Missile Defense Agency (MDA)
24.1 Small Business Innovation Research (SBIR)
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 Innovation Research (SBIR) Program is implemented, administered, and managed by the MDA SBIR/Small Business Technology Transfer (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) SBIR Program BAA. MDA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

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.

Specific questions pertaining to the administration of the MDA SBIR 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

PLEASE NOTE: It is possible that proposals not conforming to the terms of this announcement will not be considered for negotiation and/or award. 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, but not limited to, matters of national security (foreign persons, foreign influence or ownership, inability to clear the firm or personnel for security clearances, or other related issues).

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.

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 SBIR 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 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 SBIR 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 SBIR 23.1 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.

MDA will not accept any deviation to the POW requirements

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 SBIR 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)
All proposing small business concerns are REQUIRED to submit the following documents to Volume 5:

1. Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment
2. Disclosures of Foreign Affiliations or Relationships to Foreign Countries
3. Disclosure of Funding Sources

Please refer to the DoD Program BAA for more information.

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 additional documentation 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 PMO 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 SBIR firm may acquire the technical assistance services described above on its own. Firms must request this authority from MDA and demonstrate in its SBIR 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 SBIR 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 SBIR awardees in:

1. Making better technical decisions on SBIR projects;
2. Solving technical problems that arise during SBIR projects;
3. Minimizing technical risks associated with SBIR 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 SBIR Program BAA. Selections will be based on best value to the Government considering the evaluation criteria listed in the DoD SBIR 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.

Please note that potential benefit to the MDS will be considered throughout all the evaluation criteria and in the best value trade-off analysis. When combined, the stated evaluation criteria are significantly more important than cost or price.

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 PMO will distribute selection and non-selection email notices to all firms who submit an MDA SBIR 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. Firms that receive a non-selection notification are eligible for written feedback. Refer to the DoD SBIR 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 Candace Wright via email: sbirsttr@mda.mil.

The MDA 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 offeror shall provide all necessary documentation for evaluation prior to SBIR 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 rights in your 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 // SBIR 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 SBIR awards in the SBIR 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 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 SBIR topics are covered in 9.505-1 through FAR 9.505-4 as the means of avoiding, neutralizing, or mitigating organizational conflicts of interest.

All applicable rules under the FAR 9.5 apply.

If you, or another employee in your company, developed or assisted in the development of any SBIR 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 SBIR 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 SBIR 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.

Most MDA SBIR topics are subject to ITAR and/or EAR. If the topic write-up indicates that the topic is subject to ITAR and/or EAR, your company may 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), and DFARS clause 252.204-7020 (NIST SP 800-171 DoD Assessment Requirements). 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 SBIR contracts and subcontracts without exception. Any information relative to the work performed by the contractor under all MDA SBIR 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 32 Combined Federal Regulation, Part 117 National Industrial Security Program Operations Manual, 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, 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 Program (DFARs 252.227-7018 Class Deviation 2020-O0007 Revision 1)
Use this link for full description of Data Rights:
https://www.acq.osd.mil/dpap/policy/policyvault/USA001352-23-DPC.pdf

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 SBIR 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 SBIR contract must use the security classification guidance provided under that contract to verify new SBIR 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
23-MDA-11591 (21 Sep 23)

VERSION 4

MDA SBIR 24.1 Topic Index

MDA241-001	Deployable Directional Plasma Sensor
MDA241-002	Material Solution for Lightning Survivability
MDA241-003	AI/ML Augmentation of Cyber Risk Reduction
MDA241-004	Insider Threat Risk Calculator
MDA241-005	Artificial Intelligence Declassification Tool
MDA241-007	Benchmarking Simulations for Missile Defense System Analysis
MDA241-008	Extremely Thin and Flexible Electromagnetic Shielding for High Temperature Applications
MDA241-009	High Temperature Tensile Testing
MDA241-010	Strain Tolerant Coatings/Coating Architectures
MDA241-011	Non-eroding Nozzle Materials for High Temperature Combustion Gases
MDA241-012	Artificial Intelligence/Machine Learning (AI/ML) for Kinetic and Non-Kinetic (K-NK) Missile Defense Battle Management
MDA241-013	Directed Energy Lethality Assessments of Hypersonic Threats
MDA241-014	Passive Sensing for Distributed Radars

MDA241-001 TITLE: Deployable Directional Plasma Sensor

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

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: Detect photons emitted from small volumes of high temperature plasmas with sufficient directional data to locate the source.

DESCRIPTION: A directional sensor for photons emitted from high temperature plasmas would improve remote object identification and location capabilities by providing data to existing sensor suites that would significantly reduce the quantity, in both time and computational resources, of effort necessary to identify remote objects, increase the confidence of the object's identity, and increase the range at which the object is both identified and located with confidence.

PHASE I: Establish the technical basis of the solution, with possible small scale validation and theoretical analysis of the effectiveness. Initial Deployable Directional Plasma Sensor design studies, to include existing navy Launchers, that have the potential to provide over-the-horizon tracking and targeting capabilities to the Aegis Weapons System.

PHASE II: Develop and field test initial prototype Deployable Directional Plasma Sensor design that could be installed on either an in-service DDG-51 class destroyer, or the Navy's Self Defense Test Ship for:
- Evaluation of Space, Weight, and Power – Cooling (SWaP-C)
- Demonstrate successful launch and flight of UAV from ship at sea
- Evaluate existing UAV in-flight guidance and control capabilities aboard ship at sea
- Based on Phase I results, demonstrate integration with Mk 53 Nulka DLS or better launcher option

PHASE III DUAL USE APPLICATIONS: The solution would be utilized in relevant test environments, through collaboration with OEMs or whoever the next higher tier user would be. The technology would be further developed for commercial applicability.

REFERENCES:
1. Introduction to Plasma Physics - Univ of Texas Austin.pdf chapter 2 August 2, 1997 https://web2.ph.utexas.edu/~iheds/Plasma%20Sensor/sensor%202%20(introduction).pdf
2. MIT Researchers 3D Print Precise Plasma Sensors for Satellites. https://scitechdaily.com/mit-researchers-3d-print-precise-plasma-sensors-for-satellites

KEYWORDS: Plasma; Sensor; Detect Photons; Directional Data

MDA241-002 TITLE: Material Solution for Lightning Survivability

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

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: Identify materials and/or coatings to add lightning survivability capability to missiles without significant change to size, weight, or power requirements, and without impact to missile performance.

DESCRIPTION: Lightning protection is a component of an MDA core standard, MIL-STD-464. Atmospheric lightning discharge can be triggered during fly-outs (launch timing not discretionary) and reflect decrement to missile reliability. Coatings and other lightweight materials for lightning protection represent a potentially low cost method to mitigate this liability. Focusing on SM-3 Block IIA, evaluate innovative materials and techniques for improving the survivability of existing missiles when exposed to the effects of direct and indirect lightning. Identify materials that could be applied to existing missile structures and are resistant to damage from typical handling and fixtures that are used with missiles. A key focus of the study is to ensure that likely lightning attachment points, which are expected to occur on a missile in flight, would move aft quickly and not result in damage to underlying features. Ability to apply coating for lightning protection without extensive hardware re-qualification of existing components.

PHASE I: Establish the technical basis of the solution, with small scale validation and theoretical analysis of the effectiveness. The effort might include independent testing on small scale coupons and materials testing.

PHASE II: Down select any competing technologies and provide more extensive testing. If the solution purposes new apparatus, prototypes would be developed for technology demonstration.

PHASE III DUAL USE APPLICATIONS: The solution would be utilized in relevant test environments, through collaboration with OEMs or whoever the next higher tier user would be. The technology would be further developed for commercial applicability.

REFERENCES:

3. Lightning Protection Guidelines for Aerospace Vehicles https://ntrs.nasa.gov/citations/20000004589
4. Lightning strike protection strategies for composite aircraft https://www.compositesworld.com/articles/lightning-strike-protection-strategies-for-composite-aircraft

KEYWORDS: lightning protection, missile flight, novel materials, survivability, lightweight

MDA241-003 TITLE: AI/ML Augmentation of Cyber Risk Reduction

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

OBJECTIVE: Develop and implement an innovative artificial intelligence / machine learning (AI/ML) algorithm development/data analysis solution to enhance MDA Defense Industrial Base (DIB) Cyber Risk Management (DCRM) Operations to detect and help thwart cyber threats in the MDA DIB, protect MDA Controlled Unclassified Information, and help defend emerging Missile Defense System technology developed in MDA DIB.

DESCRIPTION: MDA DCRM conducts cyber risk reduction operations in the MDA DIB to detect and help defeat evolving and expanding cyber risks and threats facing the MDA DIB. The increasing agility, overwhelming number, and capability of cyber threat actors requires MDA DCRM to implement effective AI/ML solutions to augment and modernize its risk reduction operations and help safeguard MDA emerging technologies and controlled unclassified information in the MDA DIB.

Challenge/Problem: Relatively small data sets (approximately 1.5TB/mission captured on average and up to 90TB/year) and the disparate nature of the data captured (data is of various formats and captured on up to 60 unique and unrelated networks per year).

PHASE I: Conduct modeling and simulation that would provide proof of concept for recognizing actionable patterns within existing data sets; clustering the patterns in order to detect deviations from the norm and possible security incidents leading to advanced analysis.

PHASE II: Optimize the simulation tools and demonstrate effectiveness for detecting cyber-attacks.

PHASE III DUAL USE APPLICATIONS: Commercialize modeling tool and provide it to governmental organizations with cyber threat hunting programs.

REFERENCES:

1. Department of Defense Instruction 5205.13, Defense Industrial base (DIB Cybersecurity (CS) Activities) https://www.esd.whs.mil/portals/54/documents/dd/issuances/dodi/520513p.pdf
2. 2016 NDAA; MDA Director's Memorandum for all MDA Contractors Through Cognizant Contracting Officers; SUBJECT: Missile Defense Agency Cyber Assistance Team Program Participation, Dated July 28, 2022. https://supplychain.gsfc.nasa.gov/sites/supplychain/files/docs/2018/6-James-SC2018.pdf

KEYWORDS: cyber risk management; artificial intelligence; machine learning; security and incident event management; data sets; clustering; deviations; low and slow; port and protocol abuse; emerging cyber threats; malware beaconing; disparate data sets

MDA241-004 TITLE: Insider Threat Risk Calculator

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Human-Machine Interfaces

OBJECTIVE: Develop a tool that would ingest leads from various sources, synthesize the leads with all other available information regarding a Possible Threat Actor (PTA), assign a risk level to the PTA, and notify Counter-Insider Threat (C-InT) analysts of the risk level.

DESCRIPTION: Defense Agencies, along with C-InT Programs across the entire U.S. Government, collect leads on PTA's through multiple sources, some of which include: User Activity Monitoring (UAM), Information Technology professionals, and Agency reporting tools. Unfortunately, few if any C-InT programs have the workforce needed to adequately screen each lead, compare it with available other collected data, and assign a risk level to the PTA. The two main reasons for this is that screening thousands of leads each month requires a cost-prohibitive number of analysts, and the enormous volume of leads fatigues analysts, resulting in missed warning signals. Automating the lead screening process and leveraging Artificial Intelligence (AI) to assign risk levels to PTAs would enhance analysts' abilities to recognize potential threats and increase the time available for leaders to interdict and mitigate unfavorable behaviors.

PHASE I: Demonstrate ability to ingest leads and collect from automated sources, written reports, and on-line reporting sources such as social media. Collections could include written documents, images, or video feeds.

PHASE II: Demonstrate ability to fuse and synthesize the collected data and assign appropriate risk levels. The system should store in such a way that analysts could access and review the collected artifacts. Risk levels should appear as a percentage threat value with zero percent meaning no threat, and 100 percent meaning imminent threat. The risk level should also come with an associated write-up explaining how the system arrived at the risk level.

PHASE III DUAL USE APPLICATIONS: Demonstrate ability to create human interface technologies that would allow Counter-Insider Threat analysts the ability to interpret the data collected and the risk levels assigned. The system should be capable of presenting all collected data, risk levels, and explanations of findings in an easily readable, intuitive human interface, such as an "analyst workbench" or other similar interface.

REFERENCES:

1. DoD Instruction 5205.16, The DoD Insider Threat Program. https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/520516p.pdf
2. National Insider Threat Task Force Maturity Framework https://www.dni.gov/files/NCSC/documents/nittf/20181024_NITTF_MaturityFramework_web.pdf

KEYWORDS: Insider Threat; Risk assessment; Risk Scoring

MDA241-005 [TOPIC REMOVED]

MDA241-007 TITLE: Benchmarking Simulations for Missile Defense System Analysis

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

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OBJECTIVE: Develop ways to evaluate how close model performance is to benchmark data and ways to calibrate model performance to improve benchmark results.

DESCRIPTION: The Missile Defense Agency (MDA) has high-fidelity digital simulation models of the Missile Defense System (MDS) that provide very accurate results. This level of fidelity is achieved by modeling the elements in the MDS with a very high degree of realism including physics-level modeling and wrapping tactical code. While the results of these digital simulations are very accurate, this accuracy comes with high computational expense. There would be many more simulation trials desired to perform different types of analysis than would be able to be executed.

Lower fidelity models that represent the MDS can be run much faster but sacrifice some fidelity and realism of the higher fidelity models. Given benchmark data from physical tests or from high fidelity models, this topic seeks both metrics and measures of model performance as compared with the benchmark data and methods to automate the calibration of models to better align performance with benchmark data. Standardized approaches to comparing model performance with benchmark data would increase analyst confidence and ability to use faster running models for some analysis tasks. Tuning models to yield outputs that better match benchmark data would make models useful for analysis for more use cases. The ability to use lower fidelity models with confidence for more MDS analysis use cases would enable more studies to be completed and more rapidly advance the state of the MDS.
Model tuning is an optimization problem where distance measures between model outputs and benchmark data are minimized by adjusting available model parameters. In this tuning process, care must be shown to avoid overfitting and provide tuned models that are robust for use on a variety of MDS scenarios.

PHASE I: Research, design and develop metrics and measures to compare model performance vs. benchmark data. Research and create proof of concept optimization methods to automate the tuning of models to bring performance into line with benchmark data.

PHASE II: Expand the benchmarking methodology and tuning algorithms to create a full prototype capability. Work with project sponsors to perform a benchmarking study using this new technology with MDS data and models.

PHASE III DUAL USE APPLICATIONS: Scale-up the capability from the prototype utilizing the new hardware and/or software technologies developed in Phase II into a mature, fieldable capability. Work with missile defense integrators to integrate the technology into a missile defense system level testbed for regular analyst use.

REFERENCES:

1. A multi-fidelity surrogate-model-assisted evolutionary algorithm for computational expensive optimization problems; Journal of Computational Science January 2016. https://www.sciencedirect.com/science/article/abs/pii/S1877750315300387
2. Agents for sequential learning using multiple-fidelity data; Palizhati, A., Torrisi, S.B. https://pubmed.ncbi.nlm.nih.gov/35304496

KEYWORDS: benchmarking; missile defense; modeling and simulation; model tuning

MDA241-008 TITLE: Extremely Thin and Flexible Electromagnetic Shielding for High Temperature Applications

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

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OBJECTIVE: Develop lightweight, extremely thin electromagnetic shielding capable of defending from 20MHz to 20GHz at a level of 48 dB or higher. Shielding must be suitable for hypersonic applications, to include thermal considerations.

DESCRIPTION: Hypersonic interceptors have multiple systems that utilize internal capacitors, batteries and power conditioning. All of these components give off electromagnetic interference (EMI) that can interact in unintended fashions. Hypersonic flight itself also is a large contributor of EMI, which can have unwanted effects on internal systems. Extremely thin and lightweight material that is capable of efficiently blocking this interference while contributing minimally to the mass or internal volume used is crucial for effective hypersonic capability.

PHASE I: Design and develop innovative solutions, materials, and/or concepts to implement electromagnetic interference protection for internal components during all stages of flight. The solution should contrive novel uses of contemporary technologies, utilize new innovative materials or capture key areas for new development.

PHASE II: Complete a detailed prototype design incorporating government performance requirements. Coordinate with the government during prototype design and development to ensure that the delivered products would be relevant to an ongoing missile defense architecture and data types and structures.

PHASE III DUAL USE APPLICATIONS: Scale-up the capability from the prototype utilizing the new technologies developed in Phase II into a mature, full scale, fieldable capability. Work with missile defense integrators to integrate the technology into a missile defense system level test-bed and test in a relevant environment.

REFERENCES:

1. H. Wang et al., "Transparent Ultrathin Doped Silver Film for Broadband Electromagnetic Interference Shielding," 2018 IEEE MTT-S International Microwave Workshop Series on Advanced Materials and Processes for RF and THz Applications (IMWS-AMP), Ann Arbor, MI, USA, 2018, pp. 1-3, doi: 10.1109/IMWS-AMP.2018.8457129. https://ieeexplore.ieee.org/document/8457129
2. Norikazu Chikyu, Takayuki Nakano, Gunther Kletetschka, Yoku Inoue,Excellent electromagnetic interference shielding characteristics of a unidirectionally oriented thin multiwalled carbon nanotube/polyethylene film,Materials & Design,Volume 195,2020,108918,ISSN 0264-1275, https://doi.org/10.1016/j.matdes.2020.108918.
3. https://www.sciencedirect.com/science/article/pii/S0264127520304524

KEYWORDS: Electromagnetic; shielding; EMI, interference; materials; signals

MDA241-009 TITLE: High Temperature Tensile Testing

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

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OBJECTIVE: The goal of this topic is to develop methods to test the mechanical properties of materials at temperatures up to 3000°C.

DESCRIPTION: Hypersonic leading edge surfaces and propulsion materials push the limits of requirements of high strength at high temperatures. Proper design of components requires mechanical property data for all temperatures that the component may experience. Performing tensile tests at high temperatures may require the use of refractory materials and cooling of tools to hold the sample, but as the temperature for testing increases, the available materials of construction for the test equipment are limited. Accurately measuring the mechanical properties of a sample at a given temperature requires that the sample specimen is as close as possible to isothermal in the region experiencing strain. Heating methods which are not limited by the thermal or electrical conductivity are preferred. Any cooling of the equipment used to hold the sample specimen needs a method of minimizing the heat transfer from the sample. The test method should achieve high quality data including suitable strain measurement, while maintaining uniform heating of the test sample in the gauge section during testing.

PHASE I: Design a system to achieve high quality strain measurement data on samples from room temperature to 3000°C under applied stresses of up to 300 MPa at 3000°C. The proposed system should be capable of measuring Young's modulus, proportional limit, strain rate, and ultimate tensile stress of samples. The method of heating and proposed grip solutions must not cause any damage to the sample by chemical contamination of extraneous species, and must maintain uniform heating in the sample gauge section during testing. If Phase I does not include elevated temperature bench scale tests, thermal/structural FEA models should demonstrate structural margin in each of the test apparatus components when test sample stresses are up to 300 MPa at 3000°C.

PHASE II: Demonstrate that the designed system in Phase I is capable of measuring Young's modulus, the proportional limit, strain rate, and ultimate tensile stress of samples at temperatures up to 3000 °C. The designed system must be capable of measuring stresses up to 300 MPa at 3000 °C. Proposers must obtain refractory material samples and test the samples at temperatures up to 3000 °C; however, maximum stresses can be demonstrated by load capability of the test setup at temperature.

PHASE III DUAL USE APPLICATIONS: Demonstrate scalability of the testing method to maximize the number of tests possible per day. The proposer must partner with a prime contractor or system manufacturers to test refractory materials for development projects.

REFERENCES:

1. Mechanical Properties of Wrought Tungsten. https://apps.dtic.mil/sti/citations/AD0427126
2. Tensile Strength of Carbon-Carbon Composites at High Temperature up to 2773K. Institute of physics https://iccm-central.org/Proceedings/ICCM17proceedings/papers/D3.6%20Kobayashi.pdf

KEYWORDS: Testing; Tensile; Materials; High Temperature; Propulsion; Hypersonics

MDA241-010 TITLE: Strain Tolerant Coatings/Coating Architectures

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

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OBJECTIVE: Develop high temperature, oxidation resistant, strain tolerant coating solutions viable for hypersonic surfaces that undergo geometrical changes during flight.

DESCRIPTION: Significant investments have been made in the development of high temperature, oxidation resistant coatings capable of surviving extreme conditions of hypersonic flight, both acreage and stagnation point regions. Recent research efforts have also investigated advancing the performance of hypersonic systems by implementing morphing surfaces, such as vehicle outer mold line and control surfaces. The low strain capability of state of the art coating solutions are not viable for highly morphing surfaces. This topic seeks the development of coating chemistries and/or coating architectures that are viable for morphing surfaces. Solutions should be able to adhere to flexing vehicle outer mold line and control surfaces during hypersonic flight. Solutions must provide equivalent high temperature oxidation resistance performance to state of the art solutions.

PHASE I: Develop strain tolerant oxidation resistant coatings which could survive heat fluxes greater than 50 W/cm2 and are also flexible. The work should target strains above 5% in the coating during flight conditions. Proposed coatings would be applicable to metallic substrates, carbon fiber composite substrates, or both.

PHASE II: Determine the strain capability of the coatings developed in Phase I, and test the survivability of the coatings developed in Phase I under simulated morphing hypersonic flight. Demonstrate scalability of coating solutions to relevant geometries. If the proposed coating solution has limited room temperature ductility, testing must demonstrate that the coating solution can survive handling and launch environments.

PHASE III DUAL USE APPLICATIONS: Partner with a prime contractor to apply coatings to hypersonic aerocontrol surfaces that would be tested under high-enthalpy air flow on flexible materials. Proposals must include a demonstration of the ability to scale the coating process to required sizes, and the scrap rate of the coating process must be demonstrated to be less than 10 percent.

REFERENCES:

1. High-temperature flexible, strength and hydrophobic YSZ/SiO2 nanofibrous membranes with excellent thermal insulation - ScienceDirect https://www.sciencedirect.com/science/article/abs/pii/S0955221920307986
2. A highly strain and damage-tolerant thermal barrier coating fabricated by electro-sprayed zirconia hollow spheres. https://doi.org/10.1111/jace.15697

KEYWORDS: Coatings; Hypersonics; Materials; Oxidation

MDA241-011 TITLE: Non-eroding Nozzle Materials for High Temperature Combustion Gases

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

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OBJECTIVE: Develop ablation resistant, non-eroding, rocket nozzle materials with high temperature strength and compatibility with highly oxidizing propellant combustion gases.

DESCRIPTION: Maximizing missile range requires higher propellant combustion temperatures without nozzle erosion. Controllable solid propellant rockets use a variety of propellants based on their application, and many propellants used for controllable solids produce highly oxidizing combustion gases. While some propellants are seen as reducing, this topic is specifically asking for solutions for highly oxidized propellants. Besides high temperature strength, successful nozzle materials must also be capable of surviving the thermal shock experienced during ignition.

PHASE I: Develop nozzle material solutions with predicted high temperature strength and resistance to high partial pressures of oxidizing species such as oxygen, carbon dioxide, and water. If no testing is performed in Phase I, thermo-structural and chemical reaction modeling should demonstrate ablation and erosion resistance, high temperature strength, and thermal shock resistance for use in rocket motors with combustion temperatures up to 2800°C. Manufacturability of the material solution must be demonstrated.

PHASE II: Demonstrate the survivability of the material solutions developed in Phase I with loads and temperatures representative of those experienced by solid propellant rocket nozzles. High temperature mechanical and thermal material properties of the material solution should be characterized by the end of this effort. Testing must demonstrate thermal shock resistance under temperature rises experienced by rocket nozzles. Identify additional applications for the proposed technology beyond MDA applications.

PHASE III DUAL USE APPLICATIONS: Produce nozzle components that meet the requirements of a propulsion system supplier and demonstrate performance of the nozzle components through static testing. Demonstrate the quality, reproducibility, and production requirements for a developing, prime contractor system.

REFERENCES:

1. Non-eroding nozzle throat material for rocket motors with AP-based propellant https://arc.aiaa.org/doi/abs/10.2514/6.1998-3972
2. Chemical Erosion of Refractory-Metal Nozzle Inserts in Solid-Propellant Rocket Motors https://arc.aiaa.org/doi/abs/10.2514/1.37922
3. Status of army pintle technology for controllable thrust propulsion https://arc.aiaa.org/doi/abs/10.2514/6.2001-3598

KEYWORDS: Hypersonics; Materials; High Temperature; Propulsion; Nozzle

MDA241-012 TITLE: Artificial Intelligence/Machine Learning (AI/ML) for Kinetic and Non-Kinetic (K-NK) Missile Defense Battle Management

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Integrated Sensing and Cyber; Directed Energy (DE); Hypersonics; Integrated Network Systems-of-Systems; Human-Machine Interfaces

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OBJECTIVE: This topic seeks proposals that describe appropriate research to develop AI/ML tools necessary to integrate real time information from multiple sensors and available shooters in varying weather conditions. The tools should provide decision aids for Commanders to authorize and oversee weapons selection and fire control in a user-friendly format to defend a defined scenario. The tools in real-time continuously assess the environment, the sensor data and the weapon systems' effectiveness in order to quickly determine potential threat neutralization and determine the next weapon selection requirements.

DESCRIPTION: Directed Energy (DE) weapons, also known as Non-Kinetic (NK) weapons (e.g., Radio Frequency, Lasers, etc.), will be introduced into the Missile Defense System, which currently relies on Kinetic (K) kill weapons and supporting sensors (e.g., Electro-Optical (EO), Terrestrial, Airborne). The new NK weapons would add to our defensive capacity. However, the introduction of NK weapons would further complicate the decision process for Combatant Commanders on which weapon should be selected. This decision process would be based upon the type and volume of threats faced and is further complicated by weather conditions would could affect the efficacy of NK weapons. Thus, the Commanders of the future would need new situational awareness and fire control tools for rapid decision-making and weapon selection in a highly complex battlefield environment.

PHASE I: Deliver a Concept Design and present the design, trades and design issues to the Government. A Design Reference Mission can be provided by the Government to confine the scenario. This Concept Design should include:
1. A description of the AI/ML tool, the algorithms proposed, and the learning methodology.
2. Descriptions of the Commander's and support staff interface and decision capability for sensor/weapon knowledge, fire control and scenario execution (situational awareness and prosecution).
Ability to conduct work at the classified level is desired, but not required.

PHASE II: Deliver and test prototype tools and accompanying descriptions based upon the Phase I activities.

PHASE III DUAL USE APPLICATIONS: Transition prototype tool.

REFERENCES:

1. Battle Management/Command and Control, and Communications (BM/C3), Environmental Assessment https://apps.dtic.mil/sti/citations/ADA213942

2. Battle Management: DOD and Air Force Continue to Define Joint Command and Control Efforts https://www.gao.gov/products/gao-23-105495
3. Command and Control, Battle Management, and Communications (C2BMC) https://missilethreat.csis.org/defsys/c2bmc

KEYWORDS: Battle Management; Command and Control; Kinetic and Non-Kinetic; Directed Energy

MDA241-013 TITLE: Directed Energy Lethality Assessments of Hypersonic Threats

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Trusted AI and Autonomy; Advanced Computing and Software; Directed Energy (DE); Hypersonics;

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OBJECTIVE: Develop, verify and validate fast running models, simulations, tools, and analyses, including using machine learning or artificial intelligence algorithms, to describe the interaction of directed energy with a threat's vulnerable aimpoints and the materials associated with these aimpoints, or to determine the amount of directed energy required to defeat a variety of hypersonic threat systems.

DESCRIPTION: Maneuvering hypersonic velocity threats are among the most difficult threats for future directed energy weapons to defeat. The government is seeking proposals that describe the development, verification, and validation (V&V) of appropriate, affordable, and accurate models, simulations, tools, or analyses of the lethal effects of directed energy on these threat systems. Government Furnished Data can be provided upon request.

PHASE I: Propose a plan for the development, V&V of models, simulations, tools, or analyses that describe the physics associated with the interaction of directed energy on a hypersonic threat system and the associated lethality of the interaction. This plan should include:
1. A detailed description of the development plan for the model, simulation, tool, or analysis. It shall include a description of any AI/ML tools proposed as well as the learning methodology
2. A detailed description of the V&V plan and procedures of the model, simulation, tool, or analysis, including any ground based testing or flight testing necessary to verify and validate the proposed model,
3. A detailed list of the assumptions and caveats used in the development and V&V of the proposed model.
4. A list of any required GFE or GFI to use the code or perform the analysis.
Ability to conduct work at the classified level is desired, but not required.

PHASE II: Execute the plan described in Phase I. Demonstrate any models, simulations, or tools developed that describe the interaction of directed energy and the hypersonic threat system. Using the developed capability, complete and deliver an assessment of the lethality of directed energy against a hypersonic threat system, including a list of vulnerable aimpoints of the threat system, required levels of directed energy to cause a lethal effect, and the time-to-lethal effect. Government Furnished Data for model development and validation can be provided upon request.
Ability to develop, process, and store data at the classified level is required.

PHASE III DUAL USE APPLICATIONS: Additional threat analyses; further V&V of models & simulations. Also work with the government on requirements development for future directed energy systems capable of defeating hypersonic threats.

REFERENCES:

4. Science & Tech Spotlight: Directed Energy Weapons https://www.gao.gov/products/gao-23-106717
5. High Energy Laser (HEL) Lethality Data Collection Standards - Revision A https://www.deps.org/store/merchandise/TOCs/lethHandbookPreface.html
6. U.S. Hypersonic Weapons and Alternatives https://www.cbo.gov/publication/58924

KEYWORDS: Directed Energy; Lethality; Hypersonic, Models, Simulation, AI/ML

MDA241-014 TITLE: Passive Sensing for Distributed Radars

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

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OBJECTIVE: Develop capabilities for passive sensing for distributed radars. Key technical objectives are:
• Passively collect radar reflections
• Measure the time difference of arrival (TDOA) of collected signals
• Determine the range of the object
• Calculate the location, heading, and speed of the object
• Develop techniques to provide accurate location, heading, and speed with degraded or no knowledge of the emitting source
• Provide information to determine how to size passive arrays for different mission areas

DESCRIPTION: Typical sensors consist of a transmitter and a receiver (e.g. phased array radars). Passive sensors instead collect radar reflections using third-party transmitters in the environment (typically non-cooperative). Recent efforts have used this approach to perform passive sensing of objects. In order to further the technology being developed in this effort, this topic seeks the development of passive sensing of distributed radars to accomplish the Key Technical Objectives below. Potential solutions could take the form of either a new passive sensing approach, a new processing algorithm, or a combination of both. Passive sensors count on the existence of reference signals. These are signals typically from non-cooperative (unwitting) sources. With the reception of the reference signal, such passive systems can achieve successful results regarding target detection. Without reception of the transmitted signal or other prior information, it would be very challenging to perform target detection since both the transmitted signal and the channel response is completely unknown to radar receivers. When multiple incoming targets are considered, the scenario becomes even more complicated. The mixture of multiple target reflections is received at every receiver in the distributive radar system, and no extra information can be pre-obtained.

PHASE I: Passively collect radar reflections and measure the time difference of arrival (TDOA) of collected signals. Potential solutions could take the form of either a new passive sensing approach, a new processing algorithm, or a combination of both. The overall system design at this point could be rough with many questions remaining to be answered, such as how the system would determine the range of the object or calculate the location, heading and speed of the object.

PHASE II: System development would continue with the goals of both determining the bistatic range of the object and then calculating the location, heading, and speed of the object. Again, potential solutions could take the form of either a new passive sensing approach, a new processing algorithm, or a combination of both.

PHASE III DUAL USE APPLICATIONS: The team should improve upon the technology and implement a full design. The improvements could be in the form of shrinking the size of the overall system, improving upon the hardware/software solution, and/or implementing lessons learned from Phase I and II.

REFERENCES:

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