DEPARTMENT OF THE ARMY

DoD 22.4 Small Business Innovation Research (SBIR) Annual BAA
Release 4, Proposal Submission Instructions

April 13, 2022: Topic issued for pre-release
May 4, 2022: Army begins accepting proposals via DSIP
May 18, 2022: DSIP Topic Q&A closes to new questions at 12:00 p.m. ET
June 1, 2022: Deadline for receipt of proposals no later than 12:00 p.m. ET

INTRODUCTION

The future Army must be capable of conducting Multi-Domain Operations (MDO) as part of an integrated Joint Force across an array of situations in multiple theaters by 2035. The MDO concept describes how the Army will support the Joint Force in the rapid and continuous integration of all domains of warfare – land, sea, air, and cyberspace – to deter and prevail as we compete short of conflict, and fight and win if deterrence fail. The Army must provide game-changing capabilities to our Soldiers. To capitalize on small business innovation, the Army has implemented an approach to advertise SBIR funding opportunities through the Department of Defense (DoD) Annual BAA process, outside of the three pre-determined BAA cycles. This approach also strives to create a more rapid award time from solicitation to closing.

Topics released under this BAA can deviate from the traditional Army SBIR period of performance, contract award guidelines, and other proposal instructions. Please take note of the contents of the DoD Program BAA instructions, supplemented herein, when preparing proposals. Proposals will only be evaluated in response to an active corresponding Army topic.

Proposers responding to a topic in this BAA must follow all general instructions provided in the DoDSBIR Program BAA. Department of the Army requirements in addition to or deviating from the DoDProgram BAA are provided in the instructions below.

Specific questions pertaining to the administration of the Department of the Army SBIR Program and the proposal preparation instructions for this topic should be directed to the Point of Contact identified in the Topic announcement; general questions can be directed to usarmy.apg.devcom.mbx.sbir-program-managers-helpdesk@army.mil.

DIRECT TO PHASE II PROPOSAL GUIDELINES

This topic is accepting Direct to Phase II (DP2) proposals only. Proposers interested in submitting a DP2 proposal must provide documentation to substantiate that the scientific and technical merit and feasibility described in the Phase I section of the topic has been met and describes the potential commercial applications. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results. Work submitted within the feasibility documentation must have been substantially performed by the proposer and/or the Principal Investigator.

The Army will not evaluate the proposer's related Phase II proposal if it determines that the proposer has failed to demonstrate that technical merit and feasibility has been established or the proposer has failed to demonstrate that work submitted in the feasibility documentation was substantially performed by the proposer and/or the PI.

Feasibility documentation cannot be based upon any prior or ongoing federally funded SBIR or STTR

work and DP2 proposals MUST NOT logically extend from any prior or ongoing federally funded SBIR or STTR work.

Format of Technical Volume (Volume 2)
The Technical Volume must include two parts, the Feasibility Documentation and the Technical Proposal.

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 notinclude or embed active graphics such as videos, moving pictures, or other similar media in the document.

Unless otherwise noted in the topic, the length of the Technical Volume, to include Feasibility Documentation is not to exceed a total of 15 pages. The Government will not consider pages in excess of the page count limitations.

Proposers can submit an optional slide deck of 10 slides in Volume 5: Supporting Documents. The slide deck can contain information on the technical approach, the team, commercialization plans, or relevant technology/research the proposers have developed, and it can contain additional/complementary information to the technical volume. If a proposer elects to submit a slide deck, it must be submitted as a single .pdf file format and its information will be used in the evaluation process.

Number all pages of your proposal consecutively. Font size should not be smaller than 10- pointon standard 8-1/2" x 11" paper with one-inch margins. The header on each page of the TechnicalVolume should contain your company name, topic number, and proposal number assigned by DSIP when the Cover Sheet was created. The header may be included in the one-inch margin.

Content of the Feasibility Documentation (Volume 2a)
Proposers should substantiate that the scientific andtechnical merit and feasibility described in the Phase I section of the topic has been met and describes the potential commercial applications. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results. Work submitted within the feasibility documentation must have been substantially performed by the proposer and/or the Principal Investigator.

Content of the Technical Proposal (Volume 2b)
The content of the Technical Volume should address three key areas: the technical approach, the team carrying out the work (and the accompanied resources), and the commercialization strategy.The commercialization strategy should include:

- Company information: Focused objectives/core competencies; specialization area(s); products with significant sales; and history of previous Federal and non-Federal funding,regulatory experience, and subsequent commercialization successes.
- Customer and Competition: Clear description of key technology objectives, current competition, and advantages compared to competing products or services; description ofhurdles to acceptance of the innovation.
- Market: Milestones, target dates, analyses of market size, and estimated market share afterfirst year sales and after 5 years; explanation of plan to obtain market share.
- Intellectual Property: Patent status, technology lead, trade secrets or other demonstration of aplan to achieve sufficient protection to realize the commercialization stage and attain at leasta temporal competitive advantage.

- Financing: Plans for securing necessary non-SBIR funding.
- Assistance and mentoring: Plans for securing needed technical or business assistance through mentoring, partnering, or through arrangements with government sponsored (e.g., State assistance programs, Federally-funded research laboratories, Manufacturing Extension Partnership centers), not-for-profits (e.g., SBDC), commercial accelerators, DOD Prime Contractors, or other assistance provider.

Proposers are free to structure each section as they like, so long as it provides sufficient detail for evaluators to understand the proposed work, who will carry it out, and how the business plans to commercialize results.

Cost Volume (Volume 3)
Unless otherwise noted in the topic, the Army will accept Direct to Phase II proposals for a costup to $1,700,000 for a 12-month period of performance. Proposers are required to use the DSIP online Cost Volume. The Cost Volume (and supporting documentation) DOES NOT count toward the page limit of the Technical Volume.

Content of the Cost Volume (Volume 3)
ALL proposed costs should be accompanied by documentation to substantiate how the cost was derived. For example, if you proposed travel costs to attend a project-related meeting or conference, and used a travel website to compare flight costs, include a screenshot of the comparison. Similarly, if you proposed to purchase materials or equipment, and used the internet to search for the best source, include your market research for those items. You do not necessarilyhave to propose the cheapest item or supplier, but you should explain your decision to choose oneitem or supplier over another. It's important to provide enough information to allow contracting personnel to understand how the proposer plans to use the requested funds.

Some items in the cost breakdown may not apply to the proposed project. If that is the case, thereis no need to provide information on each and every item.

Cost Breakdown Guidance:
- List all key personnel by name as well as by number of hours dedicated to the project asdirect labor.
- Special tooling and test equipment and material cost may be included. 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 Contracting Officer, be advantageous to the Government and should be related directly tothe specific topic. These may include such items as innovative instrumentation and/or automatic test equipment. Title to property furnished by the Government or acquired with Government funds will be vested with the Army; unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by the Army.
- Cost for travel funds must be justified and related to the needs of the project.
- Cost sharing is permitted for proposals under this announcement; however, cost sharing is not required, nor will it be an evaluation factor in the consideration of a proposal.
- 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 Materialsection of the on-line cost proposal form. The Supporting Documents Volume (Volume 5) may be used if additional space is needed.

If a DCAA Audit has been conducted within the last five (5) years, include the audit compliance documentation in the cost proposal documents. The documentation should also include the offeror's DCAA Point of Contact (if applicable).

If selected for award, failure to include the documentation with your proposal will delay contract negotiation, and the proposer will be asked to submit the necessary documentation to the Contracting Officer to substantiate costs (e.g., cost estimates for equipment, materials, and consultants or subcontractors). It is important to respond as quickly as possible to the ContractingOfficer's request for documentation.

For more information about cost proposals and accounting standards, see the DCAA publication titled "Audit Process Overview – Information for Contractors" available at: http://www.dcaa.mil.

Company Commercialization Report (CCR) (Volume 4)
Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please referto the DoD SBIR Program BAA for full details on this requirement. Information contained in theCCR will be considered by the Department of the Army during proposal evaluations.

Supporting Documents (Volume 5)
Volume 5 is provided for proposers to submit additional documentation to support the Cover Sheet (Volume 1), Technical Volume (Volume 2), and the Cost Volume (Volume 3). In additionto the Volume 5 requirements outlined in the DoD Program BAA, the Department of the Army will accept the following documents in Volume 5:

- Additional Cost Information
- Funding Agreement Certification
- Technical Data Rights (Assertions)
- Lifecycle Certification
- Allocation of Rights
- Other (only as specified in the topic)
- Optional 10-slide deck. The slide deck can contain information on the technical approach, the team, commercialization plans, or relevant technology/research the proposers have developed, and it can contain additional/complementary information to the technical volume. If a proposer elects to submit a slide deck, it must be submitted as a single .pdf file format and its information will be used in the evaluation process.

Please only submit documents that are identified in the topic instructions. All other submissionswill be disregarded.

PHASE II PROPOSAL GUIDELINES
Phase II proposals may only be submitted by Phase I awardees. Phase II proposal submission window, notification process, expected budget/duration structure and additional instructions will be provided in the Phase I contract or by subsequent notification.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)
Discretionary Technical and Business Assistance (TABA) will not be offered for this Army topic.

EVALUATION AND SELECTION
All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD Program BAA. It is the policy of the Army to ensure equitable and comprehensive proposal evaluations based on the evaluation criteria listed above and to select the source (or sources) whose offer meets the Government's technical, policy, and programmatic goals.

All proposal evaluations will be based solely on the above evaluation criteria. The Army will conduct an evaluation of each conforming proposal. Proposals that do not comply with the requirements detailed in this BAA and the research objective(s) of the corresponding opportunity are considered non-conforming and therefore will not evaluated nor considered for award.

Using the evaluation criteria, the Government will evaluate each proposal in its entirety, documenting the strengths and weaknesses relative to each evaluation criterion, and, based on these identified strengths and weaknesses, make a determination of the proposal's overall selectability. Proposals will not be evaluated against each other during the evaluation process, but rather evaluated on their own individual merit to determine how well the proposal meets the criteria stated in this BAA and the corresponding opportunity.

Only Government personnel will evaluate proposals with the exception of technical SETA contractor personnel from PEO Aviation and US Army AvMC. The government contractors 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 selection processes, the aforementioned individuals may require access to proprietary information contained in the offerors' proposals. Therefore, pursuant to FAR 9.505-4, the individuals must execute an agreement that states that they will (1) protect the offerors' information from unauthorized use or disclosure for as long as it remains proprietary and (2) refrain from using the information for any purpose other than that for which it was furnished. These agreements will remain on file with the Army SBIR program management office at the provided address.

Awards will be made to proposers whose proposals are determined to be the most advantageous to the Government, consistent with instructions and evaluation criteria specified in the BAA herein, subsequent opportunities issued, and availability of funding. Given the limited funding available for each opportunity, not all proposals considered selectable will be necessarily selected for funding.

For the purposes of this proposal evaluation process, a selectable proposal is defined as follows:
Selectable: A selectable proposal is a proposal that has been evaluated by the Government against the evaluation criteria listed in the DoD Program BAA, and the strengths of the overall proposal outweighs its weaknesses. Additionally, there are no accumulated weaknesses that would require extensive negotiations and/or a revised proposal.

For the purposes of this proposal evaluation process, a non-selectable proposal is defined as follows:
Non-Selectable: A proposal is considered non-selectable when the proposal has been evaluated by the Government against the evaluation criteria listed in the DoD Program BAA and the strengths of the overall proposal do not outweigh its weaknesses.

Proposing firms will be notified via email of selection or non-selection status for a Phase I or direct to Phase II award within 30 days of the closing date of the BAA. The notification will come from the Army SBIR Program Office PoC mailbox sent to the Corporate Official listed on the proposal cover sheet. The Army promotes transparency regarding the technical evaluation for all Army SBIR proposals. The Army will provide a technical evaluation narrative to the proposer in accordance with the SBA Policy Directive, Appendix I, paragraph 4. The selection decision notice contains instructions for retrieving the technical evaluation narrative.

A Contracting Officer (KO) may contact applicants, when the Army SBIR Office has recommended a proposal for award, in order to discuss additional information required for award. This may include representations and certifications, revised budgets or budget explanations, certificate of current cost or pricing data, subcontracting plan for small businesses, and/or other information as applicable to the proposed award. The anticipated start date will be determined at that time.

Proposers must not regard the notification email as an authorization to commit or expend funds. Until a Government KO signs the award document (i.e. contract), no obligations to provide funding are made. The award document signed by the Government KO is the official and authorizing award instrument (i.e. contract). The KO will email the signed, authorizing award instrument to the principal investigator (PI) and/or an authorized organization representative.

Refer to the DoD SBIR Program BAA for procedures to protest the Announcement. As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to usarmy.apg.devcom.mbx.sbir-program-managers-helpdesk@army.mil.

Army SBIR 22.4 Topic Index
Release 4

A224-008 TITLE: Compact lightweight motor-generator system for future electrified unmanned aircraft system

OUSD (R&E) MODERNIZATION PRIORITY: General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Electronics; 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 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 and demonstrate a compact lightweight motor-generator system with a controller and a DC/DC converter for future electrified unmanned aircraft system.

DESCRIPTION: A motor-generator (M-G) system is a system that can perform three different functions such as engine starting, power boost, and power generation. In the current Army's unmanned aircraft system (UAS), engine starting is performed by a starter and power generation is achieved with an alternator(s). The M-G system can replace the conventional starter and generator(s) which can significantly reduce the UAS propulsion system weight, thus increase power density of the propulsion system. In addition, it will improve the reliability as the current generators have exhibited serious reliability concerns when it is used in the UAS applications. It also provides more on-board power which is critical for future UAS as it is equipped with more advanced electronics and optics that will require more power for operation. Furthermore, it can be used to boost power when the engine needs more power during take-off and climb. An M-G shall be interfaced with the existing engine in the current Army UAS via the engine crankshaft and/or the generator shafts on the gearbox. This requires axial flux design. The M-G will be powered through and controlled by a lightweight inverter/controller. Both the M-G and the inverter/controller shall be sized to fit into the space available in a target UAS aircraft. The M-G system(s) shall meet the Army requirements described in Phase I.\

PHASE I: Design a compact lightweight M-G system that includes an M-G, inverter/controller, DC/DC converter, electric cables, control cables, and other components to make a complete M-G system. It shall have the capabilities for starting, power boost and power generation. The new M-G system can have either an axial flux design to interface with an engine crankshaft or an axial flux design to interface with the shafts on a gearbox (formerly generator shafts). The axial flux design should be interfaced with the engine crankshaft with a dimension of 300 mm (11.8 inches) diameter by 80 mm (3.15 inches) length. The axial flux design that should be interfaced with the generator shaft on the gearbox should have a dimension of 127 mm (5 inches) diameter by 177 mm (7 inches) length by 177 mm (7 inches) height. The M-G should generate a maximum power of 7 kW to 10 kW, have an intermittent minimum power density of 6 kW/kg, the continuous minimum power density of 3 kW/kg, the maximum speed for the input shaft interface design is 20,000 rpm for generator shaft interface design, the minimum M-G efficiency of 95%, the inverter/controller weight less than or equal to 4 kg, a DC/DC converter with input/output nominal voltage of 28 VDC and the operating temperature of -48 to 49 degC, and the cooling by air, water or oil. Phase 1 deliverables include monthly progress reports describing challenges, technical risk, and progress against schedule, a final technical report, a complete design of the M-G system including control method, analysis data, and CAD models. The expected result is a thorough

feasibility study and proof of concept of a compact lightweight M-G system. The results shall also include manufacturability and interface capability with an existing Army UAS. The success of the Phase I will be judged based on the afore-mentioned requirements. It is instructed to review the airworthiness qualification requirements as the compact lightweight M-G is designed (refer to References).
This topic is accepting Direct to Phase II (DP2) proposals only. Proposers interested in submitting a DP2 proposal must provide documentation to substantiate that the scientific and technical merit and feasibility described in above has been met and describes the potential commercial applications. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results.

PHASE II: Develop and demonstrate the compact lightweight M-G system selected in Phase 1 under controlled conditions in a laboratory environment. This process shall be required to refine the design as the components are being developed and prototyped. Assess and quantify the capabilities of the compact lightweight M-G system at the UAS relevant operating conditions for starting, power boost, and power generation. The system package shall be considered for the space available in a target UAS aircraft. Phase 2 deliverables include design and all necessary components (hardware and software) of the compact lightweight M-G system (2 sets of M-G systems including controllers and control software), raw/processed/analyzed technical data, monthly progress report, and a final report. The results shall include the performance metrics with respect to the Government requirements. The final design shall satisfy the airworthiness requirements of the Army Military Airworthiness Certification Criteria (AMACC) or operational risk shall be determined.

TRL: TRL 4 – component and/or breadboard validation in laboratory environment

PHASE III DUAL USE APPLICATIONS: Integrate the compact lightweight M-G system into the target Army UAS engine, demonstrate and assess its performance capabilities at all engine and environmental conditions at altitudes up to 25,000 feet and temperatures as low as -40 degC. The M-G system will be integrated into the engine in the way that it will be installed in an aircraft. This will require the redesign of a gearbox both in the interface and the torque requirement to accommodate the newly designed M-G system.
Phase III goals will include:

- Performance demonstration in the Government altitude facility.
- Performance and capability measurement in all engine operating conditions at altitudes up to 25,000 ft and temperatures as low as -40 degC.
- Compact design to fit into the space in the target aircraft.
- Acceptable system weight for efficient and effective use in the target UAS aircraft.
- Technical data and technical reports retaining the outcomes.
- Product documentation detailing the operation of the M-G system.
- Monthly progress reports describing all technical challenges, technical risks, and progress against the schedule.
- Final technical report.

REFERENCES:

1. Honeywell Aerospace: https://aerospace.honeywell.com/us/en/learn/products/engines/starter-generators
2. Army Military Airworthiness Certification Criteria (AMACC), “Airworthiness qualification requirements – engine control system components and engine accessories (Appendix E),” Rev A, Change 2, April 9, 2021, US Army: https://www.avmc.army.mil/Directorates/SRD/TechDataMgmt/

KEYWORDS: Motor-generator, M-G, Inverters, unmanned aircraft system, UAS, Starting, Power boost, Power generation, altitude, aviation, performance