

DEPARTMENT OF THE NAVY (DON)
25.4 Small Business Innovation Research (SBIR)
OPEN & CONVENTIONAL TOPICS
Release 11
Phase I Proposal Submission Instructions

IMPORTANT

- The following dates apply to Open Topics, N254-P01 through N254-P03, and Conventional Topics, N254-122 through N254-124:
 - 6 August 2025: Topics issued for pre-release
 - 27 August 2025: DON begins accepting proposals
 - 10 September 2025: Topic Q&A closes to new questions
 - 24 September 2025: Full proposals due no later than 12:00 p.m. ET
- Information on virtual Topics Workshops for the Open Topics and Conventional Topics advertised in this BAA will be posted to www.navysbir.com on August 6.
- Information on virtual Office Hours related to the DON SBIR/STTR Programs can be found at <https://navysbir.com/noh25.htm>
- Submitting small business concerns are encouraged to thoroughly review the DoD SBIR/STTR Program Broad Agency Announcement (BAA) and register for the DSIP Listserv to remain apprised of important programmatic changes.
 - The DoD Program BAA is located at: <https://www.dodsbirsttr.mil/submissions/login>.
Select the tab for the appropriate BAA cycle.
 - Register for the DSIP Listserv at: <https://www.dodsbirsttr.mil/submissions/login>.
- The information provided in the DON Proposal Submission Instructions takes precedence over the DoD Instructions posted for this BAA.
- **DON Phase I Technical Volume (Volume 2) page limit is not to exceed 10 pages.**
- Proposing small business concerns that are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF) or any combination of these are eligible to submit proposals in response to DON topics advertised in this BAA. Information on Majority Ownership in Part and certification requirements at time of submission for these proposing small business concerns are detailed in the section titled ADDITIONAL SUBMISSION CONSIDERATIONS.
- Phase I Technical Volume (Volume 2) and Supporting Documents (Volume 5) templates, specific to DON topics, are available at https://www.navysbir.com/links_forms.htm.
- The DON provides notice that Basic Ordering Agreements (BOAs) may be used for Phase I awards, and BOAs or Other Transaction Agreements (OTAs) may be used for Phase II awards.
- This BAA is issued under regulations set forth in Federal Acquisition Regulation (FAR) 35.016 and awards will be made under “other competitive procedures”. The policies and procedures of FAR Subpart 15.3 shall not apply to this BAA, except as specifically referenced in it. All

procedures are at the sole discretion of the Government as set forth in this BAA. Submission of a proposal in response to this BAA constitutes the express acknowledgement to that effect by the proposing small business concern.

INTRODUCTION

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

Through this BAA, DON solicits Phase I proposals to Open Topics (numbered N254-P01 through N254-P03) and Conventional Topics (numbered N254-122 through N254-124).

For questions regarding this BAA, use the information in Table 1 to determine who to contact for what types of questions.

TABLE 1: POINTS OF CONTACT FOR QUESTIONS REGARDING THIS BAA

Type of Question	When	Contact Information
Program and administrative	Always	Navy SBIR/STTR Program Management Office usn.pentagon.cnr-arlington-va.mbx.navy-sbir-sttr@us.navy.mil or appropriate Program Manager listed in Table 2 or Table 3 (below)
Topic-specific technical questions	BAA Pre-release	Technical Point of Contact (TPOC) listed in each topic on the DoD SBIR/STTR Innovation Portal (DSIP). Refer to the Proposal Submission section of the DoD SBIR/STTR Program BAA for details.
	BAA Open	DoD SBIR/STTR Topic Q&A platform (https://www.dodsbirsttr.mil/submissions) Refer to the Proposal Submission section of the DoD SBIR/STTR Program BAA for details.
Electronic submission to the DoD SBIR/STTR Innovation Portal (DSIP)	Always	DSIP Support via email at dodsbirsupport@reisystems.com
Navy-specific BAA instructions and forms	Always	DON SBIR/STTR Program Management Office usn.pentagon.cnr-arlington-va.mbx.navy-sbir-sttr@us.navy.mil

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

<u>Topic Numbers</u>	<u>Point of Contact</u>	<u>SYSCOM</u>	<u>Email</u>
N254-122 and N254-123	Mr. Timothy Petro and Ms. Gladis Aispuro	Naval Facilities Engineering Center (NAVFAC)	timothy.j.petro4.civ@us.navy.mil and gladis.g.aispuro.civ@us.navy.mil

<u>Topic Numbers</u>	<u>Point of Contact</u>	<u>SYSCOM</u>	<u>Email</u>
N254-124	Mr. Jason Schroepfer	Naval Sea Systems Command (NAVSEA)	NSSC_SBIR.fct@navy.mil

TABLE 3: DON SYSTEMS COMMANDS (SYSCOM) SBIR PROGRAM MANAGERS

OPEN TOPICS

<u>Topic Numbers</u>	<u>Point of Contact</u>	<u>SYSCOM</u>	<u>Email</u>
N254-P01	Mr. Jeffrey Kent	Marine Corps Systems Command (MCSC)	smb_mesc_sbir_admins@usmc.mil
N254-P02	Mr. Jason Schroepfer	Naval Sea Systems Command (NAVSEA)	NSSC_SBIR.fct@navy.mil
N254-P03	Mr. Shadi Azoum	Naval Information Warfare Systems Command (NAVWAR)	info@navwarsbir.com

OPEN TOPIC SUBMISSIONS:

This release contains Open Topics (topics numbered N254-P01 through N254-P03). As outlined in section 7 of the SBIR and STTR Extension Act of 2022, innovation Open Topic activities—

- a. Increase the transition of commercial technology to the Department of Defense;
- b. Expand the small business nontraditional industrial base;
- c. Increase commercialization derived from investments of the Department of Defense; and
- d. Expand the ability for qualifying small business concerns to propose technology solutions to meet the needs of the Department of Defense.

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

A small business concern may only submit one (1) proposal to each Open Topic (topics numbered N254-P01 through N254-P03). If more than one proposal from a small business concern is received for a single Open Topic, only the most recent proposal to be certified and submitted in DSIP prior to the submission deadline will receive an evaluation. All prior proposals submitted by the small business concern for the same Open Topic will be marked as nonresponsive and will not receive an evaluation.

PHASE I SUBMISSION INSTRUCTIONS

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

(NOTE: Proposing small business concerns are advised that support contract personnel will be used to carry out administrative functions and may have access to proposals, contract award documents, contract

deliverables, and reports. All support contract personnel are bound by appropriate non-disclosure agreements.)

DoD SBIR/STTR Innovation Portal (DSIP). Proposing small business concerns are required to submit proposals via the DoD SBIR/STTR Innovation Portal (DSIP); and follow proposal submission instructions in the DoD SBIR/STTR Program BAA on the DSIP at <https://www.dodsbirsttr.mil/submissions>. Proposals submitted by any other means will be disregarded. Proposing small business concerns submitting through DSIP for the first time will be asked to register. It is recommended that small business concerns register as soon as possible upon identification of a proposal opportunity to avoid delays in the proposal submission process. Proposals that are not successfully certified electronically in DSIP by the Corporate Official prior to BAA Close will NOT be considered submitted and will not be evaluated by DON. Proposals that are encrypted, password protected, or otherwise locked in any portion of the submission will be REJECTED unless specifically directed within the text of the topic to which you are submitting. Please refer to the DoD SBIR/STTR Program BAA for further information.

Proposal Volumes. The following seven volumes are required.

- **Proposal Cover Sheet (Volume 1).** As specified in DoD SBIR/STTR Program BAA.
- **Technical Proposal (Volume 2)**
 - Technical Proposal (Volume 2) must meet the following requirements or the proposal will be REJECTED:
 - Not to exceed ten (10) pages, regardless of page content
 - Single column format, single-spaced typed lines
 - Standard 8 ½" x 11" paper
 - Page margins one inch on all sides. A header and footer may be included in the one-inch margin.
 - No font size smaller than 10-point
 - Include, within the ten-page limit of Volume 2, an Option that furthers the effort in preparation for Phase II and will bridge the funding gap between the end of Phase I and the start of Phase II. Tasks for both the Phase I Base and the Phase I Option must be clearly identified. Phase I Options are exercised upon selection for Phase II.
 - Work proposed for the Phase I Base must be exactly six (6) months.
 - Work proposed for the Phase I Option must be exactly six (6) months.
 - Additional information:
 - A Phase I proposal template specific to DON to meet Phase I requirements is available at https://navysbir.com/links_forms.htm
 - A font size smaller than 10-point is allowable for headers, footers, imbedded tables, figures, images, or graphics that include text. However, proposing small business concerns are cautioned that if the text is too small to be legible it will not be evaluated.
- **Cost Volume (Volume 3).**
 - Cost Volume (Volume 3) must meet the following requirements or the proposal will be REJECTED:
 - The Phase I Base amount must not exceed \$140,000.
 - Phase I Option amount must not exceed \$100,000.
 - Costs for the Base and Option must be separated and clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3.

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

NOTE: G&A, if proposed, will only be attributed to the proposing small business concern.
 - Subcontractor Costs (numerator for subcontractor calculation):
 - Total Subcontractor Costs (TSC)
 - Total Cost (i.e., Total Cost before Profit Rate is applied, denominator for either calculation)
- **Cost Sharing: Cost sharing is not accepted on DON Phase I proposals. A value above or below \$0.00 entered in the Cost Sharing field will not be considered in the Phase I contract award.**
- Additional information:
 - Provide sufficient detail for subcontractor, material, and travel costs. Subcontractor costs must be detailed to the same level as the prime contractor. Material costs must include a listing of items and cost per item. Travel costs must include the purpose of the trip, number of trips, location, length of trip, and number of personnel.
 - Inclusion of cost estimates for travel to the sponsoring SYSCOM's facility for one day of meetings is recommended for all proposals.
 - The "Additional Cost Information" of Supporting Documents (Volume 5) may be used to provide supporting cost details for Volume 3. When a proposal is selected for award, be prepared to submit further documentation to the SYSCOM Contracting Officer to substantiate costs (e.g., an explanation of cost estimates for equipment, materials, and consultants or subcontractors).
- **Company Commercialization Report (Volume 4).** DoD collects and uses Volume 4 and DSIP requires Volume 4 for proposal submission. Please refer to the Proposal Preparation Instructions and Requirements section of the DoD SBIR/STTR Program BAA for details to ensure compliance with DSIP Volume 4 requirements.
- **Supporting Documents (Volume 5).** Volume 5 is for the submission of administrative material that DON may or will require to process a proposal, if selected, for contract award.

- Proposing small business concerns must review and submit the following items, as applicable:
 - **Majority Ownership in Part.** Proposing small business concerns that are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF), or any combination of these as set forth in 13 C.F.R. § 121.702, are eligible to submit proposals in response to DON topics advertised within this BAA. Complete the certification as detailed under ADDITIONAL SUBMISSION CONSIDERATIONS.
- Additional information:
 - Proposing small business concerns may include the following administrative materials in Supporting Documents (Volume 5); a template is available at https://navysbir.com/links_forms.htm to provide guidance on optional material the proposing small business concern may want to include in Volume 5:
 - Additional Cost Information to support the Cost Volume (Volume 3)
 - SBIR/STTR Funding Agreement Certification
 - Data Rights Assertion
 - Disclosure of Information (DFARS 252.204-7000)
 - Prior, Current, or Pending Support of Similar Proposals or Awards
 - Foreign Citizens
 - Details of Request for Discretionary Technical and Business Assistance (TABAs), if proposed, is to be included under the Additional Cost Information section if using the DON Supporting Documents template.
 - Do not include documents or information to substantiate the Technical Volume (Volume 2) in Volume 5 (e.g., resumes, test data, technical reports, or publications). Such documents or information will not be considered.
 - A font size smaller than 10-point is allowable for documents in Volume 5; however, proposing small business concerns are cautioned that the text may be unreadable.
- **Fraud, Waste and Abuse Training Certification (Volume 6).** DoD requires Volume 6 for submission. Please refer to the Proposal Preparation Instructions and Requirements section of the DoD SBIR/STTR Program BAA for details.
- **Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Volume 7).** In accordance with Section 4 of the SBIR and STTR Extension Act of 2022 and the SBA SBIR/STTR Policy Directive, the DoD will review all proposals submitted in response to this BAA to assess security risks presented by small business concerns seeking a Federally funded award. Small business concerns must complete the Disclosures of Foreign Affiliations or Relationships to Foreign Countries webform in Volume 7 of the DSIP proposal submission. Please refer to the Proposal Preparation Instructions and Requirements section of the DoD SBIR/STTR Program BAA for details.

PHASE I EVALUATION AND SELECTION

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

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

- **Proposal Cover Sheet (Volume 1).** The Proposal Cover Sheet (Volume 1) will undergo a compliance review to verify the proposing small business concern has met eligibility requirements

and followed the instructions for the Proposal Cover Sheet as specified in the DoD SBIR/STTR Program BAA.

- **Technical Volume (Volume 2).** The DON will evaluate and select Phase I proposals using the evaluation criteria specified in the Method of Selection and Evaluation Criteria section of the DoD SBIR/STTR Program BAA, with technical merit being most important, followed by qualifications of key personnel and commercialization potential of equal importance. The information considered for this decision will come from Volume 2. This is not a FAR Part 15 evaluation and proposals will not be compared to one another. Cost is not an evaluation criterion and will not be considered during the evaluation process; the DON will only do a compliance review of Volume 3. Due to limited funding, the DON reserves the right to limit the number of awards under any topic.

The Technical Volume (Volume 2) will undergo a compliance review (prior to evaluation) to verify the proposing small business concern has met the following requirements or the proposal will be REJECTED:

- Not to exceed ten (10) pages, regardless of page content
 - Single column format, single-spaced typed lines
 - Standard 8 ½" x 11" paper
 - Page margins one inch on all sides. A header and footer may be included in the one-inch margin.
 - No font size smaller than 10-point, except as permitted in the instructions above.
 - Include, within the 10-page limit of Volume 2, an Option that furthers the effort in preparation for Phase II and will bridge the funding gap between the end of Phase I and the start of Phase II. Tasks for both the Phase I Base and the Phase I Option must be clearly identified.
 - Work proposed for the Phase I Base must be exactly six (6) months.
 - Work proposed for the Phase I Option must be exactly six (6) months.
- **Cost Volume (Volume 3).** The Cost Volume (Volume 3) will not be considered in the selection process and will only undergo a compliance review to verify the proposing small business concern has met the following requirements or the proposal will be REJECTED:
 - Must not exceed values for the Base (\$140,000) and Option (\$100,000).
 - Must meet minimum percentage of work; a minimum of two-thirds of the work is performed by the proposing small business concern. The two-thirds percentage of work requirement must be met in the Base costs as well as in the Option costs. DON will not accept deviations from the minimum percentage of work requirements for Phase I.
 - **Cost Sharing: Cost sharing is not accepted on DON Phase I proposals. A value above or below \$0.00 entered in the Cost Sharing field will not be considered in the Phase I contract award.**
 - **Company Commercialization Report (CCR) (Volume 4).** The CCR (Volume 4) will not be evaluated by the DON nor will it be considered in the award decision. However, all proposing small business concerns must refer to the DoD SBIR/STTR Program BAA to ensure compliance with DSIP Volume 4 requirements.
 - **Supporting Documents (Volume 5).** Supporting Documents (Volume 5) will not be considered in the selection process and will only undergo a compliance review to ensure the proposing small business concern has included items in accordance with the PHASE I SUBMISSION INSTRUCTIONS section above.

- **Fraud, Waste, and Abuse Training Certificate (Volume 6).** Not evaluated.
- **Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Volume 7).** Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Volume 7) will be assessed as part of the Due Diligence Program to Assess Security Risks. Refer to the DoD SBIR/STTR Program BAA to ensure compliance with Volume 7 requirements.

ADDITIONAL SUBMISSION CONSIDERATIONS

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

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

Discretionary Technical and Business Assistance (TABA). The SBIR and STTR Policy Directive section 9(b) allows the DON to provide TABA (formerly referred to as DTA) to its awardees. The purpose of TABA is to assist awardees in making better technical decisions on SBIR/STTR projects; solving technical problems that arise during SBIR/STTR projects; minimizing technical risks associated with SBIR/STTR projects; and commercializing the SBIR/STTR product or process, including intellectual property protections. Proposing small business concerns may request, in their Phase I Cost Volume (Volume 3) and Phase II Cost Volume, to contract these services themselves through one or more TABA providers in an amount not to exceed the values specified below. The Phase I TABA amount is up to \$6,500 and is in addition to the award amount. The Phase II TABA amount is up to \$25,000 per award, is to be included as part of the award amount, and is limited by the established award values for Phase II by the SYSCOM (i.e., within the \$2,000,000 or lower limit specified by the SYSCOM). As with Phase I, the amount proposed for TABA cannot include any profit/fee by the proposing small business concern and must be inclusive of all applicable indirect costs. TABA cannot be used in the calculation of general and administrative expenses (G&A) for the SBIR proposing small business concern. A Phase II project may receive up to an additional \$25,000 for TABA as part of one additional (sequential) Phase II award under the project for a total TABA award of up to \$50,000 per project. A small business concern receiving TABA will be required to submit a report detailing the results and benefits of the service received. This TABA report will be due at the time of submission of the final report.

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

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

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

TABA must NOT:

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

TABA requests must be included in the proposal as follows:

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

Proposed values for TABA must 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

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

All Phase II awardees not receiving funds for TABA in their awards must participate in the virtual Navy STP Kickoff during the first or second year of the Phase II contract. While there are no travel costs associated with this virtual event, Phase II awardees should budget time of up to a full day to participate. STP information can be obtained at: <https://navystp.com>. Phase II awardees will be contacted separately regarding this program.

Disclosure of Information (DFARS 252.204-7000). In order to eliminate the requirements for prior approval of public disclosure of information (in accordance with DFARS 252.204-7000) under this award, the proposing small business concern shall identify and describe all fundamental research to be performed under its proposal, including subcontracted work, with sufficient specificity to demonstrate that the work qualifies as fundamental research. Fundamental research means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons (defined by National Security Decision Directive 189). A small business concern whose proposed work will include fundamental research and requests to eliminate the requirement for prior approval of public disclosure of information must complete the DON Fundamental Research Disclosure and upload as a separate PDF file to the Supporting Documents (Volume 5) in DSIP as part of their proposal submission. The DON Fundamental Research Disclosure is available on https://navysbir.com/links_forms.htm and includes instructions on how to complete and upload the completed Disclosure. Simply identifying fundamental research in the Disclosure does **NOT** constitute

acceptance of the exclusion. All exclusions will be reviewed and, if approved by the Government Contracting Officer, noted in the contract.

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

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

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

System for Award Management (SAM). It is strongly encouraged that proposing small business concerns register in SAM, <https://sam.gov>, by the Close date of this BAA, or verify their registrations are still active and will not expire within 60 days of BAA Close. Additionally, proposing small business concerns should confirm that they are registered to receive contracts (not just grants) and the address in SAM matches the address on the proposal. A small business concern selected for an award **MUST** have an active SAM registration at the time of award or they will be considered ineligible.

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

Human Subjects, Animal Testing, and Recombinant DNA. Due to the short timeframe associated with Phase I of the SBIR/STTR process, the DON does **not** recommend the submission of Phase I proposals that require the use of Human Subjects, Animal Testing, or Recombinant DNA. For example, the ability to obtain Institutional Review Board (IRB) approval for proposals that involve human subjects can take 6-12 months, and that lengthy process can be at odds with the Phase I goal for time-to-award. Before the DON makes any award that involves an IRB or similar approval requirement, the proposing small business concern must demonstrate compliance with relevant regulatory approval requirements that pertain to proposals involving human, animal, or recombinant DNA protocols. It will not impact the DON's evaluation, but requiring IRB approval may delay the start time of the Phase I award and if approvals are not obtained within two months of notification of selection, the decision to award may be terminated. If the use of human, animal, and recombinant DNA is included under a Phase I or Phase II

proposal, please carefully review the requirements at: <https://www.nre.navy.mil/work-with-us/how-to-apply/compliance-and-protections/research-protections>. This webpage provides guidance and lists approvals that may be required before contract/work can begin.

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

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

SELECTION, AWARD, AND POST-AWARD INFORMATION

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

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

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

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

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

Awards. Due to limited funding, the DON reserves the right to limit the number of awards under any topic. Any notification received from the DON that indicates the proposal has been selected does not ultimately guarantee an award will be made. This notification indicates that the proposal has been selected in accordance with the evaluation criteria and has been sent to the Contracting Officer to conduct compliance review of Volume 3 to confirm eligibility of the proposing small business concern, and to take other relevant steps necessary prior to making an award.

Contract Types. The DON typically awards a Firm Fixed Price (FFP) contract or a small purchase agreement for Phase I. In addition to the negotiated contract award types listed in the section of the DoD SBIR/STTR Program BAA titled Additional Considerations, 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. 4021/10 U.S.C. 4022 and related implementing policies and regulations. The DON may choose to use a Basic Ordering Agreement (BOA) for Phase I and Phase II awards.

Funding Limitations. In accordance with the SBIR and STTR Policy Directive section 4(b)(5), there is a limit of one sequential Phase II award per small business concern per topic. The maximum Phase I proposal/award amount including all options is \$240,000. The Phase I Base amount must not exceed \$140,000 and the Phase I Option amount must not exceed \$100,000. The maximum Phase II proposal/award amount including all options (including TABA) is \$2,000,000 (unless non-SBIR/STTR funding is being added). Individual SYSCOMs may award amounts, including Base and all Options, of less than \$2,000,000 based on available funding. The structure of the Phase II proposal/award, including maximum amounts as well as breakdown between Base and Option amounts will be provided to all Phase I awardees either in their Phase I award or a minimum of 30 days prior to the due date for submission of their Initial Phase II proposal.

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

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

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

Transfer Between SBIR and STTR Programs. Section 4(b)(1)(i) of the SBIR and STTR Policy Directive provides that, at the agency's discretion, projects awarded a Phase I under a BAA for SBIR may transition in Phase II to STTR and vice versa.

PHASE II GUIDELINES

Evaluation and Selection. All Phase I awardees may submit an **Initial** Phase II proposal for evaluation and selection. The evaluation criteria for Phase II is the same as Phase I (as stated in this BAA). The Phase I Final Report and Initial Phase II Proposal will be used to evaluate the small business concern's potential to progress to a workable prototype in Phase II and transition the technology to Phase III. Details on the due date, content, and submission requirements of the Initial Phase II Proposal will be provided by the awarding SYSCOM either in the Phase I contract or by subsequent notification.

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

funding to be used for administrative support to accelerate transition of SBIR/STTR-developed technologies and provide non-financial resources for the small business concerns (e.g., the Navy STP).

PHASE III GUIDELINES

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

Navy SBIR 25.4 Topic Index
Release 11

Open Topics

N254-P01	MCSC Open Topic for Non-Lethal Counter Personnel and Vehicle Stopping Technologies
N254-P02	NAVSEA Open Topic for Modular Mine Warfare Components
N254-P03	NAVWAR Open Topic for Post-Quantum Encryption for Commodity Hardware

Conventional Topics

N254-122	Artificial Hardwood Replacement for Dry Docking Blocks
N254-123	Expeditionary Energy-Efficient Greywater Treatment for Reuse
N254-124	Non-Intrusive Sensing for Ship Space and Equipment Monitoring

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

OBJECTIVE: Joint Intermediate Force Capabilities Office (JIFCO) is seeking innovative, effective, non-lethal counter personnel systems to suppress, deter, disrupt, or disable individuals or groups who pose a threat to personnel, facilities, assets and non-intrusive, passive or active vehicle stopping technologies to enhance security at entry control points.

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

JIFCO is seeking capabilities that distract, incapacitate, disorient, impair mobility or create a disabling effect on personnel without causing permanent harm to individuals or groups. These capabilities may be achieved by systems that generate disorienting visual or auditory effects, create a sense of uncertainty or confusion, induce fatigue, reduce cognitive function, or impair coordination and balance.

In addition, JIFCO is seeking non-intrusive, passive or active systems that can be integrated into existing infrastructure to prevent vehicle-borne threats. Proposed solutions may include, but are not limited to, advanced barrier systems, netting or entanglement technologies, energy-absorbing materials, or other innovative concepts that can effectively arrest vehicle momentum and prevent breach attempts while minimizing potential harm to the vehicle occupants.

The proposal may address one or both of these capabilities.

PHASE I: The DON is planning to issue multiple Phase I awards for this topic but reserves the right to issue no awards. Each Phase I proposal must include a Base and Option period of performance. The Phase I Base must have a period of performance of six (6) months at a cost not to exceed \$140,000. The Phase I Option must have a period of performance of six (6) months at a cost not to exceed \$100,000.

Describe the proposed technology and the existing DoD Non-Lethal system(s) to be improved, modifications required, anticipated improvements to existing capabilities, and impacts to current logistics if any (i.e., transportation, storage, maintenance, safety, etc.). Results of Phase I Base will be detailed in a final technical report (Final Report). The Results of Phase I Option (if exercised) will further refine the final technical report.

Phase I deliverables include:

- Kick-Off Briefing, due 15 days from start of Base award
- Progress Report, due 90 days from start of Base award
- Final Report, due 180 days from start of Base award
- Quad Chart, due 180 days from start of Base award
- Initial Phase II Proposal, due 180 days from start of Base award

PHASE II: All Phase I awardees may submit an Initial Phase II proposal for evaluation and selection. The evaluation criteria for Phase II are the same as Phase I (as stated in this BAA). The Phase I Final Report and Initial Phase II Proposal will be used to evaluate the small business concern's potential to fill a capability gap, improve performance, or modernize an existing capability for DON and transition the technology to Phase III. Details on the due date, content, and submission requirements of the Initial Phase

II Proposal will be provided by the awarding SYSCOM either in the Phase I contract or by subsequent notification.

Develop and deliver a functional prototype(s) that can be tested and evaluated through military utility assessments with end users. Develop a transition plan including production and fielding approach (including updated logistics and safety consideration) and further commercialization (non-DoD).

PHASE III DUAL USE APPLICATIONS: Improve the technology per the Phase II guidance and transition to a fielding activity. Dual-use applications may include usage by domestic law enforcement or commercial security firms in addition to other U.S. military applications.

REFERENCES:

1. “Joint Intermediate Force Capabilities Office (JIFCO).” <https://jifco.defense.gov/>
2. Joint Intermediate Force Capabilities Office (JIFCO). “Gray Zone Competition: Campaigning below the Level of Armed Conflict March 5, 2024.” <https://ndia.dtic.mil/wp-content/uploads/2024/post/JIFCO.pdf>

KEYWORDS: Non-Lethal; counter personnel; vehicle stopping; suppress; deter; disrupt; disable

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

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

OBJECTIVE: Develop modular mine components to facilitate configurable mining capability adaptable for various environmental and operational conditions.

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

Develop innovative hardware, software, firmware, or a combination to enhance modularity in naval mines across five categories (listed below). The Navy seeks mature (Technology Readiness Level [TRL] 5 or higher) technologies that, when integrated, will enhance mine capability and adaptability. Proposed solutions must adhere to specified cylindrical form factors, support interoperability via standard interfaces, and be watertight. This modular mine technology aims to modernize maritime mining, facilitate mission capability, and enhance maintenance and sustainability.

The overall system level architecture consists of a set of Modules. The Space, Weight, Power, and Cost (SWAP-C) for the modules is provided below.

1. Sensing Module
2. Core Computing and Processing Module
3. Power and Data Bus Module
4. Energy Supply Module
5. Electronic Safe and Arming Device (ESAD) Module

Note: The dimensions and power figures listed for each of the modules are objectives for the system. If a small business concern assesses that more physical space and/or power draw is required, that assessment will be entertained if the combined size of the Sensing Module, Support Module, Core Computing and Processing Module, and ESAD does not exceed a cylindrical form factor of 2.8 inches in diameter and 6.0 inches in height.

1. Sensing Module: This SBIR topic seeks an innovative and modular Sensing Module for naval mines, capable of identifying, locating and ranging potential targets. The module should integrate one or more subsurface sensors, can include but are not limited to: magnetometers, Underwater Electric Potential (UEP) devices, passive/active acoustic sensors, and seismic sensors, or other novel sensor technologies that address current mine warfare challenges. Sensors must be low-cost, low-power, compact, and highly dependable, with standard, non-proprietary interfaces. The Sensing Module must adhere to a cylindrical form factor (less than or equal to 2.8 inches diameter, less than or equal to 6 inches length), operate within a power budget of less than or equal to 20 Watts peak and less than or equal to 1 Watt average, and provide data to other modules through shared interfaces. Proposals should emphasize the modularity of

the design and the potential for incorporating future sensor technologies. Please note: The Navy is interested in novel and innovative solutions that might exceed the provided form factor limitations. Companies with novel and innovative sensor module solutions may propose a larger form factor (up to 20 inch diameter and 6 inch height) however, only groundbreaking and high-impact capabilities will be considered for this larger size.

2. Energy Supply Module: This SBIR topic seeks innovative approaches that would be able to provide a minimum of 250 Watt-Hours of power and serve as the power source for other modules defined within this SBIR topic. This module must be designed for prolonged underwater operation and packaged in a cylindrical form factor no larger than 2.8 inches in diameter and 6.0 inches in height. For battery-based energy solutions, the Navy seeks to leverage and optimize existing, shipboard approved battery technologies.

3. Power and Data Bus Module: This SBIR topic seeks an innovative and modular Power and Data Bus Module able to efficiently manage power distribution within the mine, optimizing overall power consumption. This module will route power from the Energy Supply Module to other system components and condition/distribute power from external 28VDC and 48VDC sources. Proposers are also encouraged to suggest an additional, optimized voltage level. The module must provide robust power and data support to other modules via shared interfaces and conform to a compact cylindrical form factor (less than or equal to 2.8 inches diameter, less than or equal to 1.0 inch height).

4. Core Computing and Processing Module: This SBIR topic seeks an innovative and modular Core Computing and Processing Module that is able to provide the mine's core computing, processing, logic, and data storage capabilities, utilizing hardware, software, firmware, and algorithms. To ensure future adaptability, the module must support Central Processing Units (CPUs), Graphical Processing Units (GPUs), and Field Programmable Gate Arrays (FPGAs). The module must fit within a cylindrical form factor no greater than 2.8 inches in diameter and 1.0 inch in height, and its power draw must not exceed 40 Watts.

5. ESAD: This SBIR topic seeks to explore the development of a next-generation ESAD for naval mines, emphasizing modularity, low cost, compact size, and exceptional dependability. The ESAD must process inputs from environmental sensors and command signals to generate the necessary output for lead explosive initiation. Proposed design(s) must incorporate multiple independent safety features and comply fully with relevant portions of MIL-STD-1316F, MIL-STD-331C, Naval Air Warfare Center Weapons Division (NAWCWD) Technical Publication 8431, and Weapon System Explosive Safety Review Board (WSESRB) Technical Guidance for ESADs with non-interrupted explosive trains. Critical design constraints include a cylindrical form factor (less than or equal to 2.8 inches diameter, less than or equal to 0.7 inches height) and ultra-low power consumption. The ESAD's quiescent power draw must be less than or equal to 0.1 mWatts, with an objective of approaching 0 Watts. Power draw after sensing arming conditions must not exceed 50 Watts.

Work produced in Phase II may become classified. Note: The prospective contractor(s) must be U.S. owned and operated with no foreign influence as defined by 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVSEA in order to gain access to classified information pertaining to the national defense of the United States and its allies; this will be an inherent requirement. The selected company will be required to safeguard classified material during the advanced phases of this contract IAW the National Industrial Security

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

PHASE I: The DON is planning to issue multiple Phase I awards for this topic but reserves the right to issue no awards. Each Phase I proposal must include a Base and Option period of performance. The Phase I Base must have a period of performance of six (6) months at a cost not to exceed \$140,000. The Phase I Option must have a period of performance of six (6) months at a cost not to exceed \$100,000.

Develop a concept for a module that meet the requirements described above. Establish feasibility by developing system diagrams, as well as Computer-Aided Design (CAD) models that illustrate the module concept and provide the estimated weight, dimensions, and power of the conceptual system. Feasibility will be established by either or both testing and analytical modeling.

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

Phase I deliverables include:

- Kick-Off Briefing, due 15 days from start of Base award
- Progress Report, due 90 days from start of Base award
- Final Report, due 180 days from start of Base award
- Quad Chart, due 180 days from start of Base award
- Initial Phase II Proposal, due 180 days from start of Base award

PHASE II: All Phase I awardees may submit an Initial Phase II proposal for evaluation and selection. The evaluation criteria for Phase II are the same as Phase I (as stated in this BAA). The Phase I Final Report and Initial Phase II Proposal will be used to evaluate the small business concern's potential to adapt commercial products to fill a capability gap, improve performance, or modernize an existing capability for DON and transition the technology to Phase III. Details on the due date, content, and submission requirements of the Initial Phase II Proposal will be provided by the awarding SYSCOM either in the Phase I contract or by subsequent notification.

The scope of the Phase II effort will be specific to each project but is generally expected to develop and deliver a prototype system for in-water testing and measurement/validation of the Phase I performance attributes. Perform detailed analysis and live demonstration in a test environment as part of the evaluation. Provide detailed technical documentation of the design, including an interface control drawing and interface specification, to allow successful transition of the product.

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

PHASE III DUAL USE APPLICATIONS: Support the Navy in transitioning the technology for Navy use.

Although a fully operational module is initially targeted for use in maritime mining, technology(ies) proposed should have the ability to support additional Navy applications and be suitable for shipboard use. Application of this product could provide commercial Unmanned Underwater Vehicle (UUVs) a longer duration to explore, map, survey (pipelines, cables, piers, bridges), and perform work (repair, salvage) in underwater.

REFERENCES:

1. Fabrizio, Salvador. "Toward a Product System Modularity Construct: Literature Review and Reconceptualization" IEEE Transactions on Engineering Management 31, May 2007
https://www.researchgate.net/publication/3076981_Toward_a_Product_System_Modularity_Construct_Literature_Review_and_Reconceptualization

2. Bakken, Vegard et al. “Advantages of Modular Development for Electronic Initiation Systems” Energetic Materials Technology Working Group May 2024. https://imemg.org/wp-content/uploads/2024/06/24040_Paper-Advantages-of-Modular-Development-for-Electronic-Initiation-Systems.pdf
3. Darwish, Ahmed, Elgenedy, Mohamed and Williams, Barry. “A Review of Modular Electrical Sub-Systems of Electric Vehicles” MDPI 15, July 2024. <https://www.mdpi.com/1996-1073/17/14/3474>
4. MIL-STD-1316F. Department of Defense Design Criteria Standard: Fuze Design, Safety Criteria for 18 Aug 2017 http://everyspec.com/MIL-STD/MIL-STD-1300-1399/MIL-STD-1316F_55755/
5. MIL-STD-331C. Department of Defense Test Method Standard: Fuze and Fuze Components, Environmental and Performance Tests for 5 Jan 2005 http://everyspec.com/MIL-STD/MIL-STD-0300-0499/MIL-STD-331C_22109/
6. NAWCWD TP 8431. Technical publication: Safety and Arming Device Design Principles May 1999. http://everyspec.com/USN/NAVAIR/NAWCWD_TP-8431_MAY1999_48362/
7. Weapon System Explosive Safety Review Board (WSESRB) Technical Guidance for ESADs <https://www.med.navy.mil/Navy-and-Marine-Corps-Force-Health-Protection-Command/Environmental-Health/Industrial-Hygiene/Acquisition-Technical-Support/Weapon-System-Explosive-Safety-Review-Board-WSESRB/>
8. Technology Readiness Levels (TRL) Definitions and Description: chrome-extension://efaidnbmninnibpcjpcglclefindmkaj/https://www.dst.defence.gov.au/sites/default/files/basic_pages/documents/TRL%20Explanations_1.pdf

KEYWORDS: Modular naval mine; mining modernization; underwater sensor technology; cylindrical form factor; low-power electronics; electronic safe and arming device (ESAD)

N254-P03

TITLE: NAVWAR Open Topic for Post-Quantum Encryption for Commodity Hardware

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

OBJECTIVE: Develop a methodology for assessing the impact of adopting Post-Quantum Cryptographic (PQC) algorithms by systems constrained to legacy hardware (hardware not optimized for Quantum computing). Demonstrate effectiveness of the methodology through modeling and simulation. The approach should be able to assess the enterprise network from the cloud to the tactical edge.

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

Navy Maintenance Repair and Overhaul (N-MRO) provides a single, enterprise-wide capability for planning, predicting, scheduling, and executing maintenance at the organizational, intermediate, and depot levels across ships, submarines, expeditionary units, and aircraft. Operating globally—both ashore and afloat—N-MRO supports more than 4,100 platforms and approximately 150,000 users across ~700 Navy sites worldwide.

As quantum computing advances, the security of traditional cryptographic methods comes under increasing threat. In response, the National Institute of Standards and Technology (NIST) is standardizing PQC algorithms, and the National Security Agency (NSA) has set timelines for adopting PQC to protect national security systems. However, these algorithms often require larger key sizes and more computational resources, raising important considerations for performance, energy consumption, and hardware constraints.

This SBIR Open Topic seeks innovative solutions to evaluate and demonstrate a PQC-enabled environment within contexts like N-MRO. The goal is to explore the performance, management, configuration, training, and policy implications of PQC, especially with regard to legacy hardware. Small business concerns may propose any method to integrate and test NIST-approved PQC algorithms—potentially via tools such as dynamically linked libraries or shared objects—but are encouraged to remain flexible and consider alternative approaches.

A systematic model or simulation of PQC adoption is highly desired to quantify its impact on existing infrastructures. By understanding where performance could be maintained or improved—and identifying risks, opportunities, and timing for potential hardware upgrades—the Department of the Navy (DON) will be better positioned to transition mission-critical systems like N-MRO to post-quantum cryptography. This proactive exploration ensures that future deployments can meet operational requirements while mitigating quantum-era threats.

The following are expected:

1. Define and Develop “Drop-In” PQC Capabilities
 - Use NIST-approved PQC algorithms to handle key exchange, signature exchange, and secure communications for both data in transit and at rest.
 - Evaluate performance and power consumption to ensure feasibility in networks with strict timing requirements.
2. Establish a Monitoring Framework

- Identify and track key performance metrics—Request Response Time, Page Response Time, and Error Rate—before and after PQC adoption.
 - Provide guidelines for continuous performance assessment under operational conditions.
3. Develop a System Model
 - Simulate protocols and methods that replace traditional (“pre-quantum”) encryption with PQC.
 - Demonstrate performance implications and potential trade-offs, informing risk assessments and readiness planning.
 4. Implement a Representative Testbed
 - Acquire and configure commodity hardware to deploy PQC algorithms in a controlled environment.
 - Validate functional performance against the modeled predictions delivered in Phase I.
 - Provide procedures for system administrators to manage, configure, and monitor the new PQC capabilities.
 5. Refine the Model with Collected Metrics
 - Gather real-world data (Request Response Time, Page Response Time, and Error Rate) to validate and fine-tune the initial model.
 - Determine the operational impact of PQC, including hardware constraints and potential optimization strategies.
 6. Assess N-MRO System Impacts
 - Evaluate how selected PQC algorithms affect the Navy Maintenance Repair and Overhaul (N-MRO) family of systems.
 - Use findings to recommend any necessary system or policy changes.
 7. Recommend Policy Updates
 - Suggest edits to existing Public Key Infrastructure (PKI) and Public Key Enablement (PKE) guidance (e.g., DoDI 8520.02) based on observed PQC performance and requirements.

Work produced in Phase II may become classified. Note: The prospective contractor(s) must be U.S. owned and operated with no foreign influence as defined by 32 U.S.C. § 2004.20 et seq., National Industrial Security Program Executive Agent and Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Counterintelligence and Security Agency (DCSA) formerly Defense Security Service (DSS). The selected contractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DCSA and NAVWAR in order to gain access to classified information pertaining to the national defense of the United States and its allies; this will be an inherent requirement. The selected company will be required to safeguard classified material during the advanced phases of this contract IAW the National Industrial Security Program Operating Manual (NISPOM), which can be found at Title 32, Part 2004.20 of the Code of Federal Regulations.

PHASE I: The DON is planning to issue multiple Phase I awards for this topic but reserves the right to issue no awards. Each Phase I proposal must include a Base and Option period of performance. The Phase I Base must have a period of performance of six (6) months at a cost not to exceed \$140,000. The Phase I Option must have a period of performance of six (6) months at a cost not to exceed \$100,000.

Phase I feasibility will describe the existing proposed technology, existing DON system(s) to improve, modifications required, anticipated improvements to existing capabilities, impacts to current logistics if any (i.e., transportation, storage, maintenance, safety, etc.) and transition approach to the DON system. Results of Phase I will be detailed in a final technical report (Final Report).

Phase I deliverables include:

- Kick-Off Briefing, due 15 days from start of Base award
- Progress Report, due 90 days from start of Base award
- Final Report, due 180 days from start of Base award
- Quad Chart, due 180 days from start of Base award
- Initial Phase II Proposal, due 180 days from start of Base award

PHASE II: All Phase I awardees may submit an Initial Phase II proposal for evaluation and selection. The evaluation criteria for Phase II are the same as Phase I (as stated in this BAA). The Phase I Final Report and Initial Phase II Proposal will be used to evaluate the small business concern's potential to adapt commercial products to fill a capability gap, improve performance, or modernize an existing capability for DON and transition the technology to Phase III. Details on the due date, content, and submission requirements of the Initial Phase II Proposal will be provided by the awarding SYSCOM either in the Phase I contract or by subsequent notification.

The scope of the Phase II effort will be specific to each project but is generally expected to develop a functional prototype to demonstrate the capability, develop transition plan including production and fielding approach (including updated logistics and safety consideration) and further commercialization (non-DoD).

Deliverables include all software, scripts, architecture models, system/software design artifacts, user and transition assessment documentation, and fleet experimentation (FLEX) reports.

It is highly likely that the work, prototyping, test, simulation, and validation may become classified in Phase II (see Description for details). However, the proposal for Phase II will be UNCLASSIFIED.

PHASE III DUAL USE APPLICATIONS: Support the transition of the developed technology to Navy use. PQC impacts both DON and commercial interests. The developed assessment methodology and monitoring setup would be useful to military and commercial interests alike that have existing, fielded systems running on hardware that is not optimized for PQC and who may desire to avoid full hardware replacement.

REFERENCES:

1. Adrian, David. "Post-quantum cryptography is too damn big." Blog, March 22, 2024. <https://dadrian.io/blog/posts/pqc-signatures-2024/>
2. D'Oliveira, Rafael G. L. et al. "Post-Quantum Security for Ultra-Reliable Low-Latency Heterogeneous Networks." IEEE, 13 Aug 2021 (arXiv:2108.06409v1 [cs.IT]) <https://ieeexplore.ieee.org/document/9653013>
3. Basu, Kanad; Soni, Deepraj; Nabeel, Mohammed and Karri, Ramesh. "NIST Post-Quantum Cryptography - A Hardware Evaluation Study." <https://eprint.iacr.org/2019/047.pdf>
4. "Network Security - Post-Quantum Migration Planning and Preparation." <https://docs.paloaltonetworks.com/network-security/quantum-security/administration/quantum-security-concepts/post-quantum-migration-planning-and-preparation>
5. Office of the DoD Chief Information Officer. "DOD INSTRUCTION 8520.02 PUBLIC KEY INFRASTRUCTURE AND PUBLIC KEY ENABLING." May 18, 2023. <https://www.esd.whs.mil/portals/54/documents/dd/issuances/dodi/852002p.pdf>

KEYWORDS: Post-Quantum Cryptography; cybersecurity; Network security; Key Exchange; Encryption; Authentication; Key management; Post-Quantum Encryption; PKI; PKE

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

OBJECTIVE: Develop a hardwood replacement compound for the blocks being used in dry docking ships. This loading is perpendicular to the wood grain and in compression only. Wood is used for its compliance under these forces. The replacement compound product does not need to look like wood or have a grain.

DESCRIPTION: Stakeholder Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility needs a replacement for the hardwood caps on the docking blocks to continue the mission of repairing submarines and ships at their facility.

U.S. Navy docking blocks have changed very little in the past 100 years. These concrete blocks have a footprint of 42" x 48", and a total height of 48". The top and bottom of the concrete block are capped with 3ea 48" x 6" x 14" white oak timbers. See UFC 4-213-10, Figure 8-2 for the standard drawing [Ref 1]. These timbers are increasingly difficult to procure with long lead times. Additionally, these timbers are vulnerable to both termite and fungal attacks.

Larger dimension blocks, such as 12" x 12" x 48" are also in great need with a desire to use woodworking tools to cut the blocks into shape to conform to the shape of a ship's hull.

This loading is perpendicular to the wood grain and in compression only. Wood is used for its compliance under these forces. The desired product does not need to look like wood or have a grain.

Capability Requirements/Performance Goals

A replacement compound for the hardwood caps would:

- Have the same or greater compressive strength when compared to white oak
- Have similar stress-strain characteristics to white oak
- Be nailable with similar or greater pullout strength to white oak
- Be able to withstand at least 330 LT for up to five years while remaining dimensionally stable
- Be immune to fungal and insect attack
- Be submersible without degradation
- Have the same or greater friction with concrete and steel without damaging the surface
- Be shapeable with woodworking tools
- Be nontoxic with nontoxic byproducts from cutting and forming
- Be price competitive to white oak
- Be produced in lead times under 30 days for up to 20k board-feet

In Japan, ESLON Neo Lumber FFU, a fiber reinforced foamed urethane product, has been used in this role, but this product is not available in the U.S. market and is cost prohibitive.

PHASE I: Identify potential materials and manufacturing processes that can be used to create materials that will meet the capability requirements and performance goals listed in the Description above. Conduct mechanical and chemical feasibility testing on samples. Develop a Phase II plan.

PHASE II: Based on Phase I results, further refine the material samples to meet the performance goals. Fabricate and validate the selected prototype series and mount the sample caps to a docking block for testing in a dry dock. Prepare documentation required for prototype testing and deliver prototypes to shipyard for demonstration and validation. The Navy will identify up to 6 blocks where the caps are ready to be replaced. These blocks will likely be located in dry docks in San Diego and/or Hawaii.

PHASE III DUAL USE APPLICATIONS: Upon demonstrating and validating the prototype cap samples for docking blocks in Phase II, the awardee will need to further prove the capability to create custom shapes and sizes beyond caps (i.e. side blocks) which have the same requirement and performance goals. Firm will scale up to provide 5,000 board-feet within a 30-day lead time with a plan to scale up to 20,000 board-feet within a 30-day lead time. Support the transition to use in Navy shipyards. Material with these properties would be useful in a number of industries. This would be an excellent substitute for hardwood used in marine fenders and railroad ties. As an idea of the amount of hardwood used, a typical destroyer dry dock block build uses 19,000 board-feet of hardwood. Current spending on hardwood caps at Pearl Harbor is about \$750k per year. The DON's spending on hardwood is likely similar at all four major shipyards: Norfolk Naval Shipyard (NNSY), Portsmouth Naval Shipyard (PNSY), Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS&IMF), and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY&IMF).

REFERENCES:

6. "UFC 4-213-10 UNIFIED FACILITIES CRITERIA (UFC) GRAVING DRY DOCKS." 18 May 2020. https://www.wbdg.org/FFC/DOD/UFC/ufc_4_213_10_2020.pdf
7. American Hardwood Export Council. "STRUCTURAL DESIGN IN AMERICAN HARDWOODS." 2005. <https://www.americanhardwood.org/sites/default/files/publications/download/2017-04/AHEC%20Structural%20Guide.pdf>
8. Western Wood Products Association. "PRODUCT USE MANUAL." June 2008. <https://www.wwpa.org/resources/?id=western-lumber-product-use-manual>

KEYWORDS: Material science; Artificial Hardwood; Dry docks; Wood Replacement; Lumber; Timber; Timber Replacement

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

OBJECTIVE: Develop a rugged expeditionary system to treat greywater to the Sanitary Control and Surveillance of Field Water Supplies – Technical Bulletin (TB MED 577) recycled greywater standards in an operational environment to be used for Class II, Class III, and Class IV applications. The solution should demonstrate an effective treatment, simple functionality and maintainability, and autonomous operation, incorporating automated control systems that adjust treatment processes based on real-time input and output water quality analysis, thereby minimizing the need for manual operator intervention.

DESCRIPTION: The Department of Defense’s Expeditionary community has a need for an effective and user-friendly way to treat greywater in an operational environment. The system must be able to start processing greywater once unpacked and also be quickly disassembled and drained for transportation.

The system shall be able to treat field-generated shower and laundry water to TB MED 577 recycled greywater reuse standards or better. This will be achieved through an automated process managed by a Process Logic Controller (PLC), incorporating a robust control system with a manual override capability for operational flexibility. System performance and efficiency shall be monitored to ensure the effluent water quality meets applicable re-use standards listed in TB MED 577 – Sanitary Control and Surveillance of Field Water Supplies, Section 9-4. The product water shall be acceptable for Class II, Class III, and Class IV uses including decontamination of personnel, vehicle coolant, aircraft washing, field laundry, concrete construction, and more.

State-of-the-art greywater treatment technologies present several challenges for expeditionary applications. Novel treatment methods, while promising, often involve lengthy startup periods (exceeding six hours) and require specialized technical expertise for operation and maintenance. The ideal system should be easily operated and maintained by personnel without formal training on the specific equipment. Furthermore, reverse osmosis (RO), while effective, typically requires a large power demand, increasing the logistical burden. Additionally, legacy systems potentially exceed the necessary purification requirements for Class II and Class III water reuse applications. In expeditionary environments, minimizing energy consumption and logistical burden is paramount due to the necessity of transporting fuel to the battlefield. Therefore, offerors should carefully consider the trade-offs between treatment performance, energy efficiency, and system complexity when selecting an appropriate technology. Solutions should demonstrate efficient use of resources while consistently meeting the water quality standards defined in TB MED 577 without the excessive power demands or over-purification often associated with RO.

The innovation shall not lie in the concept of greywater recycling but in developing a system that surpasses the limitations of current energy-intensive, complex, and ineffective methods. The proposed system's novelty shall come from combining increased energy efficiency crucial for expeditionary settings; a ruggedized and compact design for easy transport and deployment; smart features like advanced sensors and automation; and enhanced contaminant removal for safe and reliable water reuse. This integrated approach, applying potentially existing technologies in a novel configuration tailored to the Department of Defense’s expeditionary needs, represents a significant advancement in sustainable water management for austere environments. The solution must be innovative yet still utilize standard and replaceable parts that can be sourced globally.

PHASE I: Design a greywater treatment system that meets TB MED 577 Class II water reuse standards. Begin with a technology matrix evaluating state-of-the-art water treatment methods, leading to the selection of the preferred method(s) for field shower and laundry water treatment. Create a design plan,

including a water quality monitoring system integration, specifying the make and model of all system components. Develop a system model, treatment capacity, and a 60% complete technical drawing package as an end deliverable. Produce a feasibility report, encompassing a full schedule for Phase II prototype demonstration in both controlled and expeditionary operating environments. Develop a Phase II plan.

PHASE II: Focus on the development and demonstration of a full-scale greywater treatment prototype based on the technology selected in Phase I. Ensure that the prototype, designed for both laboratory and field demonstrations, is capable of operating in an expeditionary environment without operator intervention for a specified time period and require minimal maintenance. (Note: At this stage the prototype is not yet required to meet full military climate and durability standards.) Produce deliverables that include a fully functional prototype system, an accompanying operation and training manual complete with a parts list and troubleshooting guide, and validation of the system by both the manufacturer and Department of Defense representatives.

PHASE III DUAL USE APPLICATIONS: The technology developed under this SBIR impacts future military water treatment and re-use applications for expeditionary forces. Improved wastewater management technologies, specifically those focused on reduced energy consumption, hold significant potential for supply constraint austere environments like military bases, disaster zones, and remote communities.

Developing mobile, robust, and water saving solutions that prioritize energy efficiency would replace bulky traditional systems, benefiting both military and commercial sectors. These innovations minimize logistical burdens, reduce environmental impact, and ensure sanitation for humanitarian aid, remote tourism, mining, and emergency response efforts. Commercialization through public-private partnerships, government procurement, and international marketing will drive adoption, fostering a more resilient and environmentally responsible future. The technology has application in the residential and commercial housing sector for water re-use applications and green infrastructure design.

REFERENCES:

1. Headquarters, Department of the Army, Navy, and Air Force. "Technical Bulletin: Sanitary Control and Surveillance of Field Water Supplies. Chapter 9 – Water Recycled and Reuse." Distribution A – Public Release. 1 MAY 2010.
https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/tbmed577.pdf
2. "MIL-PRF-30099. Performance Specification: Treatment System, Blackwater/Graywater, for Surface Ships. Commander, Naval Sea Systems Command." 13 SEP 2011.
http://everyspec.com/MIL-PRF/MIL-PRF-030000-79999/MIL-PRF-30099A_36867/
3. Office of the Under Secretary of Defense for Acquisition and Sustainment. "DoD Manual 4715.06, Volume 4. Regulations on Vessels Owned or Operated by the Department of Defense: Discharges Incidental to Normal Operations, Section 5.1.j.(1)." 25 OCT 2022.
https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodm/471506_vol4.PDF?ver=DMfStgq-zR5KkebJmGWEIQ%3D%3D

KEYWORDS: Greywater reuse; grey water; graywater; recycling, gray water; water treatment; forward operating bases; expeditionary

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

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

OBJECTIVE: Develop a non-intrusive comprehensive sensor suite that has the capability to monitor a machinery/shipboard space in its entirety, including machinery health monitoring for equipment within the space.

DESCRIPTION: The current state of shipboard monitoring is that there is a lack of existing sensors on legacy ships or systems that have sensors and are not linked to a standardized and comprehensive closed loop feedback monitoring system.. Current commercial solutions are successful because they use new technology that is built into new systems. However, because the Navy's systems will need to be retrofit and nonintrusive systems, current commercial systems do not sufficiently answer this problem. Additionally, the current state of shipboard monitoring systems is insufficient at capturing certain types of data, including high speed vibration. As a result, the Navy seeks to develop a combination of heterogeneous, nonintrusive sensing methods to better develop prognostic and diagnostic tools for shipboard machinery monitoring.

The proposed system shall be capable of monitoring machinery systems, machinery subsystems, and full platform spaces through non-intrusive wired and/or wireless sensing. The proposed system shall be integrated either individually on Navy systems or as a dedicated package for space monitoring. Data flow from all sensors shall be stored, processed, and managed at a centralized node for continuous monitoring with automated data collection methods. The centralized node shall allow for data transfer and exfiltration through direct connection, removable media, and wireless transfer. Data transfer methods shall be standard and non-proprietary. The proposed system shall be capable of ingesting, processing, and analyzing the aggregated data to provide diagnostic and prognostic assessments of space characterization and machinery health. One potential application the Navy plans to potentially use this data for is battle damage assessment and repair to quickly identify and categorize issues in a monitored space.

The proposed system shall be capable of operating in a minimally intrusive and/or non-invasive capacity with limited local power. The sensor suite shall target machinery/space health characterization through a combination of metrics including, but not limited to, acceleration, vibration, thermal, acoustic, ultrasonic, optical, pressure, power, and electrical responses. Collected data should be in standard, non-proprietary formats for accessible management and processing through third-party and Navy-owned data processing systems. The proposed system shall meet NAVSEA Cybersecurity requirements for data acquisition, storage, and transmission.

The following should be addressed: (1) a sample shipboard machinery space should be selected as the monitoring target, (2) an itemized bill of materials for the necessary sensors, mounting, and electrical hardware needed to satisfy aforementioned solution requirements, (3) a breakdown of the data structure including sensor nomenclature/data ontology, flow, and handling protocols for transmission to the centralized node and beyond, and (4) a full system feasibility analysis and conceptual design proposal.

PHASE I: Develop a concept and demonstrate the feasibility of a proposed sensor suite for shipboard space/machinery health monitoring. This sensor suite shall ensure that all sourced hardware and software solutions are capable of performing within the operating conditions of the identified shipboard machinery space. The Phase I Option, if exercised, will include the initial design specifications and capabilities description to build a prototype solution in Phase II.

PHASE II: Following a detailed assessment of the conceptual design proposal, develop and deliver a prototype capable of demonstrating the system's capability for shipboard space/machinery health monitoring. This entails: (1) procuring the necessary hardware components as identified in the validated bill of materials, (2) instrumenting the target machinery space/equipment with hardware using the planned wired/wireless transmission modes to the centralized node, (3) collecting simulated "healthy" and "anomalous" data to detail handling procedure, and (4) sample continuous monitoring demonstration which includes detection and simultaneous notification/correction of anomalous machinery behavior. Detailed documentation of the relevant costs for procurement, software development, and labor shall be presented in a cost benefit analysis. The deliverables for Phase II include developing a plan to obtain a Navy Certification for shipboard installation, which shall justify a further investment for scaling the proposed solution for installation in a Navy-owned land-based or shipboard facility. A plan for Phase III installation, testing, and validation shall be developed.

PHASE III DUAL USE APPLICATIONS: Construct a full-scale prototype for installation onboard a Navy ship and/or land-based test facility. This entails (1) adapting Phase II prototype to conform to target space and machinery, (2) installation of full-scale prototype in the identified space, and (3) conduct performance testing to verify and validate system operation.

This system can be used for private sector or commercial activity that has a need to maintain health monitoring and assessments of products.

REFERENCES:

1. "MIL-S-901D, SHOCK TESTS, H.I. (HIGH-IMPACT) SHIPBOARD MACHINERY, EQUIPMENT, AND SYSTEMS, REQUIREMENTS FOR\." 17 March 1989
https://exwc.navy.mil/Portals/88/Documents/EXWC/DoD_Locks/PDFs/MIL-S-901D.pdf
2. "INTERCEPTORNXCS." Network Integrity Systems, April 2024.
<https://www.networkintegritysystems.com/interceptor-products>
3. Department of Defense Test Method Standard. "MIL-STD-167-1A, Mechanical Vibrations of Shipboard Equipment (Type I – Environmental and Type II – Internally Excited)." 2 November 2005. https://exwc.navy.mil/Portals/88/Documents/EXWC/DoD_Locks/PDFs/MIL-STD-167-1A.pdf
4. Lindahl, P.; Leeb, S.; Donnal, J. and Bredariol, G. "Noncontact sensors and Nonintrusive Load Monitoring (NILM) aboard the USCGC Spencer." 2016 IEEE AUTOTESTCON, Anaheim, CA, USA, 2016, pp. 1-10. doi: 10.1109/AUTEST.2016.7589633.
<https://ieeexplore.ieee.org/abstract/document/7589633>
5. Li, X.; Yu, S.; Lei, Y.; Li, N. and Yang, B. "Intelligent Machinery Fault Diagnosis With Event-Based Camera." IEEE Transactions on Industrial Informatics, vol. 20, no. 1, Jan. 2024, pp. 380-389. doi: 10.1109/TII.2023.3262854. <https://ieeexplore.ieee.org/abstract/document/10086648>

KEYWORDS: Vibration; Humidity; Temperature; Acoustics; Data acquisition; Analysis; Measurements; Data Encryption; In-situ Monitoring; Sensor Fusion; Condition Based Maintenance; Non-intrusive sensing