SBIR 20.3 DEFENSE LOGISTICS AGENCY (DLA) SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM

Proposal Submission Instructions

GENERAL

The Defense Logistics Agency (DLA) implements, administers, and manages the SBIR/STTR Program as part of the Small Business Innovation Programs through DLA J68 Information Operations / Research, and Development (R&D) Division. Consult the program website at the following location: http://www.dla.mil/SmallBusiness/SmallBusinessInnovationPrograms for general information about the DLA SBIP Program and its mission. If you have any questions regarding the administration of the Program, please contact the DLA SBIR Program Manager (PM):

Denise Price email: DLASBIR2@dlamil

TECHNICAL QUESTIONS

For questions regarding the SBIR/STTR topics during the pre-release period, contact the Topic Technical Point of Contact (TPOC) listed for each topic on the SBIR/STTR website at https://www.dodsbirsttr.mil/submissions/login prior to the close of the pre-release. To obtain answers to technical questions during the open period; submit your questions through the online SBIR/STTR Q&A System https://www.dodsbirsttr.mil/submissions/login.

For general inquiries or problems with electronic submission, contact Department of Defense (DoD) SBIR Help Desk at DoDSBIRSupport@reisystems.com or 703.214.1333 between 9:00 am and 5:00 pm ET.

PHASE I KEY DATES

20.3 BAA (Pre-release) 25 August 2020
20.3 BAA (Open period) 23 September 2020
20.3 BAA Closes 22 October 2020  The countdown clock on the website is official
PROGRAM BROAD AGENCY ANNOUNCEMENT (BAA) 20.3

PHASE I GUIDELINES

DLA is committed to improving the time to award new projects. As such, all DLA Phase I topics are subject to pilot efforts intended to meet legislative goals.

A list of the topics currently eligible for proposal submission is included in the Topic Index, followed by full topic descriptions. Additional guidance is as follows:

- Proposal period of performance should follow the guidelines listed in the topic.
- Proposal Cost Estimates are topic dependent, and each topic has a specified ceiling.
- Phase I proposals may not exceed the 20-page limit.
- Volume 5 Proposal attachments, appendices, or references are not included in the Page count.
- Volume 6 FWA Training Certificate is required for proposal submission.
- Notification of selection and non-selection occurs electronically via e-mail (NLT 15 Jan 2021).

For detailed proposal submission guidance, refer to U.S. Department of Defense (DoD) Instructions 20.3 SBIR at: https://www.dodsbirstr.mil/submissions/login

Phase I Proposal Instructions

a. Proposal Cover Sheet (Volume 1)

On the Defense SBIR/STTR Innovation Portal (DSIP) at https://www.dodsbirstr.mil/submissions/, prepare the Proposal Cover Sheet. The Cover Sheet must include a brief technical abstract of no more than 200 words that describes the proposed R&D project with a discussion of anticipated benefits and potential commercial applications. **Do not include proprietary or classified information in the Proposal Cover Sheet.** If your proposal is selected for award, the technical abstract and discussion of anticipated benefits may be publicly released on the Internet. Once the Cover Sheet is saved, the system will assign a proposal number. You may modify the cover sheet as often as necessary until the BAA closes.

b. Format of Technical Volume (Volume 2)

(1) **Type of file:** The Technical Volume must be a single Portable Document Format (PDF) file, including graphics. Perform a virus check before uploading the Technical Volume file. If a virus is detected, it may cause rejection of the proposal. **Do not lock or encrypt the uploaded file. Do not include or embed active graphics such as videos, moving pictures, or other similar media in the document.**

(2) **Length:** It is the proposing firm’s responsibility to verify that the Technical Volume does not exceed the page limit after upload to DSIP. The DLA Page Limit is 20 Pages, anything beyond 20 pages will not be evaluated.

(3) **Layout:** Number all pages of your proposal consecutively. Those who wish to respond must submit a direct, concise, and informative research or research and development proposal (no type smaller than 10-point on standard 8-1/2” x 11” paper with one-inch
c. **Content of the Technical Volume (Volume 2)**

The Technical Volume should cover the following items in the order given below:

1. **Identification and Significance of the Problem or Opportunity.** Define the specific technical problem or opportunity addressed and its importance.

2. **Phase I Technical Objectives.** Enumerate the specific objectives of the Phase I work, including the questions the research and development effort will try to answer to determine the feasibility of the proposed approach.

3. **Phase I Statement of Work (including Subcontractors’ Efforts)**
   a. Provide an explicit, detailed description of the Phase I approach. If a Phase I option is required or allowed by the Component, describe appropriate research activities which would commence at the end of Phase I base period should the Component elect to exercise the option. The Statement of Work should indicate what tasks are planned, how and where the work will be conducted, a schedule of major events, and the final product(s) to be delivered. The Phase I effort should attempt to determine the technical feasibility of the proposed concept. The methods planned to achieve each objective or task should be discussed explicitly and in detail. This section should be a substantial portion of the Technical Volume section.
   b. This BAA may contain topics that have been identified by the Program Manager as research or activities involving Human/Animal Subjects and/or Recombinant DNA. In the event that Phase I performance includes performance of these kinds of research or activities, please identify the applicable protocols and how those protocols will be followed during Phase I. Please note that funds cannot be released or used on any portion of the project involving human/animal subjects or recombinant DNA research or activities until all of the proper approvals have been obtained (see Sections 4.7 - 4.9). **Submitters proposing research involving human and/or animal use are encouraged to separate these tasks in the technical proposal and cost proposal in order to avoid potential delay of contract award.**

4. **Related Work.** Describe significant activities directly related to the proposed effort, including any conducted by the principal investigator, the proposing firm, consultants, or others. Describe how these activities interface with the proposed project and discuss any planned coordination with outside sources. The technical volume must persuade reviewers of the proposer's awareness of the state-of-the-art in the specific topic. Describe previous work not directly related to the proposed effort but similar. Provide the following:
   a. Short description,
   b. Client for which work was performed (including individual to be contacted and phone number), and
   c. Date of completion.

5. **Relationship with Future Research or Research and Development**
a. State the anticipated results of the proposed approach if the project is successful.
b. Discuss the significance of the Phase I effort in providing a foundation for Phase II research or research and development effort.
c. Identify the applicable clearances, certifications, and approvals required to conduct Phase II testing and outline the plan for ensuring timely completion of said authorizations in support of Phase II research or research and development effort.

(6) Commercialization Strategy. Describe in approximately one page your company's strategy for commercializing this technology in DoD, other Federal Agencies, and/or private sector markets. Provide specific information on the market need the technology will address and the size of the market. Also include a schedule showing the quantitative commercialization results from this SBIR project that your company expects to achieve.

(7) Key Personnel. Identify key personnel who will be involved in the Phase I effort including information on directly related education and experience. A concise technical resume of the principal investigator, including a list of relevant publications (if any), must be included (Please do not include Privacy Act Information). All resumes will count toward the page limitations for Volume 2.

(8) Foreign Citizens. 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. Proposers frequently assume that individuals with dual citizenship or a work permit will be permitted to work on an SBIR project and do not report them. This is not necessarily the case and a proposal will be rejected if the requested information is not provided. Therefore, firms should report any and all individuals expected to be involved on this project that are considered a foreign national as defined in Section 3.5 of the BAA. 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)).

(9) Facilities/Equipment. Describe available instrumentation and physical facilities necessary to carry out the Phase I effort. Justify equipment purchases in this section and include detailed pricing information in the Cost Volume. State whether or not the facilities where the proposed work will be performed meet environmental laws and regulations of federal, state (name), and local Governments for, but not limited to, the following groupings: airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal practices, and handling and storage of toxic and hazardous materials.

(10) Subcontractors/Consultants. Involvement of a university or other subcontractors or consultants in the project may be appropriate. If such involvement is intended, it should be identified and described according to the Cost Breakdown Guidance. A minimum of two-thirds of the research and/or analytical work in Phase I, as measured by direct and indirect costs, must be conducted by the proposing firm, unless otherwise approved in writing by the Contracting Officer. SBIR efforts may include subcontracts with Federal Laboratories and Federally Funded Research and Development Centers (FFRDCs). A waiver is no
longer required for the use of federal laboratories and FFRDCs; however, proposers must certify their use of such facilities on the Cover Sheet of the proposal.

(11) **Prior, Current, or Pending Support of Similar Proposals or Awards.** If a proposal submitted in response to this BAA is substantially the same as another proposal that was funded, is now being funded, or is pending with another Federal Agency, or another or the same DoD Component, you must reveal this on the Proposal Cover Sheet and provide the following information:
   a. Name and address of the Federal Agency(s) or DoD Component to which a proposal was submitted, will be submitted, or from which an award is expected or has been received.
   b. Date of proposal submission or date of award.
   c. Title of proposal.
   d. Name and title of principal investigator for each proposal submitted or award received.
   e. Title, number, and date of BAA(s) or solicitation(s) under which the proposal was submitted, will be submitted, or under which award is expected or has been received.
   f. If award was received, state contract number.
   g. Specify the applicable topics for each SBIR proposal submitted or award received.

   *Note: If this does not apply, state in the proposal "No prior, current, or pending support for proposed work".*

d. **Content of the Cost Volume (Volume 3)**

Complete the Cost Volume by using the on-line cost volume form on the Defense SBIR/STTR Innovation Portal (DSIP). Some items in the Cost Breakdown Guidance may not apply to the proposed project. If that is the case, there is no need to provide information on each and every item. What matters is that enough information be provided to allow us to understand how you plan to use the requested funds if a contract is awarded.

(1) List all key personnel by name as well as by number of hours dedicated to the project as direct labor.

(2) While special tooling and test equipment and material cost may be included under Phases I, the inclusion of equipment and material will be carefully reviewed relative to need and appropriateness for the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Component Contracting Officer, be advantageous to the Government and should be related directly to the specific topic. These may include such items as innovative instrumentation or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with the DoD Component, unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by the DoD Component.

(3) Cost for travel funds must be justified and related to the needs of the project.

(4) Cost sharing is permitted for proposals under this BAA; however, cost sharing is not required nor will it be an evaluation factor in the consideration of a Phase I proposal.
(5) A Phase I Option (if applicable) should be fully costed separately from the Phase I (base) approach.

(6) All subcontractor costs and consultant costs must be detailed at the same level as prime contractor costs in regard to labor, travel, equipment, etc. Provide detailed substantiation of subcontractor costs in your cost proposal. Enter this information in the Explanatory Material section of the on-line cost proposal form. The Supporting Documents Volume (Volume 5) may be used if additional space is needed.

When a proposal is selected for award, you must be prepared to submit further documentation to the Component Contracting Officer to substantiate costs (e.g., an explanation of cost estimates for equipment, materials, and consultants or subcontractors). For more information about cost proposals and accounting standards, see http://www.dcaa.mil. Click on “Guidance” and then click on “Audit Process Overview Information for Contractors”.

e. **Company Commercialization Report (Volume 4)**

The Company Commercialization Report (CCR) will NOT be available during the 20.3 BAA cycle for Phase I or Direct to Phase II proposals. No Commercialization Achievement Index (CAI) will be generated. The CCR will be available for future DoD BAA cycles. If the CCR is available at the time of the Phase II submission for any awarded Phase I efforts resulting from this BAA, the proposing firm is required to submit the CCR for its Phase II proposal.

f. **Supporting Documents (Volume 5)**

Volume 5 is provided for small businesses to submit additional documentation to support the Technical Volume (Volume 2), and the Cost Volume (Volume 5).

Documents that are acceptable and may be included in Volume 5 are:

1. Letters of Support
2. Additional Cost Information
3. Funding Agreement Certification
4. Technical Data Rights (Assertions)
5. Lifecycle Certification
6. Allocation of Rights
7. Other

Refer to the Component-specific instructions for Volume 5 requirements.

g. **Fraud, Waste and Abuse Training (Volume 6)**

Complete the training within the DSIP system.

**PHASE II GUIDELINES**

Phase II eligibility is based on the following guidance:

- All Phase I awardees may submit a Phase II proposal without invitation.
- Proposal period of performance not to exceed 24 months, follow the guidelines listed in the original Phase I Topic.
• Volume 2 of Phase II proposals may not exceed the 40-page limit.
• Volume 5 Proposal attachments, appendices, or references are not included in the Page count.
• Commercialization Strategy Requirements:
  o Business Case highlighting benefits to the DoD/DLA.
  o Transition Strategy and Key Tasks
  o Time-Phased Transition Plan
  o Projected Transition Cost Analysis

DLA Phase II proposals must follow the detailed proposal submission guidance in the original Phase I BAA. Refer to DoD Instructions at https://rt.cto.mil/rtl-small-business-resources/past-announcements/

Phase II Proposal format is the same as Phase I with the exception of the page limit in Volume 2. The Phase II Limit is 40 pages

EVALUATION CRITERIA

Phase I see Section 6 in the OSD BAA
Phase II see Section 7 in the OSD BAA

TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The DLA SBIR Program does not participate in the Technical and Business Assistance (formally the Discretionary Technical Assistance Program). Contractors should not submit proposals that include Technical and Business Assistance.

DELIVERABLES / REPORTS

All DLA SBIR and STTR awardees are required to submit reports in accordance with the deliverable schedule. The recipient must provide all reports to the individuals identified in Exhibit A of the contract. Milestones: Each phase of the project will be milestone driven. The Principal Investigator will propose milestones prior to starting any phase of the project.

Phase I Proposals should anticipate a combination of any or all of the following deliverables:

• Plan of Action and Milestones (POAM) with sufficient detail for monthly project tracking.
• Initial Project Summary: one-page, unclassified, non-sensitive, and non-proprietary summation of the project problem statement and intended benefits (must be suitable for public viewing).
• Monthly Status Report. A format will be provided at the PAC
• The TPOC and PM will determine a meeting schedule at the PAC. Phase I awardees can expect Monthly (or more frequent) Project Reviews C)
• Draft Final Report including major accomplishments, business case analysis, commercialization strategy, transition plan with timeline, and proposed path forward for Phase II.
• Final Report including major accomplishments, business case analysis, commercialization strategy and transition plan with timeline, and proposed path forward for Phase II
• Final Project Summary (one-page, unclassified, non-sensitive and non-proprietary summation of project results, high resolution photos or graphics intended for public viewing)
• Phase II Proposal is optional at the Phase I Awardee’s discretion (as Applicable)
• Applicable Patent documentation
• Other Deliverables as defined in the Phase I Proposal

Phase II Proposals should anticipate a combination of any or all of the following deliverables:

• Plan of Action and Milestones (POAM) with sufficient detail for monthly project tracking
• Initial Project Summary: one-page, unclassified, non-sensitive, and non-proprietary summation of the project problem statement and intended benefits (must be suitable for public viewing)
• Monthly Status Report. A format will be provided at the PAC.
• Meeting schedule to be determined by the Technical Point of Contact (TPOC) and PM at the PAC
  ▪ Phase II awardees expect Monthly (minimum) Project Reviews (format provided at the PAC)
• Draft Final Report including major accomplishments, commercialization strategy and transition plan and timeline.
• Final Report including major accomplishments, commercialization strategy, transition plan, and timeline.
• Final Project Summary (one-page, unclassified, non-sensitive and non-proprietary summation of project results, non-proprietary high resolution photos, or graphics intended for public viewing)
• Applicable Patent documentation.
• Other Deliverables as defined in the Phase II Proposal.

PRE-RELEASE COMMUNICATION: During the pre-release period it is highly recommended that applicants communicate with the Technical Points of Contacts (TPOCs) provided in this topic. Best method of scheduling the dialogue is via e-mail.
<table>
<thead>
<tr>
<th>Topic ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLA203-001</td>
<td>Engaging the Manufacturing Industrial Base in Support of DLA’s Critical Supply Chains</td>
</tr>
<tr>
<td>DLA203-002</td>
<td>Research and Testing of the Outdoor Autonomous Guided Vehicles (AGVs) Operating Between DLA Distribution Center Warehouses</td>
</tr>
<tr>
<td>DLA203-003</td>
<td>Advanced Battery Electrode Manufacturing Technologies</td>
</tr>
<tr>
<td>DLA203-004</td>
<td>Direct Production Methods for Battery Electrode Material Synthesis</td>
</tr>
<tr>
<td>DLA203-005</td>
<td>Hard Armor Ballistic Plate Boron Carbon (B4C) Recovery and Reclamation</td>
</tr>
</tbody>
</table>
TITLE: Engaging the Manufacturing Industrial Base in Support of DLA’s Critical Supply Chains

RT&L FOCUS AREA(S): Nuclear; Warfighting Requirements (GWR)
TECHNOLOGY AREA(S): Ground Sea; Nuclear; Weapons; Materials; Air Platform

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 section 3.5 of 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: Build Small Business Manufacturer (SBM) base to address obsolescence and develop a qualified source of supply and ready to improve DLA product availability, provide competition for reduced lead time and cost, and address lifecycle performance issues. Through participation in DLA SBIR, SBMs will have an opportunity to collaborate with DLA Weapons System Program Managers (WSPMs) and our customer Engineering Support Activities (ESAs) to develop innovative solutions to DLA’s most critical supply chain requirements. The intent of the topic is to develop SBMs who will economically produce NSNs with historically low demand utilizing innovative technologies resulting in reduced lead time and cost with enhanced life cycle performance. In the end, the SBM benefits from the experience by qualifying as a source of supply as well as from the business relationships and experience to further expand their product lines and readiness to fulfill DLA procurement requirements.

DESCRIPTION: Competitive applicants will have reviewed the parts list provided on DLA Small Business Innovation Program (SBIP) site, (Reference 4) as well as the technical data in the cFolders of DLA DiBBs, (Reference 3). Proposals can evolve in one of four ways depending on the availability of technical data and NSNs for reverse engineering as follows. Information on competitive status, RPPOB, and tech data availability will be provided on the website, Reference:

a. Fully Competitive (AMC/AMSC-1G) NSNs where a full technical data package is available in cFolders. The SBM proposal should reflect timeline, statement of work and costs associated with the manufacturing and qualification of a representative article.

b. Other than (AMC/AMSC-1G) NSNs where a full Technical Data Package (TDP) is available in cFolders. These items may also require a qualification of a Representative Article. The SBM proposal should reflect timeline, statement of work, and costs associated with producing a Source Approval Request (SAR) and (if applicable) qualification of a Representative Article. Contact the TPOC if necessary. The scope and procedures associated with development of a SAR package are provided in Reference 1.

c. Repair Parts Purchase or Borrow (RPPOB) may be an option for other than 1G NSNs where partial or no technical data is available in cFolders. NSNs, if available, may be procured or borrowed through this program for the purposes of reverse engineering. The instructions for RPPOB can be found on the websites, Reference 5. The SBM proposal should reflect timeline, statement of work and costs associated with the procuring the part and reverse engineering of the NSN. Depending on complexity, producing both the TDP and SAR package may be included in Phase I.
d. Reverse Engineering (RE) without RPPOB is when the NSN will be provided as Government Furnished Material (GFM) if available from the ESA or one of our Service customers. In this case, contact the TPOC to discuss the availability of the NSN prior to starting the proposal. The SBM proposal should reflect timeline, statement of work and costs associated with the reverse engineering of the NSN and depending on complexity producing a TDP and SAR package in Phase I.

Specific parts may require minor deviations in the process dependent on the Engineering Support Activity (ESA) preferences and requirements. Those deviations will be addressed post award.

Participating small businesses must have an organic manufacturing capability and a Commercial and Government Entity (CAGE) code and be Joint Certification Program (JCP) certified in order to access technical data if available.

Refer to “link 2” below for further information on JCP certification. Additionally, small businesses will need to create a DLA’s Internet Bid Board System (DIBBS) account to view all data and requirements in C Folders.

Refer to “links 3 and 4” below for further information on DIBBS and C Folders. All available documents and drawings are located in the C Folder location “SBIR203C”. If the data is incomplete, or not available, the effort will require reverse engineering.

PROJECT DURATION and COST:

- Phase I: NTE 18 Months $250K - Base NTE $100K base 6 Months, - Option 1 NTE $100K 6 Months, - Option 2 NTE $50K base 6 Months
- PHASE II: Phase II – NTE 24 Months $1.6M - Base 18 months, $1M Option 6 Months NTE $.6M

PHASE I: The goal of phase I is for the SBM to qualify as a source of supply for DLA NSNs to improve DLA product availability, provide competition for reduced lead time and cost, and address lifecycle performance issues. In this phase, manufacturers will request TDP/SAR approval from the applicable Engineering Support Activity (ESA), if required, for the NSNs. At the Post Award Conference, the awardee will have the opportunity to collaborate with program, weapon system, and/or engineering experts on the technical execution and statement of work provided in their proposal. There are exceptions for more complex parts and the proposal should provide the rationale. All Phase I Proposals should demonstrate an understanding of the NSN(s) and the general challenges involved in their manufacture. Proposals that fail to demonstrate knowledge of the part will be rejected.

PHASE II: The Phase II proposal is optional for the Phase I awardee. Phase II selections are based on Phase I performance, SBM innovation and engineering capability and the availability of appropriate requirements. Typically the goal of Phase II is to expand the number of NSNs and/or to build capability to expand capacity to better fulfill DLA requirements.

PHASE III DUAL USE APPLICATIONS: No specific funding is associated with Phase III. Progress made in PHASE I and PHASE II should result in the manufacturer’s qualification as an approved source of supply enabling participation in future DLA procurement actions. Phase III for this project is defined by relevant procurement awards.

COMMERCIALIZATION: The SBM will pursue commercialization of the various technologies and processes developed in prior phases through participation in future DLA procurement actions on items identified but not limited to this BAA.
REFERENCES:
2. JCP Certification: https://public.logisticsinformation.service.dla.mil/PublicHome/jcp
3. Access the web address for DIBBS at https://www.dibbs.bsm.dla.mil, then select the “Tech Data” Tab and Log into c-Folders. This requires an additional password. Filter for solicitation “SBIR203C”
5. DLA Aviation Repair Parts Purchase or Borrow (RPPOB) Program: https://www.dla.mil/Aviation/Offer/Services/AviationEngineering/Engineering/ValueEng.aspx

KEYWORDS: Nuclear Enterprise Support (NESO), Source Approval, Reverse Engineering
TITLE: Research and Testing of an Innovative and Ruggedized Autonomous Guided Vehicle (AGV) with State-of-the-Art Indoor-Outdoor Navigation Capability

RT&L FOCUS AREA(S): Autonomy; Artificial Intelligence/ Machine Learning;
TECHNOLOGY AREA(S): Sensors, Electronics; Information 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 section 3.5 of 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 an innovative and ruggedized Autonomous Guided Vehicle (AGV) with a state-of-the-art indoor-outdoor navigation capability. The AGV may use a variety of sensors such as Global Positioning System (GPS), Light Detection and Ranging (LiDAR), and Wireless Fiber (Wi-Fi) where applicable, and should minimize the need for infrastructure modifications such as Augmented Reality (AR) tags to enable autonomous navigation in changing environments.

Objective 0: Indoor-Outdoor AGV. Develop an AGV that combines the features of both the outdoor and indoor AGVs described below. The goal of this objective is for the vendor to develop a capability for an AGV that addresses the requirements for a rugged Outdoor AGV, as described in Objective 1 below, with a state-of-the-art outdoor navigation solution and integrate this capability with an Indoor AGV design, as described in Objective 2 below, that provides for indoor GPS-denied navigation, and the capability to ascend and descend warehouse tunnel inclines while towing loaded warehouse carts, and can smoothly transition between warehouse floors, tunnels, and racks. If that proves too difficult, proposals for separate indoor and outdoor AGV will be considered.

Objective 1: Outdoor AGV. Develop an innovative and rugged Outdoor AGV with a state-of-the-art outdoor navigation solution integrated into warehouse communications systems (i.e., Warehouse Execution System (WES)). This integration allows Outdoor AGVs to receive tasking in an automated fashion to operate frequently and report success or failure at tasking. This research seeks to identify and test navigational technology that can be used uninterrupted and continuously onboard AGVs in support of routine external warehouse operations throughout the DLA enterprise. This research effort addresses DLA identified cybersecurity requirements through the test and evaluation of government security controls. It leverages current technologies in the AGV industry combined with a suitable and robust external navigation solution to test the operation of AGVs when operating externally between distribution warehouses. This research project will operate in external environments at designated DLA Distribution Centers in the United States.

Objective 2: Indoor AGV. Develop a robust AGV that operates inside warehouses and within warehouse tunnels and navigates the tunnel inclines found at the DLA Distribution Center, Hill Air Force Base, and UT (DDHU). The Indoor AGV design allows for the ascent and descent of tunnel inclines with up to 12 in a 100 grade (+/- 12%), the smooth transition between warehouse floors and tunnels, the navigation of sharp turns (180 degrees or more) requiring a minimum turning radius of 1.9 meters, and possess a threshold capability to tow two standard warehouse carts with a total combined weight of 12,000 pounds and a maximum tow capability of up to three standard warehouse carts with a total combined weight of up to 18,000 pounds (i.e., the weight of three loaded carts) given all conditions and requirements described.
above. The Indoor AGV’s state-of-the-art indoor navigation system will continuously operate within DLA Distribution Warehouses, will be integrated into warehouse automation systems, and communicates with WES Research and Development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has not been fully established. Further, proposed efforts must be judged to be at a Technology Readiness Level (TRL) 6 or less, but greater than TRL 3 to receive funding consideration.

TRL 3. (Analytical and Experimental Critical Function and/or Characteristic Proof of Concept)
TRL 6. (System/Subsystem Model or Prototype Demonstration in a Relevant Environment)

DESCRIPTION: Defense Logistics Agency (DLA) Distribution Modernization Program (DMP) topics of interest are research focused on a Continental United States-based AGV navigation solution in support of the routine navigation of vehicles operating both outdoors between DLA distribution warehouses, indoors within the DLA warehouses, and when traversing warehouse tunnels. This research project shall involve the use of Commercial/Industry AGVs that can withstand the demands of both outdoor and indoor operations, ascend/descend warehouse tunnels, and be integrated with outdoor and indoor-based navigation systems utilizing various sensors such as GPS, LS, Wi-Fi, and LiDAR that:

1. Support a joint effort between DLA Research and Development (R&D) and DLA J4 Distribution Headquarters to conduct research and testing of navigation systems integrated into a variety of AGVs during outdoor operations between warehouses and when towing loaded carts operating indoors within tunnels with 12 in a 100 grade (+/-12%) grades.
2. Significantly addresses the navigational capabilities of AGVs in the outdoor environment, while enhancing resiliency to the varying conditions of an outdoor environment (e.g., less than desirable road conditions, road debris, and inclement weather conditions present when operating outdoors—snow, rain, fog, or sunshine).
3. The AGV can be used in the outdoor environment to transport goods between multiple warehouses at a DLA distribution site safely and operate at a higher material handling throughput, even under challenging road and weather conditions.
4. Feature navigation systems able to implement high precision measurement data for regular use in outdoor/indoor navigation.
5. Can operate indoors using a state-of-the-art indoor navigation system (e.g., LiDAR) that allows AGVs to continuously work within DLA’s Distribution Warehouses and seamlessly transition between the outdoor and indoor warehouse environments.
6. Can integrate into warehouse communications systems such as a Warehouse Execution System (WES) to receive tasking and report status.
7. Allows AGVs to operate on inclines and ascend and descend warehouse tunnels with up to 12 in a 100 grade (+/-12%) when safely transporting goods inside warehouses and between multiple warehouses at DLA distribution sites, and implement high precision measurement data for regular use, even under challenging road and weather conditions.
8. Able to transition smoothly between level and elevated warehouse surfaces, can navigate sharp turns within the warehouse environment, and can tow up to three loaded standard warehouse carts weighing up to 18,000 pounds.
9. Demonstrates an enhanced operational capability over existing commercial AGVs when both outdoors and indoors through the application of external navigation and internal navigation systems for AGVs, and facilitates a safe and robust navigational network technology used in a working environment shared with warehouse workers.
10. Navigation and mapping:

DLA 14
a. Equipped with a dependable and robust navigation technology solution that allows AGVs to perform tasks outdoors and indoors without having to significantly lower operating speeds per existing trends in the industry.

b. Demonstrates compatibility with a Government data cloud environment for storage, retrieval, and use of high-resolution geospatial data without relying on a separate commercial data cloud environment to navigate successfully.

11. Conclusively demonstrates the use of new navigation technology and the use of more capable AGV designs for ascending and descending inclines when applied to AGVs in the distribution and delivery of material and goods during representative distribution warehouse operations in an innovative way.

12. Integrates a Universal Ball Hitch connection for trailers with automatic coupling by the autonomous vehicle.

13. Operates with a typical design load and all-terrain capabilities in outdoor temperatures of 10F through 100F, and adequately quantifies lost battery performance in temperatures below 40F, and implements measures to insulate batteries to address lost performance.

14. Executes a minimum 7.5-hr duty cycle at the full performance before re-charge. 30-minute quick charge from 0% to 50% charge.

PROJECT DURATION and COST:

- **Phase I:** NTE 12 Months $150K - Base NTE $100K base 6 Months, - Option 1 NTE $50K base 6 Months
- **PHASE II:** Phase II – NTE 24 Months $1.6M - Base 12-18 months, $1M Option 6 Months NTE $.6M

PHASE I: The research and development goals of Phase I provide Small Business eligible Research and Development firms the opportunity to successfully demonstrate how their proposed Outdoor and Indoor AGV navigation concept of operations (CONOPS) improves the distribution and goods and materials within the DLA distribution enterprise and effectively lessen the time to provide needed supplies to the Warfighter. The selected vendor will conduct a feasibility study to:

1. Address the requirements described above in the Description Section above for Outdoor AGVs operating between warehouses and Indoor AGVs traversing warehouse tunnel elevations.
2. Identify capability gap(s) and the requirement for DLA to use AGVs in the DLA Distribution Operations environment.
3. Develop the vendor’s Concept of Operations (CONOPS) for the utilization of the AGVs and describe clearly how the requirements develop from it.

Note: During Phase I of the SBIR, testing is not required.

The vendor is required to create a CONOPS for Outdoor/Indoor AGVs in support of both routine and wartime distribution warehouse operations. The concept of operations will cover the utilization of rugged Outdoor AGVs to navigate between distribution warehouses during all weather and road conditions, and then seamlessly (with little or no operator effort) be able to operate as an Indoor AGV in the indoor warehouse environment, describing precisely all operational requirements as part of this process. This AGV navigation requirement intends to successfully operate and navigate between distribution warehouses dependent on weather conditions.

The deliverables for this project include a final report, including a cost breakdown of courses of action.
PHASE II: Based on the research and the concept of operations developed during Phase I, the research and development goals of Phase II emphasizes the execution of the seamless Indoor-Outdoor AGV navigation system following the typical DLA Distribution Warehouse concept of operations for materiel handling. During Phase II, the vendor will:

1. Address the specific user requirements, functional requirements, and system requirements as defined and provided by DLA.
2. Develop a prototype AGV for Developmental Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E).
3. Implement government cybersecurity controls in the prototype design and secure all necessary cybersecurity certifications for the operation of the equipment in the DLA warehouse environment with DOD cloud connections.
4. Design the prototype that is equal to the technology maturity of Technology Readiness Level (TRL) 9 after Phase II.
5. Deliver a final AGV prototype to DLA that is capable of demonstrating successful execution of the CONOPS established in Phase I.

The AGVs will operate across the United States at various DLA Distribution Center sites mutually agreed upon between DLA R&D and DLA Distribution HQ. The deliverables for this project include a final report, including a cost breakdown of courses of action (COAs).

PHASE III DUAL USE APPLICATIONS: At this point, there is no specific funding associated with Phase III. During Phase I and Phase II, the progress made should result in a vendor’s qualification as an approved source for an Indoor-Outdoor AGV or as a source for both an Indoor AGV and Outdoor AGV support enabling participation in future procurements.

COMMERCIALIZATION: The manufacturer will pursue the commercialization of the various ruggedized Outdoor AGV navigation technologies, the Indoor AGV operating technology, and designs developed for ascending-descending tunnel inclines, and the processes developed in prior phases as well as potential commercial sales of manufactured mechanical parts or other items. The first path for commercial use will be at DLA’s twenty-six Distribution Centers and twenty Disposition Centers. When fielded, DLA estimates the deployment of 20 - 26 units, but the number of units could be more.

REFERENCES:


DLA 16
DLA203-003 TITLE: Advanced Battery Electrode Manufacturing Technologies

RT&L FOCUS AREA(S): Warfighting Requirements (GWR)
TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of 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: DLA seeks to provide responsive, best value supplies; in a manner, that consistently meets the customer’s needs. DLA continually investigates diverse technologies for manufacturing improvements leading to the highest level of performance, and cost efficiency in battery products supporting fielded weapon systems with a future impact on both commercial technology and government applications. DLA seeks manufacturing improvements of advanced electrode material deposition processes to demonstrate the combination of improved battery manufacturing and operation, as well as improved business methods for affordability. Modeling and simulation are encouraged, but not required, to guide the development of improvements in the battery electrode manufacturing processes.

Proposed efforts funded under this topic must encompass specific advanced battery electrode manufacturing technology resulting in a unit cost reduction and improvement of battery product availability. It is preferred that technologies do not alter the form fit and function of the battery. Research and development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has yet to demonstrate a fully established maturity. Further, proposed efforts must align between Technology Readiness Level (TRL) 3 and 6 to receive funding consideration. The definition of TRL 3 is -- analytical and experimental critical function and/or characteristic proof of concept, and TRL 6 is -- system/subsystem model or prototype demonstration in a relevant environment.

DESCRIPTION: DLA seeks to develop advanced battery electrode deposition and manufacturing solutions that improve the industrial capability to deliver high power batteries to the Warfighter in a ready to use state with better shelf life, increased safety, lower cost, and decreased production lead-time. These solutions must apply innovations to improve the production of batteries and reduce costs associated with the battery manufacturing process.

These solutions must result in an improvement in the affordability of specific battery products to DLA and its customers. The proposals must include an economic analysis of the expected market impact of the technology proposed. This topic seeks a substantial reduction of unit cost metrics and battery product availability. Incremental advancements will receive very little consideration. DLA seeks only projects the private sector considers too risky for ordinary capital investment.

PROJECT DURATION and COST:
- Phase I: NTE 12 Months $150K - Base NTE $100K base 6 Months, - Option 1 NTE $50K base 6 Months
- PHASE II: Phase II – NTE 24 Months $1.6M - Base 12-18 months, $1M Option 6 Months NTE $.6M
PHASE I: Combine innovative approaches for modification and or functionalization of current and future battery electrode deposition and manufacturing. Incorporate material within the project to evaluate concept for proof-of-principle, and demonstration of the proof of principle in a controlled manufacturing environment. Demonstration will successfully detect and presumptively identify a manufacturing cost savings, a reduced production lead-time, and an increase of the item’s availability.

PHASE II: Develop applicable and feasible demonstrations of the electrode manufacturing improvements for the approach described, and demonstrate a degree of commercial viability. Validate the feasibility of the innovative battery electrode manufacturing process by demonstrating implementation in the production, testing, and integration of items for DLA. Validation would include, but not be limited to, prototype fabrication or low-rate initial production and demonstration of item operation in a representative system. A partnership with a current or potential supplier to DLA is highly desirable. Identify any commercial benefit or application opportunities of the innovation. The development of innovative processes should proceed with the intent to readily transition to production in support of DLA and its supply chains.

PHASE III DUAL USE APPLICATIONS: Technology transition via successful demonstration of a new process technology. This demonstration must show near-term application to one or more Department of Defense systems, subsystems, or components. This demonstration must also verify the potential for enhancement of quality, reliability, performance and/or reduction of unit cost or total ownership cost of the proposed subject. Proposed efforts, if directly related to manufacturing process innovation, must be judged to be at a Manufacturing Private Sector Commercial Potential: Battery electrode deposition and manufacturing technologies have a direct applicability to all defense system technologies. Battery electrode manufacturing processes and related technology and support systems have wide applicability to the defense industry including air, ground, sea, and weapons technologies. There is relevance to the private sector industries as well as civilian sector. Many of the technologies under this topic would be directly applicable to other DoD agencies, NASA, and any commercial manufacturing venue. Advanced manufacturing technologies for battery electrodes would directly improve production in the commercial sector resulting in reduced cost and improved productivity.

REFERENCES:

KEYWORDS: Electrode deposition, electrode manufacturing, battery manufacturing, battery, technology insertion, automation, lithium, manufacturing cost, manufacturing efficiency, manufacturing quality, sustainable manufacturing, battery performance
DLA203-004  TITLE: Direct Production Methods for Battery Electrode Material Synthesis

RT&L FOCUS AREA(S): Warfighting Requirements (GWR)
TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of 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: DLA seeks to provide responsive, best value supplies; in a manner, that consistently meets the customer’s needs. DLA continually investigates diverse technologies for manufacturing improvements leading to the highest level of performance, and cost efficiency in battery products supporting fielded weapon systems with a future impact on both commercial technology and government applications. DLA seeks rapid, direct, production synthesis methods of battery-grade electrode materials to demonstrate the combination of improved battery manufacturing and operation, as well as improved business methods for affordability.

Proposed efforts funded under this topic must encompass specific synthesis methods for direct production of battery cathode/anode/electrolyte materials resulting in a cost reduction and improvement of battery product availability. It is preferred that technologies do not alter the form fit and function of the battery. Research and development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has yet to demonstrate a fully established maturity. Further, proposed efforts must align between Technology Readiness Level (TRL) 3 and 6 to receive funding consideration. The definition of TRL 3 is -- analytical and experimental critical function and/or characteristic proof of concept, and TRL 6 is -- system/subsystem model or prototype demonstration in a relevant environment.

DESCRIPTION: DLA seeks to develop rapid material synthesis processes that are significantly lower cost and displace standard sintering and synthesis processes for battery electrode materials. The process must improve the industrial capability to deliver high power batteries to the Warfighter in a ready to use state with better shelf life, increased safety, lower cost, and decreased production lead-time. These solutions must apply innovations to improve the production and availability of batteries and reduce costs associated with the battery manufacturing process. Solutions that involve materials that benefit military requirements of high energy, high safety, and broad temperature range are preferred. Potential materials to be considered for rapid, scaled synthesis are:

- Cathode
  - LCO
  - NMC
  - NCA
  - LMO
  - Lithium Cobalt or Iron Phosphates
- Anode
  - LTO
- Solid-State Electrolyte
o LLZO (Li7La3Zr2O12) ceramic

These solutions must result in an improvement in the affordability and availability of specific battery products to DLA and its customers. The proposals must include an economic analysis of the expected market impact of the technology proposed. This topic seeks a substantial reduction of cost metrics and battery material availability. Incremental advancements will receive very little consideration. DLA seeks only projects the private sector considers too risky for ordinary capital investment.

PROJECT DURATION and COST:
- Phase I: NTE 12 Months $150K - Base NTE $100K base 6 Months, - Option 1 NTE $50K base 6 Months
- PHASE II: Phase II – NTE 24 Months $1.6M - Base 12-18 months, $1M Option 6 Months NTE $.6M

PHASE I: Combine innovative approaches for modification and or functionalization of current and future battery electrode material synthesis. Incorporate material within the project to evaluate concept for proof-of-principle, and demonstration of the proof of principle in a controlled manufacturing environment. Demonstration will successfully detect and presumptively identify cost savings, reduced production lead-time, and an increase of availability.

PHASE II: Develop applicable and feasible demonstrations of the electrode synthesis for the approach described, and demonstrate a degree of commercial viability. Validate the feasibility of the innovative material production process by demonstrating implementation in the production, testing, and integration of items for DLA. Validation would include, but not be limited to, prototype fabrication or low-rate initial production and demonstration of operation in a representative system. A partnership with a current or potential supplier to DLA is highly desirable. Identify any commercial benefit or application opportunities of the innovation. The development of innovative processes should proceed with the intent to readily transition to production in support of DLA and its supply chains.

PHASE III DUAL USE APPLICATIONS: Technology transition via successful demonstration of a new process technology. This demonstration must show near-term application to one or more Department of Defense systems, subsystems, or components. This demonstration must also verify the potential for enhancement of quality, reliability, performance and/or reduction of unit cost or total ownership cost of the proposed subject.

Private Sector Commercial Potential: Battery electrode material production methods have a direct applicability to all defense system technologies. Electrode material synthesis and related manufacturing technology and support systems have wide applicability to the defense industry including air, ground, sea, and weapons technologies. There is relevance to the private sector industries as well as civilian sector. Many of the technologies under this topic would be directly applicable to other DoD agencies, NASA, and any commercial manufacturing venue. Rapid, advanced, direct production synthesis methods for battery electrode materials would directly improve production in the commercial sector resulting in reduced cost and improved productivity.

REFERENCES:

KEYWORDS: Battery electrode material synthesis, cathode/anode/electrolyte material, direct production, rapid production, rapid synthesis, battery, technology insertion, automation, lithium, agile manufacturing, manufacturing cost, manufacturing efficiency, manufacturing quality, sustainable manufacturing
TITLE: Hard Armor Ballistic Plate Boron Carbon (B4C) Recovery and Reclamation

RT&L FOCUS AREA(S): Warfighting Requirements (GWR)
TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of 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: The Defense Logistics Agency (DLA), seeks to develop the capability to recover boron carbon (B4C) from the hard armor ballistic plates used throughout the Department of Defense (DoD). The DoD develops and fields innovative Soldier protection equipment, functional uniforms and individual equipment that enhance mission effectiveness. As part of this, advanced technology demonstrations for enhancing affordability and development of advanced industrial practices the combination of improved discrete-parts recycling, manufacturing and improved business methods are of interest. All these areas of recycling and manufacturing technologies provide potential avenues toward achieving breakthrough advances. Proposed efforts funded under this topic may encompass any specific discrete-parts or materials recycling, manufacturing, or processing technology at any level resulting in a unit cost reduction. Research and Development efforts selected under this topic shall demonstrate and involve a degree of risk where the technical feasibility of the proposed work has not been fully established. Further, proposed efforts must be judged to be at a Technology Readiness Level (TRL) 6 or less, but greater than TRL 3 to receive funding consideration.

TRL 3. (Analytical and Experimental Critical Function and/or Characteristic Proof of Concept)
TRL 6. (System/Subsystem Model or Prototype Demonstration in a Relevant Environment)

DESCRIPTION: DLA R&D is looking for a domestic capability that demonstrates the capability to recover boron carbon (B4C) from the hard armor ballistic plates used throughout the Department of Defense (DoD). Currently the DoD sends defective and unserviceable hard armor ballistic plates to the Defense Logistics Agency Disposition Services for demilitarization (DEMIL), and thus renders those plates to an unusable state. Recovery of raw materials from these DEMIL plates could reduce the amount of boron carbon mined and refined; there is limited domestic production of these materials and therefore a risk of foreign reliance. The goal is to recover B4C, at a suitable purity level, suitable to be placed into strategic stockpiles to be held, and in a form that it could reintroduced into manufacturing at a later point in time. Developing an economically viable, environmentally friendly process for recycling of hard armor ballistic plates from the existing scrap armor feedstock could facilitate the establishment of a viable, competitive domestic supply chain. If this produces a viable reclamation methodology and sustainable process it may lead to follow-on efforts at the discretion of the US Government.

R&D tasks include identifying potential additional feedstock sources in the existing supply chain and developing processes for hard armor plates recycling. The process should be amenable to the scale of operation required in hard armor manufacturing, and will improve the economics of hard armor plates from recovered material for reuse, rather than depend on foreign reliance.

Determine, insofar as possible, the scientific, technical, and commercial feasibility of the concept. Include a plan to demonstrate the innovative recycling process and address implementation approaches.
for near term insertion into the manufacture of Department of Defense (DoD) systems, subsystems, components, or parts.

PROJECT DURATION and COST:
- Phase I: NTE 12 Months $150K - Base NTE $100K base 6 Months, - Option 1 NTE $50K base 6 Months
- PHASE II: Phase II – NTE 24 Months $1.6M - Base 12-18 months, $1M Option 6 Months NTE $.6M

PHASE I: Develop applicable and feasible process demonstration for the approach described, and demonstrate a degree of commercial viability.

PHASE II: Validate the feasibility of the innovative process by demonstrating its use in the production, testing, and integration of items for PM SSV. Validation would include, but not be limited to, prototype quantities, data analysis, laboratory tests, system simulations, operation in test-beds, or operation in a demonstration system. A partnership with a current or potential supplier to PM SSV, DLA, OEM, or other suitable partner is highly desirable. Identify commercial benefit or application opportunities of the innovation. Innovative processes should be developed with the intent to readily transition to production in support of PM SSV and its supply chains.

PHASE III DUAL USE APPLICATIONS: Technology transition via successful demonstration of a new process technology. This demonstration should show near-term application to one or more Department of Defense systems, subsystems, or components. This demonstration should also verify the potential for enhancement of quality, reliability, performance and/or reduction of unit cost or total ownership cost of the proposed subject. Private Sector Commercial Potential: Material manufacturing improvements, including development of domestic manufacturing capabilities, have a direct applicability to all defense system technologies. Material manufacturing technologies, processes, and systems have wide applicability to the defense industry including air, ground, sea, and weapons technologies. Competitive material manufacturing improvements should have leverage into private sector industries as well as civilian sector relevance. Many of the technologies under this topic would be directly applicable to other DoD agencies, NASA, and any commercial manufacturing venue. Advanced technologies for material manufacturing would directly improve production in the commercial sector resulting in reduced cost and improved productivity.

REFERENCES:

KEYWORDS: Hard Armor Ballistic Plate Boron Carbon (B4C) Recovery and Reclamation