Missile Defense Agency (MDA)
23.B Small Business Technology Transfer (STTR)
Proposal Submission Instructions

INTRODUCTION

The Missile Defense Agency's (MDA) mission is to develop and deploy a layered Missile Defense System (MDS) to defend the United States, its deployed forces, allies, and friends from missile attacks in all phases of flight.

The MDA Small Business Technology Transfer (STTR) Program is implemented, administered, and managed by the MDA Small Business Innovation Research (SBIR)/STTR Program Management Office (PMO), located within the Innovation, Science, & Technology (DV) directorate.

Offerors responding to a topic in this Broad Agency Announcement (BAA) must follow all general instructions provided in the Department of Defense (DoD) STTR Program BAA. MDA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

Specific questions pertaining to the administration of the MDA STTR Program and these proposal preparation instructions should be directed to:

Missile Defense Agency
SBIR/STTR Program Management Office
MDA/DVR
Bldg. 5224, Martin Road
Redstone Arsenal, AL 35898

Email: sbirsttr@mda.mil

Your proposal must conform to the terms of this announcement. MDA reserves the right not to consider any or all non-conforming proposals. MDA reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality as determined by MDA will be funded. MDA reserves the right to withdraw from negotiations at any time prior to contract award. The Government may withdraw from negotiations at any time for any reason to include matters of national security (foreign persons, foreign influence or ownership, inability to clear the firm or personnel for security clearances, or other related issues). Only United States small businesses and certain individuals are eligible to participate in the SBIR/STTR programs. A small business must meet the eligibility requirements set forth in 13 CFR 121.702. Please see SBA's SBIR/STTR website: https://www.sbir.gov/about#eligibility

Please read the entire DoD Announcement and MDA instructions carefully prior to submitting your proposal. Please go to https://www.sbir.gov/about#policy-directive to read the SBIR/STTR Policy Directive issued by the Small Business Administration.

Proposers are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.

- The DoD Program BAA is located at: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements. Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: https://www.dodsbirsttr.mil/submissions/login.

PHASE I PROPOSAL GUIDELINES

The Defense SBIR/STTR Innovation Portal (DSIP) is the official portal for DoD SBIR/STTR proposal submission. Offerors are required to submit proposals via DSIP; proposals submitted by any other means will be disregarded. Detailed instructions regarding registration and proposal submission via DSIP are provided in the DoD STTR Program BAA.

DSIP (available at https://www.dodsbirsttr.mil) will lead you through the preparation and submission of your proposal. Read the front section of the DoD announcement for detailed instructions on proposal format and program requirements. Proposals not conforming to the terms of this announcement may not be considered.

MDA's objective for Phase I is to determine the merit and technical feasibility of the concept. The contract period of performance for Phase I is six (6) months.

Proposal Cover Sheet (Volume 1)

On DSIP at https://www.dodsbirsttr.mil/submissions, prepare the Proposal Cover Sheet.

Technical Volume (Volume 2)

The technical volume is not to exceed 15 pages and must follow the formatting requirements provided in the DoD STTR Program BAA. Any pages submitted beyond the 15-page limit will not be evaluated.

Content of the Technical Volume

For technical volume format guidance, please refer to the "Format of Technical Volume" section within the DoD STTR 23.B BAA

If including a letter(s) of support and/or Technical and Business Assistance (TABA) request, it must be included as part of Volume 5 and will not count towards the 15-page Technical Volume (Volume 2) limit. Any technical data/information that should be in the Technical Volume (Volume 2) but is contained in other Volumes will not be considered.

Cost Volume (Volume 3)

The Phase I Base amount must not exceed $150,000 or not to exceed $155,000 if TABA is included. MDA does not utilize the Phase I Option.

Company Commercialization Report (CCR) (Volume 4)

Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD STTR Program BAA for full details on this requirement. Information contained in the CCR will not be considered by MDA during proposal evaluations.

Supporting Documents (Volume 5)

In addition to the requirements listed in the DoD Program BAA, MDA will only accept the following documents as part of Volume 5:

1. Request for TABA using the MDA Phase I TABA form (optional).
2. Letters of support (optional).

If including a request for TABA, the MDA Phase I TABA Form MUST be completed and uploaded using the "Other" category within Volume 5 of DSIP.

If including letters of support, they MUST be uploaded using the "Letters of Support" category within Volume 5 of DSIP. A qualified letter of support is from a relevant commercial or Government Agency procuring organization(s) working with MDA, articulating their pull for the technology (i.e., what MDS

need(s) the technology supports and why it is important to fund it), and possible commitment to provide additional funding and/or insert the technology in their acquisition/sustainment program. Letters of support shall not be contingent upon award of a subcontract.

Any documentation other than required documents listed in the DoD Program BAA, letter(s) of support, or requests for TABA included as part of Volume 5 WILL NOT be considered.

PHASE II PROPOSAL GUIDELINES

Phase II proposals may only be submitted by Phase I awardees. Details on the due date, format, content, and submission requirements of the Phase II proposal will be provided by the MDA SBIR/STTR Program Management Office during the fourth month of the Phase I period of performance.

MDA will evaluate and select Phase II proposals using the Phase II evaluation criteria listed in the DoD Program announcement. While funding must be based upon the results of work performed under a Phase I award and the scientific and technical merit, feasibility and commercial potential of the Phase II proposal, Phase I final reports will not be reviewed as part of the Phase II evaluation process. The Phase II proposal should include a concise summary of the Phase I effort including the specific technical problem or opportunity addressed and its importance, the objective of the Phase I effort, the type of research conducted, findings or results of this research, and technical feasibility of the proposed technology. Due to limited funding, MDA reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

All Phase II awardees must have a Defense Contract Audit Agency (DCAA) approved accounting system. It is strongly urged that an approved accounting system be in place prior to the MDA Phase II award timeframe. If you do not have a DCAA approved accounting system, this will delay/prevent Phase II contract award. Please visit https://www.dcaa.mil/Customers/Small-Business for more information on obtaining a DCAA approved accounting system.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The SBIR/STTR Policy Directive allows agencies to enter into agreements with suppliers to provide technical assistance to SBIR and STTR awardees, which may include access to a network of scientists and engineers engaged in a wide range of technologies or access to technical and business literature available through on-line data bases.

All requests for TABA must be completed using the MDA SBIR/STTR Phase I TABA Form and included as a part of Volume 5 of the proposal package. MDA will not accept requests for TABA that do not utilize the MDA SBIR/STTR Phase I TABA Form or are not provided as part of Volume 5 of the Phase I proposal package.

A STTR firm may acquire the technical assistance services described above on its own. Firms must request this authority from MDA and demonstrate in its STTR proposal that the individual or entity selected can provide the specific technical services needed. In addition, costs must be included in the cost volume of the offeror's proposal. The TABA provider may not be the requesting firm, an affiliate of the requesting firm, an investor of the requesting firm, or a subcontractor or consultant of the requesting firm otherwise required as part of the paid portion of the research effort (e.g. research partner or research institution).

If the awardee supports the need for this requirement sufficiently as determined by the Government, MDA will permit the awardee to acquire such technical assistance, in an amount up to $5,000 per year. This will be an allowable cost on the STTR award. The per year amount will be in addition to the award and is not subject to any burden, profit or fee by the offeror. The per-year amount is based on the original

contract period of performance and does not apply to period of performance extensions. Requests for TABA funding outside of the base period of performance (6 months) for Phase I proposal submission will not be considered.

The purpose of this technical assistance is to assist STTR awardees in:
1. Making better technical decisions on STTR projects;
2. Solving technical problems that arise during STTR projects;
3. Minimizing technical risks associated with STTR projects; and
4. Developing and commercializing new commercial products and processes resulting from such projects including intellectual property protections.

The MDA Phase I TABA form can be accessed here: (https://www.mda.mil/global/documents/pdf/SBIR_STTR_PHI_TABA_Form.pdf) and must be included as part of Volume 5 using the "Other" category.

EVALUATION AND SELECTION

All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD STTR Program BAA. Selections will be based on best value to the Government considering the evaluation criteria listed in the DoD STTR Program BAA which are listed in descending order of importance

MDA reserves the right to award none, one, or more than one contract under any topic. MDA is not responsible for any money expended by the offeror before award of any contract. Due to limited funding, MDA reserves the right to limit awards under any topic and only proposals considered to be of superior quality as determined by MDA will be funded.

It cannot be assumed that reviewers are acquainted with the firm or key individuals or any referenced experiments. Technical reviewers will base their conclusions only on information contained in the proposal. Relevant supporting data such as journal articles, literature, including Government publications, etc., should be listed in the proposal and will count toward the applicable page limit.

AWARD AND CONTRACT INFORMATION

The MDA SBIR/STTR Program Management Office will distribute selection and non-selection email notices to all firms who submit an MDA STTR proposal. Proposing firms will be notified of selection or non-selection status for a Phase I award within 90 days of the closing date of the BAA. The email will be distributed to the "Corporate Official" and "Principal Investigator" listed on the proposal coversheet and will originate from the sbirsttr@mda.mil email address. MDA cannot be responsible for notification to a company that provides incorrect information or changes such information after proposal submission.

MDA will provide written feedback to unsuccessful offerors regarding their proposals upon request. Requests for feedback must be submitted in writing to the MDA SBIR/STTR PMO within 30 calendar days of non-selection notification. Non-selection notifications will provide instructions for requesting proposal feedback. Only firms that receive a non-selection notification are eligible for written feedback. Refer to the DoD STTR Program BAA for procedures to protest the announcement.

As further prescribed in Federal Acquisition Regulation (FAR) 33.106(b), FAR 52.233-3, protests after award should be submitted to Tina Barnhill via email: sbirsttr@mda.mil.

The Missile Defense Agency will issue all contract awards. The cognizant Government Contracting Officer is the only Government official authorized to enter into any binding agreement or contract on behalf of the Government.

Offeror Small Business Eligibility Requirements

Each offeror must qualify as a small business at time of award per the Small Business Administration's (SBA) regulations at 13 CFR 121.701-121.705 and certify to this in the Cover Sheet section of the proposal. Small businesses that are selected for award will also be required to submit a Funding Agreement Certification document and be registered with Supplier Performance Risk System https://www.sprs.csd.disa.mil/ prior to award.

Ownership Eligibility

Prior to award, MDA may request business/corporate documentation to assess ownership eligibility as related to the requirements of SBIR/STTR Program Eligibility. These documents include, but may not be limited to, the Business License; Articles of Incorporation or Organization; By-Laws/Operating Agreement; Stock Certificates (Voting Stock); Board Meeting Minutes for the previous year; and a list of all board members and officers. If requested by MDA, the contractor shall provide all necessary documentation for evaluation prior to STTR award. Failure to submit the requested documentation in a timely manner as indicated by MDA may result in the offeror's ineligibility for further consideration for award.

Performance Benchmark Requirements for Phase I Eligibility

MDA does not accept proposals from firms that are currently ineligible for Phase I awards as a result of failing to meet the benchmark rates at the last assessment. Additional information on Benchmark Requirements can be found in the DoD SBIR/STTR Program BAA.

References to Hardware, Computer Software, or Technical Data

In accordance with the SBIR/STTR Policy Directive, the work within the SBIR/STTR contracts are to conduct feasibility-related experimental or theoretical Research/Research and Development (R/R&D) related to described agency requirements. The purpose for Phase I is to determine the scientific and technical merit and feasibility of the proposed effort.

It is not intended for any formal end-item contract delivery and ownership by the Government of your hardware, computer software, or technical data. As a result, your technical proposal should not contain any reference to the term "Deliverables" when referring to your hardware, computer software, or technical data. Instead use the term: "Products for Government Testing, Evaluation, Demonstration, and/or possible destructive testing."

The standard (if applicable) formal deliverables for a Phase I are the:
A001: Report of Invention(s), Contractor, and/or Subcontractor(s) // Patent Application for Invention
A002: Status Report // Phase I Bi-monthly Status Report
A003: Contract Summary Report // Phase I Final Report
A004: Certification of Compliance // STTR Funding Agreement Certification - Life Cycle Certification
A005: Computer Software Product // Product Description
A006: Technical Report - Study Services // Prototype Design and Operation Document

FAR 52.203-5 Covenant Against Contingent Fees

As prescribed in FAR 3.404, the following FAR 52.203-5 clause shall be included in all contracts awarded under this BAA:

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) Bona fide agency, as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

ADDITIONAL INFORMATION

Federally Funded Research and Development Centers (FFRDCs) and Support Contractors

Only Government personnel with active non-disclosure agreements will evaluate proposals. Non-Government technical consultants (consultants) to the Government may review and provide support in proposal evaluations during source selection. Consultants may have access to the offeror's proposals, may be utilized to review proposals, and may provide comments and recommendations to the Government's decision makers. Consultants will not establish final assessments of risk and will not rate or rank offerors' proposals. They are also expressly prohibited from competing for MDA STTR awards in the STTR topics they review and/or on which they provide comments to the Government.

All consultants are required to comply with procurement integrity laws. Consultants will not have access to proposals or pages of proposals that are properly labeled by the offerors as "Government Only." Pursuant to FAR 9.505-4, the MDA contracts with these organizations include a clause which requires them to (1) protect the offerors' information from unauthorized use or disclosure for as long as it remains proprietary and (2) refrain from using the information for any purpose other than that for which it was furnished. In addition, MDA requires the employees of those support contractors that provide technical analysis to the SBIR/STTR Program to execute non-disclosure agreements. These agreements will remain on file with the MDA SBIR/STTR PMO.

Non-Government consultants will be authorized access to only those portions of the proposal data and discussions that are necessary to enable them to perform their respective duties. In accomplishing their duties related to the source selection process, employees of the aforementioned organizations may require access to proprietary information contained in the offerors' proposals.

SBA Company Registry

Per the SBIR/STTR Policy Directive, all applicants are required to register their firm at SBA's Company Registry prior to submitting a proposal. Upon registering, each firm will receive a unique control Identification number to be used for submissions at any of the eleven (11) participating agencies in the SBIR or STTR program. For more information, please visit the SBA's Firm Registration Page: http://www.sbir.gov/registration.

Organization Conflicts of Interest (OCI)

The basic OCI rules for Contractors that support development and oversight of STTR topics are covered in FAR 9.5 as follows (the Offeror is responsible for compliance):

(1) The Contractor's objectivity and judgment are not biased because of its present or planned interests which relate to work under this contract;

(2) The Contractor does not obtain unfair competitive advantage by virtue of its access to non-public information regarding the Government's program plans and actual or anticipated resources; and

(3) The Contractor does not obtain unfair competitive advantage by virtue of its access to proprietary information belonging to others.

All applicable rules under the FAR Section 9.5 apply.

If you, or another employee in your company, developed or assisted in the development of any STTR requirement or topic, please be advised that your company may have an OCI. Your company could be precluded from an award under this BAA if your proposal contains anything directly relating to the development of the requirement or topic. Before submitting your proposal, please examine any potential OCI issues that may exist with your company to include subcontractors and understand that if any exist, your company may be required to submit an acceptable OCI mitigation plan prior to award.

In addition, FAR 3.101-1 states that Government business shall be conducted in a manner above reproach and, except as authorized by statute or regulation, with complete impartiality and with preferential treatment for none. The general rule is to avoid strictly any conflict of interest or even the appearance of a conflict of interest in Government-contractor relationships. An appearance of impropriety may arise where an offeror may have gained an unfair competitive advantage through its hiring of, or association with, a former Government official if there are facts indicating the former Government official, through their former Government employment, had access to non-public, competitively useful information. (See *Health Net Fed. Svcs*, B-401652.3; *Obsidian Solutions Group*, LLC, B-417134, 417134.2). The existence of an unfair competitive advantage may result in an offeror being disqualified and this restriction cannot be waived.

It is MDA policy to ensure all appropriate measures are taken to resolve OCI's arising under FAR 9.5 and unfair competitive advantages arising under FAR 3.101-1 to prevent the existence of conflicting roles that might bias a contractor's judgment and deprive MDA of objective advice or assistance, and to prevent contractors from gaining an unfair competitive advantage.

Use of Foreign Nationals (also known as Foreign Persons), Green Card Holders, and Dual Citizens

See the "Foreign Nationals" section of the DoD STTR Program announcement for the definition of a Foreign National (also known as Foreign Persons).

ALL offerors proposing to use foreign nationals, green-card holders, or dual citizens, MUST disclose this information regardless of whether the topic is subject to export control restrictions. Identify any foreign nationals or individuals holding dual citizenship expected to be involved on this project as a direct employee, **subcontractor, or consultant.** For these individuals, please specify their country of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project. You may be asked to provide additional information during negotiations in order to verify the foreign citizen's eligibility to participate on a STTR contract. Supplemental information provided in response to this paragraph will be protected in

accordance with the Privacy Act (5 U.S.C. 552a), if applicable, and the Freedom of Information Act (5 U.S.C. 552(b)(6)).

Proposals submitted to export control-restricted topics and/or those with foreign nationals, dual citizens, or green card holders listed will be subject to security review during the contract negotiation process (if selected for award). MDA reserves the right to vet all un-cleared individuals involved in the project, regardless of citizenship, who will have access to Controlled Unclassified Information (CUI) such as export controlled information. If the security review disqualifies a person from participating in the proposed work, the contractor may propose a suitable replacement. In the event a proposed person and/or firm is found ineligible by the Government to perform proposed work, the contracting officer will advise the offeror of any disqualifications but is not required to disclose the underlying rationale.

Export Control Restrictions

The technology within most MDA topics is restricted under export control regulations including the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR). ITAR controls the export and import of listed defense-related material, technical data and services that provide the United States with a critical military advantage. EAR controls military, dual-use and commercial items not listed on the United States Munitions List or any other export control lists. EAR regulates export controlled items based on user, country, and purpose. The offeror must ensure that their firm complies with all applicable export control regulations. Please refer to the following URLs for additional information: https://www.pmddtc.state.gov/ and https://www.bis.doc.gov/index.php/regulations/export-administration-regulations-ear.

All MDA STTR topics are subject to ITAR and/or EAR. Your company will be required to submit a Technology Control Plan (TCP) during the contracting negotiation process.

Flow-Down of Clauses to Subcontractors

The clauses to which the prime contractor and subcontractors are required to comply include, but are not limited to the following clauses: MDA clause H-08 (Public Release of Information), DFARS 252.204-7000 (Disclosure of Information), DFARS clause 252.204-7012 (Safeguarding Covered Defense Information and Cyber Incident Reporting), DFARS clause 252.204-7020 (NIST SP 800-171 DoD Assessment Requirements), MDA clause H-09 (Organizational Conflict of Interest), MDA clause H-27 (Foreign Persons), and MDA clause H-28 (Distribution of Control Technical Data). Your proposal submission confirms that any proposed subcontract is in accordance to the clauses cited above and any other clauses identified by MDA in any resulting contract. All proposed universities will need to provide written acceptance of the Flow-Down Clauses in both SBIR and STTR proposals.

MDA Clause H-08 Public Release of Information (Publication Approval)

MDA Clause H-08 pertaining to the public release of information is incorporated into all MDA STTR contracts and subcontracts without exception. Any information relative to the work performed by the contractor under all MDA STTR contracts must be submitted to the Procuring Contracting Officer (PCO) for review and approval prior to its release to the public. This mandatory clause also includes subcontractors, who shall provide their submission through the prime contractor for MDA's approval for release.

a. In addition to the requirements of National Industrial Security Program Operations Manual (DoD 5220.22-M), all foreign and domestic contractor(s) and its subcontractors are required to comply with the following:

1) Any official MDA information/materials that a contractor/subcontractor intends to release to the public that pertains to any work under performance of this contract, the Missile Defense Agency (MDA) will perform a prepublication review prior to authorizing any release of information/materials.

2) At a minimum, these information/materials may be technical papers, presentations, articles for publication, key messages, talking points, speeches, and social media or digital media, such as press releases, photographs, fact sheets, advertising, posters, videos, etc.

b. Subcontractor public information/materials must be submitted for approval through the prime contractor to MDA.

c. Upon request to the MDA PCO, contractors shall be provided the "Request for Industry Media Engagement" form (or any superseding MDA form).

d. At least 45 calendar days prior to the desired release date, the contractor must submit the required form and information/materials to be reviewed for public release to MDAPressOperations@mda.mil, and simultaneously provide courtesy copy to the appropriate PCO.

e. All information/materials submitted for MDA review must be an exact copy of the intended item(s) to be released, must be of high quality and are free of tracked changes and/or comments. Photographs must have captions, and videos must have the intended narration included. All items must be marked with the applicable month, day, and year.

f. No documents or media shall be publically released by the Contractor without MDA Public Release approval.

g. Once information has been cleared for public release, it resides in the public domain and must always be used in its originally cleared context and format. Information previously cleared for public release but containing new, modified or further developed information must be re-submitted

Rights in Noncommercial Technical Data and Computer Software – SBIR/STTR Program (DFARs 252.227-7018)
Use this link for full description of Data Rights:
https://www.acquisition.gov/dfars/part-252-solicitation-provisions-and-contract-clauses#DFARS_252.227-7018

Fraud, Waste, and Abuse
All offerors must complete the fraud, waste, and abuse training (Volume 6) that is located on DSIP (https://www.dodsbirsttr.mil). Please follow guidance provided on DSIP to complete the required training.

To Report Fraud, Waste, or Abuse, Please Contact:
MDA Fraud, Waste & Abuse
Hotline: (256) 313-9699
MDAHotline@mda.mil

DoD Inspector General (IG) Fraud, Waste & Abuse
Hotline: (800) 424-9098
hotline@dodig.mil

Additional information on Fraud, Waste and Abuse may be found in the DoD Instructions of this announcement.

Proposal Submission
All proposals MUST be submitted online using DSIP (https://www.dodsbirsttr.mil). Any questions pertaining to the DoD SBIR/STTR submission system should be directed to the DoD SBIR/STTR Help Desk: DoDSBIRSupport@reisystems.com.

It is recommended that potential offerors email topic authors to schedule a time for topic discussion during the pre-release period.

Classified Proposals
Classified proposals **ARE NOT** accepted under the MDA STTR Program. The inclusion of classified data in an unclassified proposal MAY BE grounds for the Agency to determine the proposal as non-responsive and the proposal not to be evaluated. Contractors currently working under a classified MDA STTR contract must use the security classification guidance provided under that contract to verify new STTR proposals are unclassified prior to submission. Phase I contracts are not typically awarded for classified work. However, in some instances, work being performed on Phase II contracts will require security clearances. If a Phase II contract will require classified work, the offeror must have a facility clearance and appropriate personnel clearances in order to perform the classified work. For more information on facility and personnel clearance procedures and requirements, please visit the Defense Counterintelligence and Security Agency Web site at: https://www.dcsa.mil.

Use of Acronyms
Acronyms should be spelled out the first time they are used within the technical volume (Volume 2), the technical abstract, and the anticipated benefits/potential commercial applications of the research or development sections. This will help avoid confusion when proposals are evaluated by technical reviewers.

Communication
All communication from the MDA SBIR/STTR PMO will originate from the sbirsttr@mda.mil email address. Please white-list this address in your company's spam filters to ensure timely receipt of communications from our office.

Proposal titles, abstracts, anticipated benefits, and keywords of proposals that are selected for contract award will undergo an MDA Policy and Security Review. Proposal titles, abstracts, anticipated benefits, and keywords are subject to revision and/or redaction by MDA. Final approved versions of proposal titles, abstracts, anticipated benefits, and keywords may appear on DSIP and/or the SBA's SBIR/STTR award site (https://www.sbir.gov/sbirsearch/award/all).

Approved for Public Release (instructions)
23-MDA-11398 (13 Mar 23)

MDA STTR 23.B Topic Index

MDA23-T001 TITLE: Enhanced SM3 Communications

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): 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: Design and develop tri-band (S, C, and X-band) communications antennas for on-missile body use.

DESCRIPTION: This topic seeks to design and develop an on-missile body tri-band (S, C, and X-band) communications antenna. This program desires to create drop-in, or near drop-in replacements of existing antenna systems to extend the communication capability of a missile across the common RF bands of S, C, and X. No specific antenna types are being recommended for this effort. Proposer is encouraged to propose and explore any of the myriad of antenna concepts (1) (2) (3) that may result in a compliant final design.

The goal of this proposed effort is to design and demonstrate a set of proof of manufacturing prototype antenna elements to serve as drop-in replacements. These elements would match existing antenna systems in terms of size, weight, and power (SWaP) to minimize the impact on the existing qualification. The objective would be a single antenna aperture capable of communicating on all three stated bands. The threshold is an antenna system consisting of no more than two distinct apertures capable of being drop-in replacements of current systems.

PHASE I: Conduct a study to determine the feasibility of the design concepts. The feasibility would be demonstrated, at a minimum, with modeling results demonstrating antenna gain, return loss, and patterns. The final deliverable produced would be a report containing design concept plots indicating antenna performance across the entire S, C, and X-bands. Trades between antenna performance and band coverage should be explained. No performance requirements are stated for this phase, but a detailed explanation of the trade space illustrating feasibility will be required.

PHASE II: Develop, refine, and mature the initial concepts demonstrated in Phase I to meet refined performance requirements provided by the government at a program kick-off meeting. A preliminary design review would be held 12 months after award. Design would be fabricated and demonstrated to a technology readiness level of 5 or greater by the end of the 24 month Phase II effort.

PHASE III DUAL USE APPLICATIONS: Reducing or maintaining a common SWaP performance while integrating additional communication band is a technology applicable across the defense and commercial spaces. In particular, the greater commercialization of Space would lead to an increased need for communication redundancy of these platforms.

REFERENCES:

1. https://ieeexplore.ieee.org/document/9708507;
2. https://ieeexplore.ieee.org/document/8943886;
3. https://ieeexplore.ieee.org/document/8748427;

KEYWORDS: Missile Antenna; Tri Band (S, C, & X) Communications

MDA23-T002 TITLE: AI-Informed Algorithms Combined with Differential Game Theory to Support Swarm-on-Swarm Engagements

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Hypersonics; Network Systems-of-Systems; Trusted AI and Autonomy

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

OBJECTIVE: Design and develop innovative solutions, methods, algorithms and concepts that leverage differential game theory and artificial intelligence to support anti-swarm operation in the hypersonic defense context. Demonstrate a working software prototype with example results. The algorithms should be narrow in focus, and verifiable in operation. The solutions should identify appropriate methods and technologies to minimize the time intensive processes, incorporate new technologies unearthed during the effort, and document key areas for further development.

DESCRIPTION: Unmanned vehicles operating in "swarms" are a growing concern for warfighters operating across all domains of the modern battlespace (air, sea, ground, and space). In particular, swarms operating in the exo-atmosphere and in the hypersonic regime may be encountered by missile defense systems. To enable defensive systems to counter these evolving threats, this program desires AI-informed algorithms combined with differential game theory to support swarm-on-swarm engagement where the adversary swarm is AI-directed. In addition, the desire for algorithms that are executable post-launch on hardware with size, weight, and power suitable for carrying on each missile and have adequate on-board (and/or satellite-based) sensing and intra-missile-fleet communications. Ideally, entire system would be free of command and control after launch while utilizing centralized battle management control prior to launch; the entire system would be peer-to-peer, without a central fly-along "mother ship", in order to reduce single-point vulnerability. Hypersonic engagements may include multiple attacking hypersonic missiles (glide vehicles or powered, and either separately launched or multi-warhead launched) and multiple defensive missiles, presumably involving multiple launches with multiple KVs on each launch. For both red and blue missiles fleets, consider the following factors:

* Significant missile-trajectory maneuverability
* Intra-vehicle communication
* Implementation of pursuit/evasion strategies
* Maneuvers informed by real-time observation of adversary action
* Distributed decision-making connecting (perhaps onboard) sensor information and directing maneuver response
* Decision making informed by artificial intelligence (AI), particularly of the machine learning/deep learning type (ML/DL)
* Maneuvering decisions based on differential game theory.
* Possible total autonomy from human control after launch.

Exploitation of AI algorithms being developed for offensive deployment of, or defense against, UAV-borne weapons is encouraged. Development of sensing and communication technology would not be part of research.

PHASE I: Develop preliminary system design(s) with anticipated performance. Perform modeling, simulation and analysis (MS&A) and/or limited bench level testing to demonstrate the concept and an understanding of the technology. The proof of concept demonstration may be subscale and used in conjunction with MS&A results to verify scaling laws and feasibility.

PHASE II: Complete a critical design and demonstrate the use of the technology in a table top/brass board prototype. Evaluate the effectiveness of the technology. Perform MS&A and characterization testing within the financial and schedule constraints of the program to show the level of performance achieved. If brass board achieved, government can provide independent test and characterization. Develop a plan for Phase III product design, test and characterization.

PHASE III DUAL USE APPLICATIONS: Incorporate lessons-learned from the Phase II prototype into a product design and formulate how to Integrate into battle management. Work with government and/or government contractor to demonstrate product's performance improvement as compared to the state of the art. Work with government and/or government contractor to fully qualify the product for the intended application(s). Assist government and/or government contractor in integrating this product into a demonstrator system and assist with test and characterization.

REFERENCES:

1. Campbell, Adam. (2018). Enabling tactical autonomy for unmanned surface vehicles in defensive swarm engagements.;
2. Montalbano, Nicholas G., Humphreys, Todd E., "Intercepting Unmanned Aerial Vehicle Swarms with Neural-Network-Aided Game-Theoretic Target Assignment," 2020 IEEE/ION Position, Location and Navigation Symposium (PLANS), Portland, Oregon, April 2020, pp. 36-43.;
3. H. Duan, P. Li and Y. Yu, "A predator-prey particle swarm optimization approach to multiple UCAV air combat modeled by dynamic game theory," in IEEE/CAA Journal of Automatica Sinica, vol. 2, no. 1, pp. 11-18, 10 January 2015, doi: 10.1109/JAS.2015.7032901.;
4. Laura Strickland, Michael A. Day, Kevin DeMarco, Eric Squires, and Charles Pippin "Responding to unmanned aerial swarm saturation attacks with autonomous counter-swarms", Proc. SPIE 10635, Ground/Air Multisensor Interoperability, Integration, and Networking for Persistent ISR IX, 106350Y (4 May 2018); https://doi.org/10.1117/12.2305086.

KEYWORDS: AI; artificial intelligence; game theory; differential game theory; swarm; hypersonic; hypersonic defense; distributed decision making; peer-to-peer; ML/DL; machine learning; deep learning

MDA23-T003 TITLE: Coatings for Sharp Hypersonic Leading Edges

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

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OBJECTIVE: Develop robust oxidation resistant coatings for metals and/or composites to enable shape stable performance in extreme heat flux environments.

DESCRIPTION: Sharp leading edges and nose tips for hypersonic vehicles are beneficial because they enable low drag, but it is difficult to produce sharp leading edges that retain their shape throughout hypersonic flight due to rapid heating, oxidation, and aerodynamic forces. This topic seeks protective coating solutions that enable shape retention and prevent passage of oxygen at high transient heat fluxes, for tens of seconds. Coating solutions are sought for both metallic and composite substrates. Metallic substrates of interest include tungsten alloys (e.g. W-25Re), niobium alloys (e.g. C103), and molybdenum alloys (e.g. TZM - titanium-zirconium-molybdenum). Composite substrates of interest include carbon-carbon, carbon-silicon-carbide, and carbon-carbon-silicon-carbide. Solutions must provide the coating, but solutions may also include modifications to the substrate material and intermediate layers to improve coating interface. Novel coating solutions with functionally graded, structural compatibility and high interfacial characteristics are desired. Vertical integration of coat solution is desired but not required. If proposing glass forming coating solutions, analytical models and simulation tools to predict formed glass retention as a function of temperature and shear is desired. Proposals must provide a path to mature production capability. Mature production capability includes 100 leading edges per year throughput and <10% scrap rate.

PHASE I: Evaluate feasibility of proposed coating solution through analytical modeling and simulation, process modeling and/or proof of concept testing. Material formulation and/or coupon fabrication is recommended to provide evaluation of critical properties. Work with hypersonic system integrators to understand environments.

PHASE II: Continue material and process development through design, analysis, and experimentation. Optimize processing parameters for yield and quality. Scale process to facilitate coating of leading edge components representative of full-scale configurations, as agreed to by the government. Experimental validation techniques should simulate representative heat fluxes and pressures. Diagnostics and/or process modeling techniques should be utilized to ensure experimental evaluation approach is traceable to target environment. Demonstration in a representative environment is desired. Phase II should identify insertion opportunities, include cost/rate estimates and conclude with definition of a mature manufacturing process.

PHASE III DUAL USE APPLICATIONS: Work with a hypersonic system integrator to iteratively design and fabricate prototype components for high-fidelity testing in a relevant environment for current or future missile defense applications. A successful Phase III would provide the necessary technical data to transition the technology into a missile defense application.

REFERENCES:

1. https://doi.org/10.1016/j.compositesb.2021.109278;
2. https://doi.org/10.1016/j.surfcoat.2021.126913

KEYWORDS: Coatings; Leading Edges; Hypersonics; Materials; High Temperatures; Oxidation

MDA23-T004 TITLE: Solutions for Rapid Yaw Maneuvers for High L/D Hypersonic Vehicles

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

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OBJECTIVE: Develop solutions for rapid yaw maneuvers for high lift to drag (L/D) hypersonic glide vehicles.

DESCRIPTION: Hypersonic vehicles with non-axisymmetric lifting bodies may achieve L/D ratios around 4, which is significantly higher than finned vehicles with conical bodies, but may have slower yaw maneuver response times since bank to turn yaw maneuvers are slower than skid to turn maneuvers. This topic seeks solutions, such as innovative control surfaces and or hybrid configurations to decrease the time constant for maneuvers while maintaining the high L/D of the vehicle concepts. This topic does not seek a solution for any systems in development, but rather seeks to develop and demonstrate solutions that could be applied to future developments. Proposers should assume a glide vehicle with a non-conical geometry similar to the waveriders in reference 1 or the artistic representation of DARPA Falcon HTV-2 in reference 2. Proposers should provide their own geometry or the government may be able to provide a generic geometry after contract award. Design solutions should seek to minimize mass, volume, and drag impacts from control surfaces and/or other mechanisms. Designs should seek to enable time constant for all maneuvers comparable with time constants for finned conical vehicles. Proposers may assume a range of Mach numbers above Mach 5 and a range of altitudes up to 50km.

PHASE I: Basic studies on aerodynamic controls or other mechanisms. Could include modeling and/or limited wind tunnel assessment. Estimate maneuverability and kinetic energy loss for maneuvers at a range of Mach numbers and altitudes. Down select to 1 or 2 preferred designs.

PHASE II: Work with a missile defense system integrator to mature selected geometry and design. Obtain higher fidelity estimates of performance. Test in representative environment such as wind tunnel.

PHASE III DUAL USE APPLICATIONS: Work with system integrator to refine requirements and integrate into full guidance navigation and control system. Demonstrate technology in a representative environment. Transition Technology into missile defense application.

REFERENCES:

1. http://www.aerospaceweb.org/design/waverider/waverider.shtml;
2. https://www.darpa.mil/about-us/timeline/falcon-htv-2 (topics) Approved for Public Release 23-MDA-11365 (30 Jan 23)

KEYWORDS: Aerodynamic Control; Hypersonic; Maneuvers; Lifting Body