

## VERSION 2

### DEPARTMENT OF THE NAVY (DON) 21.A Small Business Technology Transfer (STTR) Proposal Submission Instructions

#### IMPORTANT

- **The following instructions apply to STTR topics only:**
  - N21A-T001 through N21A-T018
- **The information provided in the DON Proposal Submission Instruction document takes precedence over the DoD Instructions posted for this Broad Agency Announcement (BAA).**
- **DON Phase I Technical Volume (Volume 2) page limit to not exceed 10 pages.**
- **Proposers that are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF) or any combination of these are eligible to submit proposals in response to DON topics advertised in this BAA. Information on Majority Ownership in Part and certification requirements at time of submission for these proposers are detailed in the section titled ADDITIONAL NOTES.**
- A Phase I proposal template specific to DON topics will be available to assist small businesses to generate a Phase I Technical Volume (Volume 2). The template will be located on [https://www.navysbir.com/links\\_forms.htm](https://www.navysbir.com/links_forms.htm).
- The DON provides notice that Basic Ordering Agreements (BOAs) may be used for Phase I awards, and BOAs or Other Transaction Agreements (OTAs) may be used for Phase II awards.
- The Supporting Documents Volume (Volume 5) is available for the STTR 21.A BAA cycle. The 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 Program Manager of the DON STTR Program is Mr. Steve Sullivan. For program and administrative questions, contact the SYSCOM Program Manager listed in [Table 1](#); **do not** contact them for technical questions. For technical questions about a topic, contact the Topic Authors listed within the topic during the Pre-release period. During the Open period the DoD SBIR/STTR Topic Q&A platform (<https://www.dodsbirsttr.mil/submissions>) must be used for any technical inquiry. Review section 4.13 of the Department of Defense (DoD) SBIR/STTR Program Broad Agency Announcement (BAA) for further information related to Direct Contact with Topic Authors and the Topic Q&A platform. For general inquiries or problems with electronic submission, contact the DoD SBIR/STTR Help Desk at 1-703-214-1333 (Monday through Friday, 9:00 a.m. to 5:00 p.m. ET) or via email at [dodsbirsupport@reisystems.com](mailto:dodsbirsupport@reisystems.com).

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**TABLE 1: DON SYSTEMS COMMAND (SYSCOM) STTR PROGRAM MANAGER**

<u>Topic Numbers</u>	<u>Point of Contact</u>	<u>SYSCOM</u>	<u>Email</u>
N21A-T001	Mr. Jeffrey Kent	Marine Corps Systems Command (MCSC)	jeffrey.a.kent@usmc.mil
N21A-T002 to N21A-T004	Ms. Donna Attick	Naval Air Systems Command (NAVAIR)	navair.sbir@navy.mil
N21A-T005 to N21A-T008	Mr. Dean Putnam	Naval Sea Systems Command (NAVSEA)	dean.r.putnam@navy.mil
N21A-T009 to N21A-T018	Mr. Steve Sullivan	Office of Naval Research (ONR)	steven.sullivan@navy.mil

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

### PHASE I GUIDELINES

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

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

### PHASE I PROPOSAL SUBMISSION REQUIREMENTS

The following SHALL BE MET or the proposal will be REJECTED for noncompliance.

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

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

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

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

### **Disclosure of Information (DFARS 252.204-7000)**

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

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

- **Cost Volume (Volume 3).** The Phase I Base amount must not exceed \$140,000 and the Phase I Option amount must not exceed \$100,000. Costs for the Base and Option must be separated and clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3.
- **Period of Performance.** The Phase I Base Period of Performance must be exactly six (6) months and the Phase I Option Period of Performance must be exactly six (6) months.
- **Company Commercialization Report (Volume 4).** DoD requires Volume 4 for submission to the 21.A Phase I BAA. Please refer to instructions provided in section 5.4.e of the DoD SBIR/STTR Program BAA.
- **Supporting Documents (Volume 5).** Volume 5 is available for use when submitting Phase I and Phase II proposals.

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 proposals must include as a part of their**

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**submission a written certification in response to the NDAA clauses (Federal Acquisition Regulation clauses 52.204-24, 52-204-25 and 52-204-26).** 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 instructions provided in section 5.4.g of the DoD SBIR/STTR Program BAA.

A proposal that has an answer of “Yes” to any question regarding foreign investment disclosure in the Firm Certifications section of Volume 1 (Proposal Cover Sheet) must then include as part of their submission a Foreign Disclosure Addendum. The Foreign Disclosure Addendum can be found in Attachment 2 of the DoD SBIR/STTR Program BAA. The addendum, if required, must be completed by the authorized company representative and uploaded as a separate PDF file in Volume 5. Please refer to instructions provided in section 5.4.h of the DoD SBIR/STTR Program BAA.

Volume 5 is available for small businesses to submit additional documentation to support the Technical Proposal (Volume 2) and the Cost Volume (Volume 3). A template is available on [https://navysbir.com/links\\_forms.htm](https://navysbir.com/links_forms.htm). DON will not be using any of the information in Volume 5 during the evaluation.

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

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

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

- **Fraud, Waste and Abuse Training Certification (Volume 6).** DoD requires Volume 6 for submission to the 21.A Phase I BAA. Please refer to instructions provided in section 5.4.i of the DoD SBIR/STTR Program BAA.

### DON STTR 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).

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For Phase I a minimum of 40% of the work is performed by the proposing firm, and a minimum of 30% of the work is performed by the single research institution. The percentage of work is measured by both direct and indirect costs.

To calculate the minimum percentage of effort for the proposing firm the sum of all direct and indirect costs attributable to the proposing firm represent the numerator and the total proposals costs (i.e. costs before profit or fee) is the denominator. The single research institution percentage is calculated by taking the sum of all costs attributable to the single research institution as the numerator and the total proposal costs (i.e. costs before profit or fee) as the denominator.

- **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 in the Base and/or Option periods, but the total value may not exceed \$6,500 in Phase I.

### DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)

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

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

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

TABA must NOT:

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

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

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

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

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

NOTE: Section 9(b)(5) of the SBIR and STTR Policy Directive requires that a firm receiving technical or business assistance from a vendor during a fiscal year submit a report with a description of the technical or business assistance received and the benefits and results of the technical or business assistance provided. More information on the reporting requirements of awardees that receive TABA funding through the DON can be found on [https://www.navysbir.com/links\\_forms.htm](https://www.navysbir.com/links_forms.htm). Awardees that receive TABA funding through the DON will upload the report to <https://www.navysbirprogram.com/navydeliverables/>.

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

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

### EVALUATION AND SELECTION

The DON will evaluate and select Phase I and Phase II proposals using the evaluation criteria in Sections 6.0 and 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.

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

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

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

Protests to Phase I and Phase II selections and awards must be directed to the cognizant Contracting Officer for the DON Topic Number, or filed with the Government Accountability Office (GAO). Contact information or the 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 the instruction provided in section 4.11 of the DoD SBIR/STTR Program BAA.

### CONTRACT DELIVERABLES

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

### AWARD AND FUNDING LIMITATIONS

Awards. The DON typically awards a Firm Fixed Price (FFP) contract or a small purchase agreement for Phase I. In addition to the negotiated contract award types listed in Section 4.14.b of the DoD SBIR/STTR Program BAA for Phase II awards, the DON may (under appropriate circumstances) propose the use of an Other Transaction Agreement (OTA) as specified in 10 U.S.C. 2371/10 U.S.C. 2371b and related implementing policies and regulations. The DON may choose to use a Basic Ordering Agreement (BOA) for Phase I and Phase II awards.

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

### PAYMENTS

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

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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 STTR may transition in Phase II to SBIR and vice versa. Please refer to instructions provided in section 7.2 of the DoD SBIR/STTR Program BAA.

### ADDITIONAL NOTES

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

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

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

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

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

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

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

Support Contract Personnel for Administrative Functions. Proposers are advised that support contract personnel will be used to 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.

Partnering Research Institutions. The Naval Academy, the Naval Postgraduate School, and other military academies are Government organizations but qualify as partnering research institutions. However, DON laboratories DO NOT qualify as research partners. DON laboratories may be proposed only IN ADDITION TO the partnering research institution.

### PHASE II GUIDELINES

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

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

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

### PHASE III GUIDELINES

A Phase III SBIR/STTR award is any work that derives from, extends, or completes effort(s) performed under prior SBIR/STTR funding agreements, but is funded by sources other than the SBIR/STTR programs. This covers any contract, grant, or agreement issued as a follow-on Phase III award or any contract, grant, or agreement award issued as a result of a competitive process where the awardee was an SBIR/STTR firm

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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 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.

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### **NAVY STTR 21.A Topics**

N21A-T001	Military Uniform Fabric Produced with Hemp Fibers
N21A-T002	Commercial Scale Methods for Reclamation and Reuse of Carbon Fiber
N21A-T003	Combined Electro-Optics/Infrared and Radar Sensor System for Detect and Avoid of Non-Cooperative Traffic for Small Unmanned Aerial Systems
N21A-T004	Integrated High-Frequency Analog-to-Information Receiver
N21A-T005	Ground Fault Detection System
N21A-T006	Compact, Efficient 2-Band Underwater Optical Communications System
N21A-T007	Defect-Tolerant High-Temperature Superconductor for Coil Applications
N21A-T008	Low Cost High Performance Efficient Uncooled or Thermoelectric Cooled Night Vision (NV) Infrared (IR) Imaging System
N21A-T009	Organic Solar Cell Processing and Product Development
N21A-T010	Novel Acoustic Source Concepts for Target Identification and Classification
N21A-T011	Enhancement of Detonation Wave Dynamics in Rotating Detonation Combustors (RDC)
N21A-T012	Advanced Thermal Management of Power Converters
N21A-T013	Real-time Monitoring for Decompression Sickness
N21A-T014	Self-Healing Ship Systems
N21A-T015	Aerosol Spectral Absorption Measurement for Near UV through Near Infrared Wavelengths
N21A-T016	Peer-to-Peer Knowledge Sharing: Curation Automation Engine
N21A-T017	Compact Electric Compressors for Aerospace Applications
N21A-T018	Airborne Radar-Based Detection and Discrimination of Small Unmanned Aerial Systems and Birds For Collision Avoidance and Force Protection

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N21A-T001 TITLE: Military Uniform Fabric Produced with Hemp Fibers

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

TECHNOLOGY AREA(S): Materials / Processes

OBJECTIVE: Develop a higher performing uniform fabric using hemp fibers.

DESCRIPTION: Hemp fibers have been used for thousands of years in textile products such as sacks, ropes, and fishnets. Today, hemp fibers are woven into clothing, cordage, curtains, rope, carpets, burlap, sacking, and shoes. Clothing produced with hemp fibers are strong, UV and mold resistant, making it an excellent fiber for outdoor wear. Hemp, due to its propensity to have a rougher hand than some other natural fibers, such as cotton, is typically blended with other fibers for clothing end uses. Compared to cotton, hemp is more environmentally friendly and less costly to cultivate; it does not require pesticides or fertilizers, needs less water, and renews the soil with each growth cycle. Its long roots prevent erosion and help retain the topsoil. As a result of these favorable properties, university research within the United States into hemp plant production, fibers, and fabric is rising.

The desired end result would be a uniform fabric with significant performance benefits, compared to the current Marine Corps Combat Utility Uniform (MCCUU) fabric. The significant performance benefits may include, but not be limited to, a lower cost, lighter weight, more durable, more comfortable, and environmentally friendly fabric. The fabric would need to be produced with standard textile manufacturing processes and be Berry Amendment compliant. In order to demonstrate the performance benefits, the hemp-containing fabric would be compared to the existing uniform fabric (i.e., MCCUU fabric). The fabric should meet and exceed many of the requirements as defined in the MCCUU requirement document, the MCCUU Purchase Description [Ref 4]. Some fabric properties, such as a lower fabric weight and improved durability as compared to the current MCCUU fabric, are highly desired. A lighter weight uniform will reduce the load Marines need to carry and a more durable uniform will be less likely to fail (e.g., tear) in the field.

Additional desired attributes are the ability to provide vector protection (e.g., protection from insects), improved flame resistance (i.e., ability to self-extinguish), and camouflage protection beyond the current visual and near infrared requirement.

All hemp products must comply with 21 USC 802(16). Only hemp products containing less than 0.3 percent tetrahydrocannabinol (THC) on a dry weight basis are allowable.

PHASE I: Conduct research on and determine the performance levels of hemp fabric, as compared to existing MCCUU fabric. Validation/tests should demonstrate where the fabric meets and exceeds the MCCUU fabric requirements, as defined in the MCCUU Purchase Description [Ref 4]. Develop a Phase II plan for prototype production.

Provide at least one MCCUU set (blouse and trouser) or an equivalent amount of fabric to the Marine Corps for Marine Corps testing and evaluation.

PHASE II: Optimize the material properties based on Marine Corps evaluation results and feedback in Phase I, and scale up the production process to reduce manufacturing costs. Provide at least an additional 10 MCCUU sets to the Marine Corps for evaluation based on the performance criteria in the MCCUU Purchase Description.

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PHASE III DUAL USE APPLICATIONS: Demonstrate the suitability of the material in a clothing design and field evaluation. Integrate the material into relevant items for system level testing, evaluation, and demonstration. Provide at least 100 MCCUU sets to the Marine Corps for evaluation.

Commercial potential of this technology for use in durable outdoor wear is significant and may have a pronounced benefit to the United States garment industry as hemp-contained fabric could be used in cotton-blend clothing. The growth of hemp to support this industry would be more environmentally friendly and potentially have far lower cost due to lower demands for fertilizer and pesticides as compared to cotton.

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KEYWORDS: Hemp; MARPAT; MCCUU; military uniform

## VERSION 2

N21A-T002 TITLE: Commercial Scale Methods for Reclamation and Reuse of Carbon Fiber

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

TECHNOLOGY AREA(S): Air Platforms; Materials / Processes

OBJECTIVE: Design and develop methodologies to reclaim and reuse carbon fiber from in-process waste and scrap parts generated in the manufacturing of advanced aircraft, and from end-of-life aircraft.

DESCRIPTION: Manufacturing waste (pre-impregnated edge trimmings, trimmed cured composites, etc.) and scrap, generated during the manufacturing of advanced composite parts for aircraft and rotorcraft, is currently landfilled. This situation arises because there are no commercial methods to reclaim the fiber from these composites. Additionally, as current aircraft reach the end of service, they need to be deconstructed and recycled, by as high a degree as possible, rather than landfilled. Robust, commercial scale methods are sought for reclaiming carbon fiber from end-of-life parts, in-process excess materials, and scrap.

The scrap generated during advanced composite manufacturing consists largely of aerospace-grade carbon fiber and advanced thermoset resins, including epoxies and bismaleimides (BMI). Other materials may also be present, including but not limited to, fiberglass and aramid fibers, metallic fasteners, wires, and mesh. Any process proposed under this STTR topic must be capable of handling these non-ideal sources of carbon fiber [Refs 1, 5].

Any approach proposing to process the composites' waste, scrap parts, and end-of-life parts must be cost-effective and follow all appropriate environmental regulations. Business case analysis should include, but not be limited to, data such as cost, energy input, and CO<sub>2</sub> emission, as compared to current composite usage and disposal methods.

Once the carbon fiber is recovered from the composite waste and parts, it must be converted into raw material that would be of interest to the Navy and to non-military customers such as commercial aircraft, automotive, or sporting goods industries. Recovered carbon fibers can be continuous or discontinuous. Prototype demonstration of viable, large scale, composite forming processes is desired.

Although not required, it is highly recommended to work in coordination with the original equipment manufacturer (OEM) to ensure proper design and to facilitate transition of the final technology. It is also recommended that awardees to work directly with aircraft fabricators to determine the potential types and amounts of scrap and in-process excess materials to be processed.

PHASE I: Define and develop a pilot scale approach to reclaim carbon fiber from carbon fiber reinforced composites that is directly scalable to commercial practice. Candidate approaches should include processes for the deconstruction of waste and scrap composite materials, and for recovery and separation of fiber from the polymer matrix. The use of reclaimed fiber in making composite test parts should use multiple fabrication methods, and mechanical properties obtained from parts fabricated using the recycled material should be comparable to parts fabricated using its original non-recycled materials [Ref 2]. Data comparison of the developed recycling method to traditional composite waste disposal from a financial as well as an environmental perspective should be included. The Phase I effort will include any prototype plans to be developed under Phase II.

PHASE II: Demonstrate the methodology to reclaim and reuse carbon fiber from in-process waste and scrap with data to include, but not be limited to, cost, energy input, and CO<sub>2</sub> emissions versus current

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composite usage and disposal methods. Define and validate a process evaluation, process modeling, and process economics for the selected approach.

PHASE III DUAL USE APPLICATIONS: Finalize and mature the technology for transition and insertion into aircraft component fabricators and end-of-life aircraft processors. The technology developed under this STTR effort has direct applicability to the commercial aircraft industry. Other applications for this method may include the automotive industry. Remaining fibers that cannot be used in either aircraft or automotive may benefit sporting goods manufacturers.

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KEYWORDS: reusable; composites; waste; fibers; carbon fiber; recycling

## VERSION 2

N21A-T003      TITLE: Combined Electro-Optics/Infrared and Radar Sensor System for Detect and Avoid of Non-Cooperative Traffic for Small Unmanned Aerial Systems

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

TECHNOLOGY AREA(S): Air Platforms; Electronics

OBJECTIVE: Develop dual-sensor, electro-optics/infrared (EO/IR) and radar, non-cooperative, traffic sensor concepts that will provide sufficient performance and balanced size, weight, power, and cost (SWaP-C) for small unmanned aerial systems (sUAS) where sufficient performance is unachievable by any single-sensor concept.

DESCRIPTION: DAA cooperative sensors that have been developed for manned aircraft, for example, Traffic Collision Avoidance System (TCAS) and Automatic Dependent Surveillance-Broadcast (ADS-B), are nondevelopmental and off the shelf. Detect and avoid (DAA) non-cooperative sensor subsystems, which take the place of a pilot's eyes, are a new construct whose role and employment has not been previously defined. Airborne Collision Avoidance System Xu (ACAS Xu) is a new DAA technology being developed by the Federal Aviation Administration (FAA) that processes inputs from both cooperative and non-cooperative sensors and provides alerts to the UAS operator to Remain Well Clear (RWC), and in the future will provide automatic maneuvers. Radar is the only current sensor actively being procured by the Navy as a non-cooperative DAA sensor with Radio Technical Commission for Aeronautics (RTCA) Do-366 addressing radar's Minimum Operational Performance Standard (MOPS) in the National Air Space (NAS). No other non-cooperative sensor has a MOPS. The radar development and production costs are high and dependent on its assigned role and the associated performance requirements. As such, a complete assessment of SWaP-C must be included in the establishment of safety requirements. EO/IR sensors are a desired alternative due to potentially lower SWaP-C. They are currently being considered for non-cooperative traffic surveillance as a part of RTCA Special Committee 228; however, they have performance challenges in low-visibility conditions and difficulty estimating range and range rate measurements that are essential for projecting Closest Point of Approach (CPA) and Time of CPA (TCPA). There is interest by civilian authorities (e.g. Federal Aviation Administration) and by the Navy for a dual sensor EO/IR and radar non-cooperative traffic sensor that will provide sufficient performance, but with less SWaP-C. A camera alone is not sufficient nor suitable for integration with ACAS Xu due to these shortcomings, and a radar, capable of doing the job, would not fit on board. A lower performing radar, providing suitable range and bearing information, to be combined with an EO/IR sensor, to meet the stringent SWaP-C limitations of sUAS is desired. All airborne hardware should weigh less than 3 lbs (1.36 kg) (Threshold) and 12 oz (340.2 g) (Objective); and consume less than 64 in.<sup>3</sup> (0.00105 m<sup>3</sup>) (Threshold) and 27 in.<sup>3</sup> (0.000442451 m<sup>3</sup>) (Objective) of total space, with a power draw of less than 50 W average (Threshold) and 25 W average (Objective).

Critical evaluation criteria include the ability to provide sufficient tracking range and accuracy in order for an RQ-7 Shadow or RQ-21 Blackjack to avoid midair collisions and near midair collisions with other aircraft such as a Lancair Evolution, Cessna TTx, or Cessna 150. In general, radars provide highly accurate range and range rate information, but their angular resolution is inferior to EO/IR sensors. A dual-sensor system approach for sUAS must operate in lower altitude (<10,000 ft), overland environments, which present challenges for radar systems as slow-speed traffic may not separate well from the clutter and sources of false alarms. Likewise, performance of EO/IR systems suffer their own false-alarm problems, and performance is highly dependent on atmospheric conditions. An effective dual-sensor system must be able to detect and track targets in a range of atmospheric conditions, manage false alarms and clutter effects, and provide high enough accuracy to predict and avoid collisions. Such a system must consider multisensor data fusion approaches, multiband imaging system for all-weather

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operations, algorithms for mitigating false alarms and enhancing detection, sensor resource management (SRM) and feature-aided target characterization and tracking.

PHASE I: Design, develop, and demonstrate feasibility of dual-sensor detection, tracking, and false-alarm mitigation algorithms for expected operational environments and conditions. The Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Based on Phase I results, candidate concept(s) will be matured through more detailed, high-fidelity analyses and the development of dual-sensor detection, tracking, and false-alarm mitigation algorithms for expected operational environments and conditions. Examine sensor-integration concepts suitable for candidate sUAS. Assess hardware, software, and firmware impacts to accommodate the dual-sensor system, onboard candidate, sUAS. Identify critical technical challenges, perform necessary analysis, and as required, experimentation to understand the associated risk. The Phase II deliverable must provide a dual-sensor concept of sufficient detail to support the fabrication of a prototype demonstrator system.

PHASE III DUAL USE APPLICATIONS: Complete development, perform final testing, integrate, and transition the final solution to Navy airborne platforms. The dual sensor system is suitable for use on commercial small unmanned aircraft.

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