prototype Very High-Speed Integrated Circuit Hardware Description Language (VHDL) design to operate on Multifunctional Information Distribution System (MIDS) terminals using specified frequencies. Assess design requirements and conduct initial hardware testing and lab demonstration.

DESCRIPTION: The modern communication field is characterized by the networking, Internet Protocol (IP)-ready capability, long range with limited transmit power, high throughput and high Anti-Jam (AJ) resistance. At the same time, Moore's law brought a substantial increase in computational capabilities at the lower power consumption needed for the tactical communications systems, thus making the implementation of these new computationally complex algorithms possible [Ref 1]. However, advancement of increased computational capabilities has also provided the opportunity for adversaries to develop capabilities that can potentially degrade or inhibit communications for military systems on relevant operational environments.

The Navy seeks mature (Technology Readiness Level (TRL) 5 or higher) innovative interference mitigation algorithms solutions that can be implemented in Field Programmable Gated Array (FPGA) to improve communications resilience in a contested/degraded operational environments and demonstrated via a prototype for transition into a MIDS Program Of Record (PoR). The effort should include the assessment of existing software algorithms and should be accompanied by detailed analysis and/or simulations that allow for comparison of performance of the proposed algorithms with current algorithms, and estimates of the computational requirements. The selected interference removal solution(s) should not degrade the link and should demonstrate significant performance during software and hardware simulation, prototyping, and testing. In addition, algorithm parameters should be developed and identified that will be used for a future link layer algorithm that allows for trades to be made between adversarial and friendly nodes to preserve interconnectivity and data dissemination capability. Of higher interest are mature technology solutions (TRL6 or higher) that are efficient in utilization of FPGA resources, have low latency (i.e., 10uS or less) and the ability to separate both signal of interest and interferer, and are able to output both signals.

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

safeguard classified material IAW DoD 5220.22-M during the advanced phases of this contract. SPAWAR will process the DD254 to support the contractor for personnel and facility certification for secure access.

PHASE I: Feasibility documentation MUST NOT be solely based on work performed under prior or ongoing federally funded SBIR/STTR work. Demonstrating proof of feasibility is a requirement for a Direct to Phase II award.

For this Direct to Phase II topic, the Government expects that the small business would have accomplished the following in a Phase I-type effort:

- Surveyed existing algorithms and established base figure of merits for proposing two algorithms – one implementable in General Purpose Processor (GPP) and another implementable in FPGA.
- Established simulations required to establish the Eb/N0 figure of merit for the proposed algorithm modulations, codeword size and coding rates, included in Additive Gaussian White Noise (AWGN) environments.

FEASIBILITY DOCUMENTATION: Offerors interested in proposing to this Direct to Phase II topic must include in their response Phase I feasibility documentation that substantiates the scientific and technical merit; proof that 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, but feasibility documentation must not be 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 Phase I-type development of technology as stated 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).

PHASE II: Produce, deliver, and implement (in software) prototypes for the proposed algorithms, encompassing both the design of the encoding and decoding algorithms. Conduct evaluations primarily by simulation and testing the algorithms against the required modulations and the emulated threat signal sets. (Note: The Government, at its discretion, may also provide threat signal data for testing. Likewise, the Government may also opt to conduct independent testing at a Government facility at Government expense.) After successful software implementation and performance, integrate proposed algorithms on an actual Software Defined Radio (SDR) hardware to demonstrate successful MIDS Joint Tactical Radio System (JTRS) TRL6 performance on a relevant laboratory environment. Assess FPGA resources required for final integration into targeted SDR FPGA hardware. Evaluate the performance of the algorithms based on efficient utilization of FPGA resources (less than 10% desired), latency (less than 10uSec required), Eb/N0 [Ref 2] and ability to separate both signal of interest and interferer(s) at a TRL6. Prepare a Phase III development plan to transition the technology for Navy and potential commercial use. Partnership with MIDS prime vendors is encouraged.

It is likely that the work under this effort will be classified under Phase II (see Description section for details). Though Phase II work may become classified, the Direct to Phase II proposal will be UNCLASSIFIED.

PHASE III DUAL USE APPLICATIONS: Support the Navy in transitioning the algorithms to Navy use. Further refine finished algorithms to ensure software coded, validated, documented, and information assurance (IA) compliance according to the Phase III development plan for evaluation to determine their figures of merit. Perform test and validation to certify and qualify software and firmware components for Navy use. Implement in the form of fast, efficient algorithms that, once proven, can be coded in software defined radios. Support or license the final product and transition to the Government. Partnership with prime vendors is encouraged.

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KEYWORDS: Data Links; Software Defined Radio; Algorithms; Figures of Merits; Interference

Questions may also be submitted through DOD SBIR/STTR SITIS website.