

Version 2

Missile Defense Agency (MDA) 23.1 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.

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

Proposals not conforming to the terms of this announcement may not be considered. 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).

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.

Version 2

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 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 (TABAs) 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 TABAs are included. MDA does not utilize the Phase I Option.

Please review the updated Percentage of Work (POW) calculation details included in section 5.3 of the DoD Program BAA. 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)

MDA will only accept the following four documents as part of Volume 5:

1. Contractor Certification Regarding Provision of Prohibited Video Surveillance and Telecommunications Services and Equipment (Required).
2. Foreign Ownership or Control Disclosure (Offerors must review Attachment 2 in the DoD SBIR Program BAA to determine applicability.)
3. Request for TABAs using the MDA [Phase I TABA form](#) (optional).
4. Letters of support (optional).

If including a request for TABAs, 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.

Version 2

Any documentation other than the Prohibited Video Surveillance and Telecommunications Services and Equipment form, Foreign Ownership or Control Disclosure, letter(s) of support, or requests for TABA included as part of Volume 5 WILL NOT be considered.

DIRECT TO PHASE II PROPOSAL GUIDELINES

MDA is not accepting Direct to Phase II proposals for the 23.1 SBIR BAA.

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 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

Version 2

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 a determination of the proposal(s) most advantageous to the Government considering the evaluation criteria listed in the DoD SBIR Program BAA which are listed in descending order of importance. Please note that potential benefit to the MDS will be considered throughout all the evaluation criteria and in the award determination. When combined, the stated evaluation criteria are significantly more important than cost or price.

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 Contracting Office 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 Tina Barnhill via email: sbirsttr@mda.mil.

Version 2

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 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 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:

Version 2

(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.

Version 2

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 SBIR 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 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.

Version 2

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 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

Version 2

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>).

(Instructions) Approved for Public Release
22-MDA-11249 (30 Aug 22)

Version 2

MDA SBIR 23.1 Phase I Topic Index

MDA23-001	Expendable Ship Launched Sensor
MDA23-002	Federation Playback and Restart
MDA23-003	CdZnTe Impurity and Te-Precipitate Defect Reduction
MDA23-004	CdZnTe Large Ampoule and Crucible Improvement
MDA23-005	Artificial Intelligence Controller of a Filter Wheel for Acquisition and Tracking in Congested Environments
MDA23-006	Low Cost Actuators

Version 2

MDA23-001 TITLE: Expendable Ship Launched Sensor

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Integrated Network Systems-of-Systems

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

OBJECTIVE: Research and Develop a capability for launching expendable, ship-launched sensor system capable of providing tracking.

DESCRIPTION: Research, develop and demonstrate a launcher capable of support expendable, ship-launched sensors for military and civilian ships that can provide tracking information. Initial design considerations would look to use existing expendable UAV designs and Government Furnished Information where applicable and appropriate.

PHASE I: Initial launcher design studies for integrated systems. GFI may be provided to include Mk 53 Nulka DLS which is an expendable launcher on various ships in the US inventory.

PHASE II: Develop and demonstrate initial prototype expendable launcher design that can be installed on the Navy's Self Defense Test Ship (ex-Paul F Foster, DD-964) for:

- Evaluation of Size, Weight, and Power – Cooling (SWaP-C)
- Demonstration of successful launch and flight of UAV from ship at sea
- Evaluation of existing UAV in-flight guidance and control capabilities aboard ship at sea
- Integration with Mk 53 Nulka DLS or better launcher option based on Phase I results.

PHASE III DUAL USE APPLICATIONS: Based on Phase II lessons learned, refine the prototype system design and perform Phase III test and integration plan using the mature design capable of being integrated on various ships at the end of Phase III. Work with missile defense system integrators to prepare system for transition to use in a Program of Record supporting Aegis Weapon System. Pursue partnerships with other system integrators with the goal to use this capability for civilian applications which include traffic monitoring and control, crowd monitoring and control, search and rescue, and border protection. The Government has multi-service needs for this capability.

REFERENCES:

- 1) “A Scout for a Scout: Army Plots Future Air-Launched Effects” – Steve Trimble, Aviation Week & Space Technology, Oct 12-25, 2020.
- 2) “Air-Launched Effects Are the Second Step in U.S. Army Aviation’s Transformation” – Dan Gouré, RealClear Defense, Dec 09, 2021.

KEYWORDS: Expendable; UAV; Launcher; Shipboard; Sensor; Navy; Over-the-Horizon; Targeting; Tracking

TPOC-1: Charles Schlise
Phone: 540-663-6959
Email: charles.schlise@mda.mil

Version 2

MDA23-002 TITLE: Federation Playback and Restart

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

OBJECTIVE: Develop a minimally invasive simulation playback and restart capability for simulation federations.

DESCRIPTION: Extremely useful capabilities within some simulations are playback and restart. In both cases, a simulation saves critical state data during execution. For playback, these states are used to re-create a simulation execution exactly as previously executed without recalculating all intermediate model results, while not needing to store all intermediate data. For restart, the saved simulation states are used to restart a simulation execution at a save-point, either saving re-run time in failed execution or allowing execution variations from that save-point.

Simulation developers must specifically design this capability into the simulation code-base, and the capability introduces a significant bookkeeping overhead on both models and the simulation (although some simulation engines facilitate this, e.g., optimistic simulation engines). Due to these complexities, this capability exists almost exclusively within integrated simulations.

Federated simulations, simulations-of-simulations in which simulations are independently developed and connected/executed together by a simulation framework, almost never have this capability as most federate simulations do not save required state data nor pass it to the federation framework. All of the federate simulations and the framework would require a common means of implementing the playback/restart capability.

Development of federate simulations is done independently, and as a result federates are essentially “black boxes” to the developers of the federation framework. Therefore, any solution should be minimally invasive, meaning the requirements federate developers need to meet must be the minimum necessary. Changes to their code should be minimized, simple to implement, and clear-cut regardless of the nature of the federate simulation. Performance of the federates or federation as a whole should not be noticeably compromised. The solution should work with distributed architectures. Ideally the solution should support parallelization.

Technical Objectives include:

- 1) Identify minimum requirements for Playback/Restart Capabilities in federation.
- 2) Define minimally invasive changes for federates.
- 3) Define changes to Framework.
- 4) Demonstrate collection of simulation state data from federates.
- 5) Demonstrate re-initialization of federates.
- 6) Demonstrate playback in federation.
- 7) Demonstrate restart in federation.
- 8) Benchmark federate and federation performance.

PHASE I: Phase I should focus on proving a solution concept, including:

- 1) Identify minimum requirements for Playback/Restart Capabilities in federation via analysis.
- 2) Define minimally invasive changes for federates via analysis.
- 3) Define changes to Framework via analysis.
- 4) Show collection of simulation state data from federates via demonstration in a contractor test simulation environment representing a federation.

Version 2

- 5) Show re-initialization of federates via demonstration in a contractor test simulation environment representing a federation.
- 6) Show playback in federation via demonstration in a contractor test simulation environment representing a federation.
- 7) Show restart in federation via a demonstration in a contractor test simulation environment representing a federation.

PHASE II: Phase II should focus on demonstrating a prototype capability in a relevant simulation federation and developing specific software required to integrate with operational federations.

- 1) Show collection of simulation state data from federates via demonstration in a simulation federation.
- 2) Show re-initialization of federates via demonstration in a simulation federation.
- 3) Show playback in federation via demonstration in a simulation federation.
- 4) Show restart in federation via demonstration in a simulation federation.
- 5) Benchmark federate and federation performance while collecting simulation state data against normal operation via test in a simulation federation.

PHASE III DUAL USE APPLICATIONS: Phase III should focus on implementing the capability in a missile defense system and other DoD simulation federations.

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KEYWORDS: Model; Simulation; M&S Frameworks; M&S Federations; Simulation Restart; Simulation Playback; State Saves; Checkpoint

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Version 2

MDA23-003 TITLE: CdZnTe Impurity and Te-Precipitate Defect Reduction

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

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: Improve the quality of CdZnTe substrates for HgCdTe growth by reducing the level of impurities in order to advance the production of the highest performing long-wave infrared (LWIR) detector arrays.

DESCRIPTION: HgCdTe infrared detector array technology has improved significantly over the last decade. However, a current limitation of MBE HgCdTe epilayers is the presence of a surface micro-defect density in the 7×10^2 - 1×10^4 cm⁻² range. These micro-defects have a diameter of about 2 micrometers in size and degrade detector device performance. Such MBE HgCdTe surface defects are induced by surface Te-precipitates present on the CdZnTe substrates.

Commercially available (211) CdZnTe substrates for MBE HgCdTe have been grown specifically to have high Te-precipitate densities of about 5×10^6 – 1×10^7 cm⁻³. The main reason for this is that such Te-precipitates are needed to getter and trap the very low levels of p-type acceptor impurities present on the bulk substrates and prevent them from diffusing and compensating/contaminating the MBE HgCdTe epilayers during device processing.

It is hoped the need for substrate Te-precipitates can be reduced or fully eliminated during CdZnTe growth by purification improvements of the starting materials (Te, Cd, Zn, CdTe, ZnTe, and/or CdZnTe boules).

Innovative ideas are requested for the reduction in p-type acceptor impurities like Cu, Li, Na, Au, etc. from the current state-of-the-art (SOA) of a few parts per billion (ppb) in the starting materials. Reductions of other common impurities from these starting materials are also encouraged. The proposed impurity analysis methodology should be described in detail. To detect the very low impurity levels required for 8N purity materials it is possible the standard chemical analysis technique of Glow Discharge Mass Spectrometry (GDMS) may not be sensitive enough to detect Cu and the other acceptor impurities mentioned above. If that is the case, then a direct or indirect alternate analytical approach should also be proposed.

As a result of this effort, infrared Focal Plane Array (FPA) sensors with much higher yield would become available. Higher purity materials could also advance commercial CdTe-based solar cells by improving the device collection efficiency and production yields.

Please note that this topic is focused on improving our capability to grow 8N (99.999999%) purity bulk single-crystal CdZnTe material. Solutions related to processing bulk-material into CdZnTe substrates (e.g., wire sawing, dicing, grinding, lapping, polishing) are outside the scope of this topic. Proposals should include a number of purification innovations that, as a whole, would significantly push the SOA.

Version 2

Proposed solutions should also be compatible with all the material specifications and safety requirements of a SOA commercial CdZnTe foundry.

PHASE I: Study the scientific and technical feasibility of the proposed approach. Collaborate with government agencies and industry (e.g., starting material suppliers, CdZnTe foundries, and detector manufacturers) to develop requirements. Conduct research, analyses, and experimentation as needed to demonstrate feasibility and/or validate purification models. Develop preliminary designs for any new equipment, if applicable. Complete cost and performance assessments and compare to existing SOA approaches. Identify risk areas and mitigation plans that would be implemented in Phase II. Responders to this topic are strongly encouraged to team with existing starting material suppliers. Complete a plan for Phase II and contact starting material suppliers to verify the plan is executable.

PHASE II: Finalize equipment purification designs and fabricate a prototype, if applicable. Demonstrate the ability to carry out further purification improvements of the starting materials (Te, Cd, Zn, CdTe, ZnTe, and/or CdZnTe boules) before they are used for high quality growth of single-crystal CdZnTe substrates meeting the topic objectives. Responders to this topic are strongly encouraged to team with existing starting material suppliers. Provide samples of the purified materials to the Government and industry partners for independent assessment. Update models with experimental data and refine the design based on lessons learned. Finalize cost and performance estimates based on these initial results. Collaborate with industry partners to put together a Phase III plan that includes quotes and letters of commitment.

PHASE III DUAL USE APPLICATIONS: Transition operation of the purification and growth capability to CdZnTe commercial foundry operators. Provide supporting documentation and training for their operation and maintenance. Make multiple lots of single-crystal CdZnTe substrates for verification testing to demonstrate quality, consistency and reproducibility of the improved purity material. Show how the technology can also support CdZnTe growth for other defense and commercial applications (e.g. CdTe solar cells).

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Version 2

KEYWORDS: CdZnTe; CZT; Material Purification; Purity Testing

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Version 2

MDA23-004 TITLE: CdZnTe Large Ampoule and Crucible Improvement

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

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: Achieve larger CdZnTe substrate size (150 mm or greater) through improvements in ampoule and crucible design as well as develop automated processes for sealing the ampoule containing the CdZnTe charge to increase production capacity.

DESCRIPTION: Infrared detectors made with HgCdTe provide the Government with high sensitivity for many missile-defense applications. HgCdTe deposited by molecular beam epitaxy (MBE) is currently grown on commercially available, (211) oriented CdZnTe substrates with sizes up to 7x7.5 cm. These substrates are typically made from 125 mm diameter CdZnTe boules grown using the Vertical Gradient Freeze (VGF) process.

The problem is scaling up reactor diameter to allow for larger diameter boules and thereby larger size CdZnTe substrates. This topic is focusing not on the VGF reactor itself but improving the sub-components to allow these larger reactors to be produced. The Government is seeking innovative ideas for improvements to the VGF CdZnTe growth package. These improvements should address:

1. High purity quartz and PBN component tolerances (wall thickness, circularity, etc.)
2. Automation and thermal management of the vacuum seal-off
3. Modifications to the growth package to support increasing reliability and safety

A complete solution encompassing all three areas is preferred but not required. Many of these challenges are limited by current quartz and PBN manufacturability. A reusable VGF CdZnTe component package would be ideal but is not required.

Please note that this topic is focused on improving our capability to grow high purity, bulk, single-crystal CdZnTe material, which would then be further processed into substrates for long-wave infrared (LWIR) detector arrays. Solutions related to processing bulk-material into CdZnTe substrates (e.g., wire sawing, dicing, grinding, lapping, polishing) are outside the scope of this topic. Proposals should include a number of innovations that, as a whole, would significantly push the SOA. Proposed solutions should also be compatible with all the material specifications and safety requirements of a SOA commercial CdZnTe foundry.

PHASE I: Study the scientific and technical feasibility of the proposed approach. Collaborate with government agencies and industry (e.g., CdZnTe foundries and detector manufacturers) to develop requirements. Conduct research, analyses, and experimentation as needed to demonstrate feasibility and/or validate models. Develop preliminary designs for any new equipment, if applicable. Complete cost and performance assessments and compare to existing SOA approaches. Identify risk areas and mitigation plans that would be implemented in Phase II. Responders to this topic are strongly encouraged to team with existing CdZnTe boule manufacturers. Complete a plan for Phase II and contact CdZnTe boule manufacturers to verify the plan is executable.

Version 2

PHASE II: Finalize equipment designs and fabricate a prototype, if applicable. Demonstrate the ability to carry out further improvements before they are used for high quality growth of single-crystal CdZnTe boules meeting the topic objectives. Responders to this topic are strongly encouraged to team with existing CdZnTe boule manufacturers. Provide samples to the Government and industry partners for independent assessment. Update models with experimental data and refine the design based on lessons learned. Finalize cost and performance estimates based on these initial results. Collaborate with industry partners to put together a Phase III plan that includes quotes and letters of commitment.

PHASE III DUAL USE APPLICATIONS: Transition operation of the growth capability to at least one CdZnTe commercial foundry operator. Provide supporting documentation and training for their operation and maintenance, as required. Process a resulting demonstration boule from the commercial foundry to make several CdZnTe substrates for verification testing to demonstrate quality, consistency and reproducibility of the improved growth capability. Show how the technology can also support CdZnTe growth for other defense and commercial applications (e.g. CdTe solar cells).

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- 1). "Impact of CdZnTe Substrates on MBE HgCdTe Deposition" J. D. Benson, L. O. Bubulac, M. Jaime-Vasquez, J. M. Arias, P. J. Smith, R. N. Jacobs, J. K. Markunas, L. A. Almeida, A. Stoltz, P. S. Wijewarnasuriya, J. Peterson, M. Reddy, K. Jones, S. M. Johnson, and D. D. Lofgreen, Journal of Electronic Materials 46, (2017).
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KEYWORDS: CdZnTe; CZT; Substrate Growth; Ampoule Improvement; Boule Improvement

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Version 2

MDA23-005 TITLE: Artificial Intelligence Controller of a Filter Wheel for Acquisition and Tracking in Congested Environments

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

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

OBJECTIVE: Develop Artificial Intelligence (AI) controlled sensor filter wheel for autonomous recognition of congested conditions and applications of correct filters for best possible scene analysis.

DESCRIPTION: Some multispectral low-earth-orbit smaller-satellite-platform space sensors require an operator observing system readouts to command changes in optical/infrared bandpass filter settings and other system parameters in real time, based on varying background conditions in field of view (FOV), in order to acquire and continuously track an object. The operation could potentially be performed more quickly and efficiently using AI to change: filter settings, viewing geometries, day and night sensor controls, solar condition controls, tangent heights, and clutter background scene settings to ensure minimal missed detections and maintain continuity of track.

PHASE I: Design and develop innovative solutions, methods, algorithms and concepts to implement automation into sensor declutter controls. Declutter artificial intelligence and/or machine learning algorithm should be narrow in focus and verifiable in operation. The solutions should capture the key areas for new development, suggest appropriate methods and technologies to minimize the time intensive processes, and incorporate new technologies researched during the design and development.

PHASE II: Complete a detailed prototype design incorporating government performance requirements. Coordinate with the Government during prototype design and development to ensure the delivered products will be relevant to an ongoing missile defense architecture, 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.

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Version 2

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KEYWORDS: Sensor; Filter Wheel; Artificial Intelligence; Machine Learning; AI; ML; Declutter

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Version 2

MDA23-006 TITLE: Low Cost Actuators

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

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OBJECTIVE: Develop new technologies or designs for linear actuators to decrease cost and improve performance.

DESCRIPTION: The Government desires improvements in linear actuators to decrease cost and improve design space for future interceptor systems. In particular, linear actuators with fast response times and high accuracy requirements that are used in applications such as pintle valves are significant cost drivers. Electro-mechanical actuators are the typical state-of-the-art technology for these applications. Solutions could focus on improved designs, improved actuator components, or completely new type of linear actuators. In addition to decreasing actuator cost, solutions should also seek to minimize mass, volume, and power usage. While this topic focuses on actuators for pintle valves, additional missile defense applications could include thrust vector control and aero control surfaces.

Proposers are strongly encouraged to work with a controllable solid propulsion system manufacturer, prime contractor, or actuator manufacturer for requirements definition and transition planning. This topic does not seek to design actuators for a specific system, but rather seeks to improve technologies for future systems. For purposes of the Phase I, proposers are encouraged to obtain requirements from an industry partner or may utilize the following ballpark performance objectives if requirements are not available:

- Capable of operating at temperatures above 150°C
- Stall load requirements vary significantly depending on application, proposers may select 5000 N
- Minimal position error of 2%
- Maximum stroke length: 5 cm
- Velocity achieved within commanded stroke: > 0.1 m/s

PHASE I: Evaluate feasibility of proposed actuator concept by modeling and simulation and/or proof of concept testing. Component or breadboard fabrication is recommended to provide evaluation of critical properties or to validate new manufacturing techniques. Work with solid propulsion system developers to understand environments and to further define requirements.

PHASE II: Continue actuator development through design, analysis, and experimentation. Optimize parameters for cost and performance. Actuator testing should be conducted to validate models and generate performance databases. Demonstration in a representative environment is desired. Phase II should identify an insertion opportunity and conclude with a reasonable manufacturing strategy.

PHASE III DUAL USE APPLICATIONS: Work with a solid propulsion system manufacturer to iteratively design and fabricate prototype components for high-fidelity testing in a relevant solid rocket motor 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.

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KEYWORDS: Actuators; Propulsion; Pintle Valves

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