MISSILE DEFENSE AGENCY (MDA)
16.3 Small Business Innovation Research (SBIR)
Proposal Submission Instructions

INTRODUCTION

The Missile Defense Agency's (MDA) mission is to develop, test, and field an integrated, layered, ballistic missile defense system (BMDS) to defend the United States, its deployed forces, allies, and friends against all ranges of enemy ballistic missiles in all phases of flight.

The MDA Small Business Innovation Research (SBIR) Program is implemented, administered, and managed by the MDA SBIR/STTR Program Management Office (PMO), located within Advanced Technology (DV). Specific questions pertaining to the administration of the MDA SBIR Program should be submitted to:

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

Email: sbirsttr@mda.mil
Phone: 256-955-2020

Proposals not conforming to the terms of this Announcement will not be considered. MDA reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality will be funded. Only Government personnel with active non-disclosure agreements will evaluate proposals. MDA reserves the right to withdraw from negotiations at any time prior to contract award.

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

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

The offeror's attention is directed to the fact that non-Government advisors to the Government may review and provide support in proposal evaluations during source selection. Non-Government advisors 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. These advisors will not establish final assessments of risk and will not rate or rank offeror's proposals. They are also expressly prohibited from competing for MDA SBIR or STTR awards in the SBIR/STTR topics they review and/or on which they provide comments to the Government.

All advisors are required to comply with procurement integrity laws. Non-Government technical consultants/experts will not have access to proposals that are labeled by their proposers 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 offeror’s 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 advisors 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 offeror's proposals.

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. Additionally, in accordance with SBA SBIR Program Policy Directive dated 24 February 2014 offerors must re-certify at certain points during the Phase I and Phase II period of performance to ensure that the awardee is in compliance with the program's requirements.

SBA Company Registry

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

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 Announcement.

ORGANIZATIONAL CONFLICTS OF INTEREST (OCI)

The basic OCI rules are covered in FAR 9.5 as follows (the Contractor 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 other applicable rules under the FAR Section 9.5 apply to Contractors.

USE OF FOREIGN NATIONALS

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

ALL offerors proposing to use foreign nationals MUST disclose this information regardless of whether the topic is subject to export control restrictions. Identify any foreign citizens 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 with a foreign national listed will be subject to security review during the contract negotiation process (if selected for award). If the security review disqualifies a foreign national from participating in the proposed work, the contractor may propose a suitable replacement. In the event a proposed foreign person is found ineligible to perform proposed work, the contracting officer will advise the offeror of any disqualifications but may not disclose the underlying rationale.

EXPORT CONTROL RESTRICTIONS

The technology within some 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. You must ensure that your firm complies with all applicable export control regulations. Please refer to the following URLs for additional information: http://www.pmddtc.state.gov/regulations_laws/itar.html and http://www.bis.doc.gov/index.php/regulations/export-administration-regulations-ear.

Proposals submitted to export control-restricted topics will be subject to security review during the contract negotiation process (if selected for award). In the event a firm is found ineligible to perform proposed work, the contracting officer will advise the offeror of any disqualifications but may not disclose the underlying rationale.

CLAUSE H-08 PUBLIC RELEASE OF INFORMATION (Publication Approval)

Clause H-08 pertaining to the public release of information is incorporated into all MDA SBIR and STTR contracts and subcontracts without exception. All materials which relate to work performed by the contractor under MDA SBIR and STTR contracts must be submitted to MDA for review and approval prior to release to the public. Subcontractor public information materials must be submitted for approval through the prime contractor to MDA.

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, DFARS 252.204-7000, and DFARS clause 252.204-7012.

Confirm in your proposal that you will comply with the requirement to flow down, by contractual agreement with your subcontractors, all contract clauses and provisions which require flow down, including those specifically listed above.

Confirm also that you have received from your subcontractor written agreement that they will receive and comply with the clauses listed above.

These must be flowed down to each of your subcontractor exactly, without exception or modification of the wording. Unless otherwise stated, the technology involved with the performance of your contract is controlled unclassified information.

OWNERSHIP ELIGIBILITY

Prior to award, the Missile Defense Agency may request business/corporate documentation to assess ownership eligibility as related to the requirements of the Guide to 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/STTR award. Failure to submit the requested documentation may lead to loss of consideration or award.

FRAUD, WASTE, AND ABUSE

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; Sections 3.6 and 4.19.

PROPOSAL FUNDAMENTALS

Proposal Submission

All proposals MUST be submitted online using the DoD SBIR/STTR submission system (https://sbir.defensebusiness.org). Any questions pertaining to the DoD SBIR/STTR submission system should be directed to the DoD SBIR/STTR Help Desk at sbirhelp@bytecubed.com or 1-800-348-0787.

Classified Proposals

Classified proposals **are not** accepted under the MDA SBIR/STTR Program. Contractors currently working under a classified MDA SBIR/STTR contract must use the security classification guidance provided under that contract to verify new SBIR/STTR proposals are unclassified prior to submission. Phase I contracts are not typically awarded for classified work. However, in some instances, work being performed on Phase II contracts will require security clearances. If a Phase II contract will require classified work, the proposing firm 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 Security Service Web site at: http://www.dss.mil/index.html.

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 Status

The MDA SBIR/STTR PMO will distribute selection and non-selection email notices to all firms who submit a MDA SBIR/STTR proposal. The email will be distributed to the "Corporate Official" and "Principal Investigator" listed on the proposal Cover Sheet. MDA cannot be responsible for notification to a company that provides incorrect information or changes such information after proposal submission.

Debriefing

MDA offers debriefings to unsuccessful offerors in accordance with Federal Acquisition Regulation (FAR) Subpart 15.5. Requests for debriefing 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 a proposal debriefing.

Discretionary Technical Assistance (DTA)

Section 9(b) of the SBIR and STTR Policy Directives allows agencies to enter into agreements with vendors to provide technical assistance to SBIR or 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 databases.

MDA permits award recipients to obtain technical assistance in accordance with the SBIR and STTR Policy Directives. An SBIR or STTR firm may acquire the technical assistance services described above on its own. Firms must request this authority from MDA and demonstrate in its SBIR or STTR proposal that the individual or entity selected can provide the specific technical services needed. In addition, costs must be included in the cost volume of the offeror's proposal. The DTA 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 demonstrates this requirement sufficiently, MDA will permit the awardee to acquire such technical assistance itself, in an amount up to $5,000 per year, as an allowable cost of the SBIR or STTR award. The per year amount will be in addition to the award and is not subject to any profit or fee by the requesting firm and shall be inclusive of all indirect rates. The per-year amount is based on the original contract period of performance and does not apply to period of performance extensions. Requests for DTA funding outside of the Phase I or Phase II proposal submission will not be considered.

PHASE I PROPOSAL GUIDELINES

The DoD SBIR/STTR Proposal Submission system (available at https://sbir.defensebusiness.org) 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 will not be considered.

MAXIMUM PHASE I PAGE LIMIT FOR MDA IS 20 PAGES

Any pages submitted beyond the 20-page limit within the Technical Volume (Volume 2) will not be evaluated**.**

Phase I Proposal

A complete Phase I proposal consists of four volumes:

Volume 1: Proposal Cover Sheet *(does not count towards maximum page limit)*
Volume 2: Technical Volume
Volume 3: Cost Volume *(does not count towards maximum page limit)*
Volume 4: Company Commercialization Report *(does not count towards maximum page limit)*

MDA intends for the Phase I effort to determine the merit and technical feasibility of the concept. The contract period of performance for Phase I shall be six (6) months, and the award shall not exceed $100,000. A Phase I Option may be submitted with a period of performance of six (6) months and an amount not to exceed $50,000. This option may or may not be exercised at the sole discretion of the agency. A list of topics currently eligible for proposal submission is included in these instructions, followed by full topic descriptions. These are the only topics for which proposals will be accepted at this time.

References to Hardware, Computer Software, or Technical Data

In accordance with the SBIR Directive, SBIR contracts are to conduct feasibility-related experimental or theoretical R/R&D related to described agency requirements. The object of the Phase I is to determine the scientific and technical merit and feasibility of the proposed effort and quality of performance of the Small Business Concern. It is not for formal end-item contract delivery, and ownership by the Government of your hardware, computer software, or technical data.

Based on this, in your technical proposal, do not use 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 formal deliverables for a Phase I are the Report of Invention and Disclosure, Certificates of Compliance, Computer Software Product (normally not applicable for a Phase I), Prototype Design and Operation Document (normally not applicable for a Phase I,) Monthly Reports for months 1 through 4, Draft Final Report for month 5, and Final Report for month 6.

PHASE I PROPOSAL SUBMISSION CHECKLIST

All of the following criteria must be met or your proposal will be REJECTED.

____1. The following have been submitted electronically through the DoD submission site by 6:00 a.m. (EDT) 26 October 2016.

_____ a. Volume 1: DoD Proposal Cover Sheet

_____ b. Volume 2: Technical Volume (DOES NOT EXCEED 20 PAGES)**: Any pages submitted beyond this will not be evaluated. Your Proposal Cover Sheet, Cost Volume, and Company Commercialization Report DO NOT count toward your maximum page limit.**

_____ c. If proposing to use foreign nationals; identify the foreign national(s) you expect to be involved on this project, the type of visa or work permit under which they are performing, country of origin and level of involvement.

_____ d. Volume 3: Cost Volume. **(Online Cost Volume form is REQUIRED by MDA)**

_____ e. Volume 4: Company Commercialization Report. (required even if your firm has no prior SBIR/STTR awards).

____2. The Phase I proposed cost plus option does not exceed $150,000 (this amount does not include DTA).

PHASE I OPTION MUST BE INCLUDED AS PART OF PHASE I PROPOSAL

MDA implements the use of a Phase I Option that may be exercised at MDA's sole discretion to fund interim Phase I activities to bridge the gap between Phase I and Phase II contracts. The exercise of a Phase I option does not guarantee an award of a Phase II contract. The Phase I Option, which must be included as part of the Phase I proposal, should cover activities over a period of up to six months and describe appropriate initial Phase II activities that may lead to the successful demonstration of a product or technology. The Phase I Option must be included within the 20-page limit for the Phase I proposal.

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 will appear on the DoD SBIR/STTR awards website (https://sbir.defensebusiness.org).

MDA PROPOSAL EVALUATIONS

MDA will evaluate and select Phase I and Phase II proposals using scientific review criteria based upon technical merit and other criteria as discussed in this announcement document. 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 proposer 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 will be funded.

MDA Phase I and Phase II proposals will be evaluated based on the criteria outlined below, including potential benefit to the Ballistic Missile Defense System (BMDS). Selections will be based on best value to the Government considering the following factors which are listed in descending order of importance:

a) The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.
b) The qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.
c) The potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization.

In Phase I and Phase II, firms with a Commercialization Achievement Index (CAI) at or below the 20th percentile will be penalized in accordance with the DoD program announcement.

Please note that potential benefit to the BMDS 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 on information contained in the

proposal. Relevant supporting data such as journal articles, literature, including Government publications, etc., should be contained in the proposal and will count toward the applicable page limit.

Qualified advocacy letter(s) will count towards the proposal page limit and will be evaluated towards criterion C. Advocacy letters are not required for Phase I or Phase II.

A qualified advocacy letter is from a relevant commercial or Government Agency procuring organization(s) working with MDA, articulating their pull for the technology (i.e., what BMDS 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. This letter should be included as the last page(s) of your technical upload. Advocacy letter(s) which are faxed or e-mailed separately will NOT be considered.

Phase II Proposal Submission

Per DoD SBIR Phase II Proposal guidance, all Phase I awardees from the 16.3 Phase I announcement will be permitted to submit a Phase II proposal for evaluation and potential award selection. Details on the due date, content, and submission requirements of the Phase II proposal will be provided by the MDA SBIR/STTR PMO either in the Phase I award contract or by subsequent notification. Only firms who receive a Phase I award resulting from the 16.3 announcement may submit a Phase II proposal.

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. MDA does NOT participate in the DoD Fast Track program.

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.

Approved for Public Release
16-MDA-8725 (21 June 16)

MDA SBIR 16.3 Topic Index

MDA16-020	Rayon Replacement for High Temperature Materials
MDA16-021	Thermophysical Property Characterization of Decomposing Aerospace Materials
MDA16-022	Artificial Scene Generator
MDA16-023	Programmable Signal Generator Module

MDA SBIR 16.3 Topic Descriptions

MDA16-020 TITLE: Rayon Replacement for High Temperature Materials

TECHNOLOGY AREA(S): Materials/Processes

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 5.4.c.(8) of the solicitation.

OBJECTIVE: Develop, characterize, and manufacture innovative high temperature composites that 1) exploit newly available carbonized fibers and 2) eliminate and/or mitigate the issue associated with availability of carbonized rayon.

DESCRIPTION: Rayon-based fibers continue as the industry standard for ablative and non-ablative insulators in applications such as nozzles and reentry vehicles. In recent decades, environmental constraints have limited availability since rayon is no longer domestically produced. Many aerospace programs have stockpiled heritage material or utilize foreign sources. This topic focuses on domestically available replacement materials, such as structural or ablative insulators, with performance properties comparable to or exceeding rayon based high temperature composites.

In order to address domestic supply issues, many manufacturers have used Polyacrylonitrile (PAN) fibers as reinforcement for high temperature composites. However, PAN based fibers do not have the same thermal properties as rayon based fibers, and some PAN based materials have exhibited aging issues. New fibers, such as cellulose based fiber, have demonstrated properties very similar to rayon in the carbonized form. The thermal conductivity of carbonized rayon fiber is close to 5W/mK and on the order of 1W/mK for some rayon based composites. Other precursor fibers may also provide a viable domestic source for high temperature composites. Utilization of new fiber precursors could significantly decrease thermal conductivity of ablative and/or structural insulators. In addition, new fiber based architectures (braids, weaves, etc.) could improve mechanical and thermal properties. Efforts should demonstrate the feasibility of producing either structural or ablative insulator components (valve components, nozzle components, etc.) with improved thermal properties. Process technologies should be appropriate for modest production volumes, be repeatable, and offer significant potential for enhancing performance properties while improving producibility.

PHASE I: Evaluate the feasibility of either structural insulator or ablative insulator material concept with modeling and/or proof-of-concept material testing. Provide estimated performance and reliability characteristics. A sub-scale material fabrication demonstration and limited evaluation of critical properties is recommended in Phase I, but not required.

PHASE II: Continue material and process development through design, analysis, and experimentation. Optimize processing parameters for yield and quality. Coupon-level testing should be conducted to validate material models and generate property databases. Phase II should identify an insertion opportunity and conclude with a mature manufacturing process.

PHASE III DUAL USE APPLICATIONS: Iteratively design and fabricate prototype components for high-fidelity testing in a relevant high temperature environment for current or future missile defense applications. A successful Phase III would provide the necessary technical data to transition the technology into a missile defense application. The material could also provide benefit throughout the Department of Defense and the National Aeronautics and Space Administration.

REFERENCES:

1. U.S. Missile Defense Agency. March 3, 2016. Ballistic Missile Defense System. Retrieved from http://www.mda.mil/index.html.

2. R. C. Rossi. 1995. “Availability of Aerospace Rayon for SRM Nozzle Insulators.” American Institute of Aeronautics and Astronautics.

3. Gisela Goldham. 2011. “TENCEL® Carbon Precursor.” 50th Man-Made Fiber Conference. Dornbirn, Austria. Lenzinger Berichte, 2012.

4. U.S. Department of Defense. Undated. Ballistic Missile Defense Review. Retrieved from http://www.defense.gov/bmdr.

5. George P. Sutton. 2010. "Rocket Propulsion Elements." 8th edition, John Wiley & Sons Inc.

KEYWORDS: carbon fibers, composites, high temperature materials, structural insulators, ablative insulators

MDA16-021 TITLE: Thermophysical Property Characterization of Decomposing Aerospace Materials

TECHNOLOGY AREA(S): Materials/Processes, Sensors, Space Platforms

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 5.4.c.(8) of the solicitation.

OBJECTIVE: Seek innovative technologies that provide complete thermophysical characterization of aerospace vehicle materials during the various stages of partial decomposition associated with rocket boosted ascent and reentry.

DESCRIPTION: The government performs thermal analyses on both the ascent and reentry flights for a wide range of booster and target vehicles. Efficient technologies are currently used to thermo-physically characterize the materials in the native state. However, vehicle velocities are normally high enough to create an aerothermal heating environment that leads to some level of material decomposition. The large flight velocity envelope associated with various missile defense vehicles and flight scenarios causes the vehicle material energetics/properties to constantly change. In addition, flight scenarios that are comprised of both ascent and reentry flight environments mandate that the vehicle materials must be thermally analyzed during multiple heating and cooling cycles. Accurate, time-efficient (from a data collection standpoint) and cost effective technologies are desired that fully thermo-physically characterize aerospace materials over the full range of decomposing states.

PHASE I: Develop an accurate, time efficient technology that fully characterizes the thermo-physical degradation. Perform appropriate coupon level testing to provide proof of concept. Define cost and measurement time estimates and the expected measurement accuracy range.

PHASE II: Comparisons should be made between the new thermo-physical characterization and the historic characterization data (wind tunnel and high-enthalpy arc-heated tests) to determine performance gains in thermal response accuracy. The time required to setup and acquire material measurements should be fully defined. Estimate the cost of collecting the measurements.

PHASE III DUAL USE APPLICATIONS: Phase III will leverage the results of Phase II and compare with data from previous government tests. The data from testing during Phases II and III will be incorporated into the

material properties of existing models for use in future missile defense flight tests.

REFERENCES:
1. June 20, 2013. Material Response Characterization of Low Density Carbon-Phenolic Ablators 10th International Planetary Probe Workshop San Jose, CA.

2. B. B. Helber, O. Chazot, T. Magin, and A. Hubin. Undated. Aeronautics and Aerospace Department, von Karman Institute for Fluid Dynamics, Belgium Research Group Electrochemical and Surface Engineering, Vrije Universiteit Brussel.

3. Sergey V. Baryshev, Robert A. Erck, Jerry F. Moore, Alexander V. Zinovev, C. Emil Tripa, and Igor V. Veryovkin. February 27, 2013. Characterization of Surface Modifications by White Light Interferometry: Applications in Ion Sputtering, Laser Ablation, and Tribology Experiments Vis Exp. 2013; (72)

KEYWORDS: material properties, materials modeling, thermal properties

MDA16-022 TITLE: Artificial Scene Generator

TECHNOLOGY AREA(S): Air Platform, Battlespace, Sensors, Space Platforms

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 5.4.c.(8) of the solicitation.

OBJECTIVE: Develop a technology capable of generating pre-planned scenes in exo- and endo-atmospheric flight test conditions operating over various frequency bands of the electromagnetic spectrum.

DESCRIPTION: The government has a requirement to assess the performance during flight test of missile systems capable of engaging threats in highly variable environments. The requested flight hardware scene generator system should have the capability to be tailored to allow testing of the viewing system to incrementally improve system engagements. The development of the prototype system must also account for deployment methodologies, dispersion rates, and maintain scene characteristics. The deployment methods should ensure multiple scene component characteristics that are capable of meeting various and multiple requirements. The dispersion rates must be aligned with the specified times of dispersion, locations of the scene components, and specific distances. This is essential for numerous sensor systems and associated technologies, as well as for testing missile capabilities.

The artificial scene generator (ASG) is envisioned to be a flexible modular system designed to fit in a predefined volume and interface to the delivery system according to an interface control document. Individual modules of the ASG should be developed to meet specific flight deployment characteristics required for missile test events. This system should have the capability to maintain dynamic control of multiple scene components and associated characteristics. Additionally, the system must meet the government-provided packaging size constraints.

Multiple module solutions are expected and encouraged. Proposed module designs do not have to accommodate all possible functions. However, all modules must be designed to be incorporated into a framework of fixed volume size, communications, electrical power, and interoperability as defined by the interface control document. If possible, approaches to these solutions should be scalable in dimensions to maximal extent, i.e. a solution should be able to be scaled up in size, number, or density as necessary. Leveraging commercial off the shelf technologies is encouraged to keep cost low as long as it does not inadvertently impact performance. Innovative solutions are sought that can achieve desired performance within the packaging size constraints.

PHASE I: Analyze the feasibility of developing modules of different measurement characteristics and develop initial designs. For each module design, the designer should provide a description of the expected measurement performance characteristics and provide both the fabrication and test plans along with a schedule to demonstrate those characteristics. Additionally, the designer should outline a path to miniaturization.

PHASE II: Complete the detailed design according to the government provided interface control document and environments for integration in government furnished hardware. Prototype test units should be fabricated and tested to demonstrate capabilities to generate desired scenes. Additional units should be fabricated for protoflight testing to determine if the modules can survive environments and for fit checks in government furnished hardware. Plans for miniaturization should be developed and any design modifications should be presented.

PHASE III DUAL USE APPLICATIONS: Fabricate selected module designs and conduct ground testing to demonstrate survivability in flight environments. Successful units may be incorporated into missile defense targets for flight tests.

REFERENCES:
1. Terma. March 24, 2016. Self-Protection System Solutions for Wide-Body and Special Mission Aircraft. Retrieved from http://www.terma.com/defense/aircraft-survivability-equipment/self-protection-solutions/self-protection-system-solutions-for-wide-body-and-special-mission-aircraft/#sthash.QfCMPzQm.dpuf

2. J.E. Costanza and R.A. Sellers. 2013. Large aircraft self-defense system installation configuration, US Patent 8,376,277. Retrieved from http://www.google.com/patents/US8376277.

KEYWORDS: modular, electromagnetic sensor testing, miniaturization, debris modeling

MDA16-023 TITLE: Programmable Signal Generator Module

TECHNOLOGY AREA(S): Electronics, Space Platforms

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 5.4.c.(8) of the solicitation.

OBJECTIVE: Develop innovative beacon technologies capable of generating custom pre-preprogrammed signals that consume low power, are miniaturized, and are low cost for use in various future missile flight test systems.

DESCRIPTION: The need for smaller and more efficient electronic beacon systems is growing due to smaller platforms that may not have the space or power delivery systems for all electronic items. As testing of the missile defense system involves multiple systems in flight at one time, there is also a need for beacons to operate in specific frequencies with the added flexibility to have each beacon generate a unique signal to allow the range radar resources to more effectively distinguish each beacon. The government is looking for novel approaches that have the capability to interface with various transmitters to meet different mission requirements.

The Programmable Signal Generator Module (PSGM) is envisioned to be a plug and play module that interfaces with a telemetry radio. The PSGM should generate a signal waveform that is defined before flight. The module should be as small as possible and must receive power externally from the transmitter. The module should be able to be programmed through the transmitter after integration in the vehicle. The commercial off the shelf baseline system should fit within the same size, weight, and power requirements as the current digital signal processing chip (23 x 23 mm, with a max power consumption of 3.3V and a few grams in weight) and should interface with the current telemetry radio.

PHASE I: Develop single board design approaches and demonstrate the programmability of the hardware to be able to generate any signal waveform including random signals. Completion of Phase I should result in designs for single small footprint modules to lead into Phase II.

PHASE II: Fabricate prototype module(s) and demonstrate hardware functionality. Conduct testing with a representative telemetry system. Phase II should conclude with a final design of the hardware and software.

PHASE III DUAL USE APPLICATIONS: Fabricate and ground test flight representative hardware to demonstrate survivability in missile flight environments. Successful modules may be incorporated into future government targets for flight tests.

REFERENCES:
1. Texas Instruments, TMS320C6424x. March 23, 2016. Retrieved from http://www.ti.com/solution/signal_waveform_generator.

2. Texas Instruments, Block Diagram (SBD) – Signal/Waveform Generator. March 23, 2016. Retrieved from http://www.ti.com/solution/signal_waveform_generator.

3. T.B Welch, C.H. G. Wright, and M.G. Morrow. December 2011. Real-Time Digital Signal Processing from MATLAB to C with the TMS320C6x DSPs, 2nd Edition, CRC Press.

KEYWORDS: miniaturization, programmable component, modular, signal generation