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

**IMPORTANT**

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

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

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

- **DoN Phase I Technical Volume (Volume 2) page limit is not to exceed 10 pages.**

- Proposing small business concerns that are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF) or any combination of these are eligible to submit proposals in response to DoN topics advertised in this BAA. Information on Majority Ownership in Part and certification requirements at time of submission for these proposing small business concerns are detailed in the section titled ADDITIONAL SUBMISSION CONSIDERATIONS.

- Phase I Technical Volume (Volume 2) and Supporting Documents (Volume 5) templates, specific to DoN topics, are available at https://www.navysbir.com/links_forms.htm.

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

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

## INTRODUCTION

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

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

### TABLE 1: POINTS OF CONTACT FOR QUESTIONS REGARDING THIS BAA

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

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

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

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

**PHASE I SUBMISSION INSTRUCTIONS**

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

(NOTE: Proposing small business concerns are advised that support contract personnel will be used to carry out administrative functions and may have access to proposals, contract award documents, contract deliverables, and reports. All support contract personnel are bound by appropriate non-disclosure agreements.)

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

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

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

- **Technical Proposal (Volume 2)**
  - Technical Proposal (Volume 2) must meet the following requirements or the proposal will be REJECTED:
    - Not to exceed ten (10) pages, regardless of page content
    - Single column format, single-spaced typed lines
    - Standard 8 ½" x 11" paper
    - Page margins one inch on all sides. A header and footer may be included in the one-inch margin.
    - No font size smaller than 10-point
    - Include, within the ten-page limit of Volume 2, an Option that furthers the effort in preparation for Phase II and will bridge the funding gap between the end of Phase I and the start of Phase II. Tasks for both the Phase I Base and the Phase I Option must be clearly identified. Phase I Options are exercised upon selection for Phase II.
    - Work proposed for the Phase I Base must be exactly six (6) months.
    - Work proposed for the Phase I Option must be exactly six (6) months.

  - Additional information:

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

- **Cost Volume (Volume 3).**
  - Cost Volume (Volume 3) must meet the following requirements or the proposal will be REJECTED:
    - The Phase I Base amount must not exceed $140,000.
    - Phase I Option amount must not exceed $100,000.
    - Costs for the Base and Option must be separated and clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3.
    - For Phase I, a minimum of two-thirds of the work is performed by the proposing small business concern. The two-thirds percentage of work requirement must be met in the Base costs as well as in the Option costs. DoN will not accept deviations from the minimum percentage of work requirements for Phase I. The percentage of work is measured by both direct and indirect costs. To calculate the minimum percentage of work for the proposing small business concern the sum of all direct and indirect costs attributable to the proposing small business concern represent the numerator and the total cost of the proposal (i.e., Total Cost before Profit Rate is applied) is the denominator. The subcontractor percentage is calculated by taking the sum of all costs attributable to the subcontractor (Total Subcontractor Costs (TSC)) as the numerator and the total cost of the proposal (i.e., Total Cost before Profit Rate is applied) as the denominator.
      - Proposing Small Business Concern Costs (included in numerator for calculation of the small business concern):
        - Total Direct Labor (TDL)
        - Total Direct Material Costs (TDM)
        - Total Direct Supplies Costs (TDS)
        - Total Direct Equipment Costs (TDE)
        - Total Direct Travel Costs (TDT)
        - Total Other Direct Costs (TODC)
        - General & Administrative Cost (G&A)

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

  - Additional information:
    - Provide sufficient detail for subcontractor, material, and travel costs. Subcontractor costs must be detailed to the same level as the prime contractor. Material costs must include a listing of items and cost per item. Travel costs must include the purpose of the trip, number of trips, location, length of trip, and number of personnel.
    - Inclusion of cost estimates for travel to the sponsoring SYSCOM's facility for one day of meetings is recommended for all proposals.

- The "Additional Cost Information" of Supporting Documents (Volume 5) may be used to provide supporting cost details for Volume 3. When a proposal is selected for award, be prepared to submit further documentation to the SYSCOM Contracting Officer to substantiate costs (e.g., an explanation of cost estimates for equipment, materials, and consultants or subcontractors).

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

- **Supporting Documents (Volume 5).** Volume 5 is for the submission of administrative material that DoN may or will require to process a proposal, if selected, for contract award.

  All proposing small business concerns must review and submit the following items, as applicable:
  - **Telecommunications Equipment Certification.** Required for all proposing small business concerns. The DoD must comply with Section 889(a)(1)(B) of the FY2019 National Defense Authorization Act (NDAA) and is working to reduce or eliminate contracts, or extending or renewing a contract with an entity that uses any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As such, all proposing small business concerns must include as a part of their submission a written certification in response to the clauses (DFAR clauses 252.204-7016, 252.204-7018, and subpart 204.21). The written certification can be found in Attachment 1 of the DoD SBIR/STTR Program BAA. This certification must be signed by the authorized company representative and is to be uploaded as a separate PDF file in Volume 5. Failure to submit the required certification as a part of the proposal submission process will be cause for rejection of the proposal submission without evaluation. Please refer to the instructions provided in the Phase I Proposal section of the DoD SBIR/STTR Program BAA.
  - **Disclosures of Foreign Affiliations or Relationships to Foreign Countries.** Each proposing small business concern is required to complete Attachment 2 of this BAA, "Disclosures of Foreign Affiliations or Relationships to Foreign Countries" and upload the form to Volume 5, Supporting Documents. Please refer to the following sections of the DoD SBIR/STTR Program BAA for details:
    - Program Description
    - Proposal Fundamentals
    - Phase I Proposal
    - Attachment 2
  - **Majority Ownership in Part.** Proposing small business concerns which are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF), or any combination of these as set forth in 13 C.F.R. § 121.702, are eligible to submit proposals in response to DoN topics advertised within this BAA. Complete certification as detailed under ADDITIONAL SUBMISSION CONSIDERATIONS.

  - Additional information:
    - Proposing small business concerns may include the following administrative materials in Supporting Documents (Volume 5); a template is available at

https://navysbir.com/links_forms.htm to provide guidance on optional material the proposing small business concern may want to include in Volume 5:
    - Additional Cost Information to support the Cost Volume (Volume 3)
    - SBIR/STTR Funding Agreement Certification
    - Data Rights Assertion
    - Allocation of Rights between Prime and Subcontractor
    - Disclosure of Information (DFARS 252.204-7000)
    - Prior, Current, or Pending Support of Similar Proposals or Awards
    - Foreign Citizens
  - Details of Request for Discretionary Technical and Business Assistance (TABA), if proposed, is to be included under the Additional Cost Information section if using the DoN Supporting Documents template.
  - Do not include documents or information to substantiate the Technical Volume (Volume 2) in Volume 5 (e.g., resumes, test data, technical reports, or publications). Such documents or information will not be considered.
  - A font size smaller than 10-point is allowable for documents in Volume 5; however, proposing small business concerns are cautioned that the text may be unreadable.

- **Fraud, Waste and Abuse Training Certification (Volume 6)**. DoD requires Volume 6 for submission. Please refer to the Phase I Proposal section of the DoD SBIR/STTR Program BAA for details.

## PHASE I EVALUATION AND SELECTION

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

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

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

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

  The Technical Volume (Volume 2) will undergo a compliance review (prior to evaluation) to verify the proposing small business concern has met the following requirements or the proposal will be REJECTED:
  - Not to exceed ten (10) pages, regardless of page content

- Single column format, single-spaced typed lines
- Standard 8 ½" x 11" paper
- Page margins one inch on all sides. A header and footer may be included in the one-inch margin.
- No font size smaller than 10-point, except as permitted in the instructions above.
- Include, within the 10-page limit of Volume 2, an Option that furthers the effort in preparation for Phase II and will bridge the funding gap between the end of Phase I and the start of Phase II. Tasks for both the Phase I Base and the Phase I Option must be clearly identified.
- Work proposed for the Phase I Base must be exactly six (6) months.
- Work proposed for the Phase I Option must be exactly six (6) months.

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

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

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

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

## ADDITIONAL SUBMISSION CONSIDERATIONS

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

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

**Discretionary Technical and Business Assistance (TABA).** The SBIR and STTR Policy Directive section 9(b) allows the DoN to provide TABA (formerly referred to as DTA) to its awardees. The purpose of TABA is to assist awardees in making better technical decisions on SBIR/STTR projects; solving

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

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

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

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

TABA must 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 DoN SBIR/STTR Transition Program (STP), the DoN Forum for SBIR/STTR Transition (FST), and any other Phase II assistance the DoN provides directly to awardees.

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

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

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

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

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

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

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

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

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

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

## SELECTION, AWARD, AND POST-AWARD INFORMATION

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

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

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

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

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

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

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

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

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

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

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

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

## PHASE II GUIDELINES

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

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

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

## PHASE III GUIDELINES

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

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

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

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

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

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

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

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

development plan to transition the technology to Marine Corps use. The technology should reach TRL 6/7 at the conclusion of this phase.

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

REFERENCES:

1. Mohammed-Ibrahim, Jamesh. “Recent advances on hydrogen production through seawater electrolysis.” Materials Science for Energy Technologies. Volume 3, 2020, Pp. 780-807
2. “Advances in Electrochemical Hydrogen Compression and Purification.” Peter Jaime Bouwman. The Electrochemical Society. 2016
3. Department of Defense. MIL-STD-810H, Environmental Engineering Considerations and Laboratory Tests. 31 January 2019
4. Dept of Defense. MIL-STD-1472H, Human Engineering. 15 September 2020

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

N242-071 TITLE: Intelligent Hydrogen Filling System

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

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

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

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

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

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

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

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

REFERENCES:

1. “An Introduction to SAE Hydrogen Fueling Standardization.” Department of Energy. 11 September 2014. An Introduction to SAE Hydrogen Fueling Standardization (energy.gov)
2. Department of Defense. MIL-STD-810H, Environmental Engineering Considerations and Laboratory Tests. 31 January 2019.
3. Dept of Defense. MIL-STD-1472H, Human Engineering. 15 September 2020.

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

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

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

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

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

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

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

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

REFERENCES:

1. Wright Aeronautical Laboratories. “MIL-HDBK-337: Military standardization handbook: Adhesive bonded aerospace structure repair.” Department of Defense, 1 December 1982. http://everyspec.com/MIL-HDBK/MIL-HDBK-0300-0499/MIL_HDBK_337_1865/
2. “AC_43-214A: Repairs and alterations to composite and bonded aircraft structure.” U.S. Department of Transportation, 23 July 2016. https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_43-214A.pdf
3. Baker, A. “Bonded composite repair of fatigue-cracked primary aircraft structure.” Composite structures, 47(1-4), 1999, pp. 431-443. https://doi.org/10.1016/S0263-8223(00)00011-8
4. Katnam, K. B.; Da Silva, L. F. M. and Young, T. M. “Bonded repair of composite aircraft structures: A review of scientific challenges and opportunities.” Progress in Aerospace Sciences, 61,2013, pp. 26-42. https://doi.org/10.1016/j.paerosci.2013.03.003
5. “Composite Bonding & Repair Benefits and Solutions.” Composites World, 8 September 2020. https://www.compositesworld.com/articles/composite-bonding-repair-benefits-and-solutions

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

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

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

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

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

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

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

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

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

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

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

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

REFERENCES:


1. Lepkowski, J. and Lepkowski, W. "Evaluating TVS protection circuits with SPICE." Power Electronics Technology, 32(1), 44, 2006. https://www.electronicdesign.com/technologies/power/power-supply/power-electronics-systems/article/21188592/evaluating-tvs-protection-circuits-with-spice
2. Digitron Semiconductors. (n.d.). "Digitron semiconductors 30KP28A–30KP320CA." Digitron Semiconductors. https://digitroncorp.com/getmedia/76286f69-0dc6-42ce-bc16-cb25c6dd46a3/30KP28A-30KP320CA
3. Davis, N. "An introduction to transient voltage suppressors (TVS)." All About Circuits, 24 May 2019. https://www.allaboutcircuits.com/technical-articles/transient-voltage-suppressors-tvs-an-introduction/
4. "MIL-STD-704F(1) NOT 3 (w/Change-1): Department of Defense interface standard: Aircraft electric power characteristics (05-DEC-2016)." Department of Defense. https://quicksearch.dla.mil/qsSearch.aspx
5. "MIL-STD-810H: Department of Defense test method standard: Environmental engineering considerations and laboratory tests (31-JAN-2019)." Department of Defense, MIL-STD-810 Working Group. / http://everyspec.com/MIL-STD/MIL-STD-0800-0899/MIL-STD-810H_55998/
6. "MIL-STD-461G: Department of Defense interface standard: Requirements for the control of electromagnetic interference characteristics of subsystems and equipment (11-DEC-2015)." Department of Defense, MIL-STD-461 Working Group. http://everyspec.com/MIL-STD/MIL-STD-0300-0499/MIL-STD-461G_53571/
7. "Wiring aerospace vehicle AS50881 SAE International. https://www.sae.org/standards/content/as50881h/
8. "MIL-E-7016F: Electric load and power source capacity, aircraft, analysis of (24-JUL-2019)." Department of Defense. https://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=6249
9. Naval Air Systems Command. (1998). MIL-W-5088 Rev. L(1) NOT 2: Military specification: Wiring, aerospace vehicle. Department of Defense. https://quicksearch.dla.mil/qsSearch.aspx


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

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

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

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

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

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

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

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

Innovative sources and methods are sought for the repair/refurbishment of sapphire, Ge, and Si IR windows and domes that have experienced damage as described above to the strength (i.e., Young's modulus, Poisson's ratio, Knoop hardness), shape (including original thickness), material (sapphire, Ge,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

In the civil field, the hypersonic vehicle can be used as a new type of intercontinental passenger/cargo transportation vehicle to improve human lifestyle and living standards. Hypersonic cargo vehicle can easily realize the rapid and accurate remote delivery of high-value materials, improve transportation

efficiency, and stimulate global economic growth. Hypersonic passenger vehicles can shorten passenger travel time to improve work efficiency.

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

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

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

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

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

OBJECTIVE: Develop waveforms designed to address gaps in current tactical waveform technology. These waveforms shall include high-capacity throughput and Low-probability-of-Detection/Identification/Tracking/(LPx) features to counter rapidly evolving threats with an open architecture digital interface to minimize application integration risks, and challenges. These waveforms should be power efficient and portable across multiple hardware instantiations for beyond line of sight and omni-directional line of sight (threshold) and directional communications (objective).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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