

DEPARTMENT OF THE ARMY
DoD 22.4 Small Business Innovation Research (SBIR) Annual BAA
Proposal Submission Instructions

June 15, 2022: Topics issued for pre-release

June 28, 2022: Army begins accepting proposals via DSIP

July 19, 2022: DSIP Topic Q&A closes to new questions at 12:00 p.m. ET

August 2, 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 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 DoD SBIR Program BAA. Department of the Army requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below.

Specific questions pertaining to the administration of the 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 below:

Email: usarmy.pentagon.hqda-asa-alt.mbx.army-applied-sbir-program@mail.mil

Mailing Address:

Army Applied SBIR Office
2530 Crystal Dr; Ste 11192
Arlington, VA 22202

PHASE I PROPOSAL GUIDELINES

The Defense SBIR/STTR Innovation Portal (DSIP) is the official portal for DoD SBIR/STTR proposal submission. Proposers are required to submit proposals via DSIP; proposals submitted by any other means will be disregarded. Detailed instructions regarding registration and proposal submission via DSIP are provided in the DoD SBIR Program BAA.

Technical Volume (Volume 2)

The technical volume is not to exceed 5 pages and must follow the formatting requirements provided in the DoD SBIR Program BAA. A commercialization plan must also accompany the technical proposal and should be no more than 10 slides. The commercialization plan must be

converted to a pdf and attached to the end of the technical volume, resulting in one pdf file to be uploaded to DSIP as Volume 2. The commercialization plan does not count towards the technical volume 5-page limit. Any proposals submitted without a commercialization plan or in a format other than that provided by the BAA will not be reviewed.

Content of the Technical Volume

The Technical Volume will contain three key sections – technical approach, team qualifications and commercialization section. The technical approach section contains details on how the proposer is going to solve the problem. It should detail key elements of your approach, any risks, relevant past work and how you measure success. The team qualifications section should highlight the key personnel working on the project, and the resources that will be brought to bear on solving the problem. The commercialization plan 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 of hurdles to acceptance of the innovation.
- **Market:** Milestones, target dates, analyses of market size, and estimated market share after first 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 a plan to achieve sufficient protection to realize the commercialization stage and attain at least a 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.

These instructions supersede those stated in section 5.3.c of the DoD Program BAA.

Cost Volume (Volume 3)

Unless otherwise noted in the topic, the Phase I Base amount must not exceed \$250,000 for a 6-month period of performance. Phase I Options are not anticipated at this time. If an option is identified in the topic posting, costs for the Base and Option must be separated and clearly identified on the Proposal Cover Sheet (Volume 1) and in Volume 3. Awards for these topics will be in the form of a firm fixed price contract.

For pricing purposes, offerors should assume a contract or agreement start date of approximately ninety (90) days after submission of the proposal. For this BAA, adequate price competition (APC), as defined in FAR 15.403-1(c), is anticipated. In the event that adequate price competition is not realized (i.e. only one proposal is received for a given topic), the Government may choose to conduct additional proposal analysis, in accordance with the techniques identified at FAR 15.404-1. Additionally, offerors are to provide any current Forward Pricing Rate Agreements (FPRA) in effect at time of proposal submission.

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 necessarily have to propose the cheapest item or supplier, but you should explain your decision to choose one item 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.

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 Contracting Officer's request for documentation.

Company Commercialization Report (CCR) (Volume 4)

Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR Program BAA for full details on this requirement. Information contained in the CCR will 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 addition to the Volume 5 requirements outlined in the DoD Program BAA, the Department of the Army may 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)

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

DIRECT TO PHASE II PROPOSAL GUIDELINES

Proposers interested in submitting a DP2 proposal in response to an eligible topic 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 not include or embed active graphics such as videos, moving pictures, or other similar media in the document.

The length of the Feasibility Documentation is not to exceed 5 pages and the length of the Technical Proposal is not to exceed 10 pages. A commercialization plan must also accompany the technical proposal and should be no more than 10 slides. Any proposals submitted in a different format, or exceed the page count limits will not be reviewed.

Number all pages of your proposal consecutively. Font size should not be smaller than 10- point on standard 8-1/2" x 11" paper with one-inch margins. The header on each page of the Technical Volume 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)

The content of the Feasibility Documentation Proposers should 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.

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 plan 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 of hurdles to acceptance of the innovation.
- **Market**: Milestones, target dates, analyses of market size, and estimated market share after first 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 a plan to achieve sufficient protection to realize the commercialization stage and attain at least a 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 cost up to \$1,700,000 for an 18-month period of performance. Proposers are required to use the Cost Proposal method as provided on the DSIP submission site. 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 necessarily have to propose the cheapest item or supplier, but you should explain your decision to choose one item 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, there is 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 as direct 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 to the 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 Material section 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 Contracting Officer'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 refer to the DoD SBIR Program BAA for full details on this requirement. Information contained in the CCR 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 addition to 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)

Please only submit documents that are identified in the topic instructions. All other submissions will 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)

The Army, at its discretion, may provide Technical and Business Assistance (TABA). The Army will select a preferred vendor(s) for the Army SBIR TABA program through a competitive process. Alternately, a small business concern may, by contract or otherwise, select one or more vendors to assist the firm in meeting the TABA goals. The Applicant must request the authority to select its own TABA provider in the Army SBIR proposal, demonstrating that the vendor is uniquely postured to provide the specific technical and business services required.

Participation in the Army SBIR TABA program is voluntary for each Army SBIR awardee. Services provided to Army SBIR firms under the auspices of the TABA program may include, but are not limited to:

1. Access to a network of scientists, engineers, and technologists focused on commercialization and transition considerations such as protected supply chain management, advanced manufacturing, process/product/production scaling, etc;

2. Assistance with intellectual property protections, such as legal considerations, intellectual property rights, patent filing, patent fees, licensing considerations, etc;
3. Commercialization and technology transition support such as market research, market validation, development of regulatory or manufacturing plans, brand development;
4. Regulatory support such as product domain regulatory considerations, regulatory planning, and regulatory strategy development.

The Army SBIR program sponsors participation in the TABA program. The resource limitation for each firm is:

- Phase I Firms: Up to \$6,500 per project per year (in addition to the base SBIR award amount);
- Phase II Firms: Up to \$50,000 per project;
 - Army-Preferred Vendor: In addition to the base SBIR award amount;
 - Firm-Selected Vendor: Included in the base SBIR award amount and must be included in Phase II proposal.

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 be 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.

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 90 days of the closing date of the Topic. 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 the Point of Contract identified in the topic solicitation:

Email: usarmy.pentagon.hqda-asa-alt.mbx.army-applied-sbir-program@mail.mil

Mailing Address:

Army Applied SBIR Office
2530 Crystal Dr; Ste 11192
Arlington, VA 22202

Appendix A

Phase I Evaluation Criteria

Army Applied SBIR Phase I (v1) Evaluation Criteria Defined



DEFINITION

TECHNICAL FEASIBILITY <i>weight 50%</i>	SCIENTIFIC FEASIBILITY	Is the science behind the solution sound? Convince readers who don't have deep expertise in your field that your innovation is built atop sound scientific and engineering principles.
	ENABLING TECHNOLOGIES	Point to the foundational technologies that you rely on to deliver your solution. Do the required enabling technologies introduce added risk? Using proven (and ideally Army-fielded) underlying technologies and techniques helps to lower technical risk.
	SOLUTION'S UNIQUENESS	From a warfighter's perspective, why is your proposed solution the best choice for the Army? Refute the substitutes for your solution that warfighters are either using currently or considering adopting. Why will soldiers prefer your solution?
	OPERATIONAL IMPACT	Looking only at the soldiers who will be impacted by your solution, argue that their jobs or lives will be significantly improved if your solution is adopted. What is the impact of your solution for a soldier vs. today's solutions?
	MILESTONE SCHEDULE	Please share with us a thoughtful execution plan. Strike a balance between giving us a sense of the detailed thinking behind the scenes and the need for your contracting officer to manage a reasonably small number of milestones during your period of performance.
COMMERCIALIZATION AND POTENTIAL <i>weight 30%</i>	COMMERCIALIZATION POTENTIAL	Through the Applied SBIR program, the Army wants to take advantage of the speed and scale of the commercial sector. Our organization funds projects that do not rely solely on DoD funding. A key indicator of this the potential for your product / solution to create sustained profitability in the commercial sector. Make your best case that your product is or will be commercially profitable. If you have more than one product, please focus your argument on the product / solution presented for this SBIR program.
	FINANCIAL SUSTAINABILITY	Make the case that private dollars will continue to fund improvements to your solution from which the Army will benefit in the future. Companies who cannot demonstrate non-DoD funding sources for future solution enhancements are less attractive to the Applied SBIR program.
	TRANSITION AND COMMERCIALIZATION INFORMATION	Whatever your stage in terms of technology maturity and engagement with the Army, demonstrate that you have an appropriate goal for your next step in "transitioning" with the Army (and/or DoD more broadly.) What is that next goal for you in terms of your next contracting or collaboration opportunity with the Army? Beyond this SBIR opportunity, describe the next type of deal you aim to make with the Army, e.g. a CRADA, a different SBIR contract, a CSO, etc. Briefly make the case that you know how to accomplish that mission.
TEAM ABILITY <i>weight 20%</i>	TECHNICAL PERSONNEL	Briefly list and describe your core scientific and technical team. Do you have the people and technical capabilities you need to successfully complete your proposed project? If not, convince the reader you have a credible recruiting plan and can fill personnel gaps.
	BUSINESS PERSONNEL	Briefly list and describe your business team. Do you have the people and capabilities you need to successfully position your company for DoD Transition? If not, convince the reader you have a credible recruiting plan and can fill personnel gaps.
	PAST EXECUTION	Prove your team has executed well as a group. What milestones have you accomplished as a group in this company?
	SUMMARY	Write a clear, concise description of what your innovation does or will do, and how it will impact the Army. Readers should "get it" after reading this. Please re-use your content in both the SBIR application web form and this section of the application document itself.
	DATA QUALITY & ATTRIBUTION	Support your arguments with relevant, properly attributed data to enhance your credibility.

Appendix B

Direct to Phase II Evaluation Criteria

Army Applied SBIR Direct to Phase II (v2) Evaluation Criteria Defined



		DEFINITION
TECHNICAL FEASIBILITY <i>weight 50%</i>	SCIENTIFIC FEASIBILITY	Is the science behind the solution sound? Convince readers who don't have deep expertise in your field that your innovation is built atop sound scientific and engineering principles.
	ENABLING TECHNOLOGIES	Point to the foundational technologies that you rely on to deliver your solution. Do the required enabling technologies introduce added risk? Using proven (and ideally Army-fielded) underlying technologies and techniques helps to lower technical risk.
	SOLUTION'S UNIQUENESS	From a warfighter's perspective, why is your proposed solution the best choice for the Army? Refute the substitutes for your solution that warfighters are either using currently or considering adopting. Why will soldiers prefer your solution?
	OPERATIONAL IMPACT	Looking only at the soldiers who will be impacted by your solution, argue that their jobs or lives will be significantly improved if your solution is adopted. What is the impact of your solution for a soldier vs. today's solutions?
	MILESTONE SCHEDULE	Please share with us a thoughtful execution plan. Strike a balance between giving us a sense of the detailed thinking behind the scenes and the need for contracting to manage a reasonably small number of milestones during your period of performance.
COMMERCIALIZATION AND POTENTIAL <i>weight 30%</i>	COMMERCIALIZATION POTENTIAL	Through the Applied SBIR Program, the Army wants to take advantage of the speed and scale of the commercial sector. Our organization funds projects that do not rely solely on DoD funding. A key indicator of this the potential for your product / solution to create sustained profitability in the commercial sector. Make your best case that your product is or will be commercially profitable. If you have more than one product, please focus your argument on the product / solution presented for this application.
	FINANCIAL SUSTAINABILITY	Make the case that private dollars will continue to fund improvements to your solution from which the Army will benefit in the future. Companies who cannot demonstrate non-DoD funding sources for future solution enhancements are less attractive to our program.
	TRANSITION AND COMMERCIALIZATION INFORMATION	Whatever your stage in terms of technology maturity and engagement with the Army, demonstrate that you have an appropriate goal for your next step in "transitioning" with the Army (and/or DoD more broadly.) What is that next goal for you in terms of your next contracting or collaboration opportunity with the Army? Beyond the program, describe the next type of deal you aim to make with the Army, e.g. a CRADA, a Phase I SBIR, a Phase II, a CSO, etc. Briefly make the case that you know how to accomplish that mission.
TEAM ABILITY <i>weight 20%</i>	TECHNICAL PERSONNEL	Briefly list and describe your core scientific and technical team. Do you have the people and technical capabilities you need to successfully complete your proposed project? If not, convince the reader you have a credible recruiting plan and can fill personnel gaps.
	BUSINESS PERSONNEL	Briefly list and describe your business team. Do you have the people and capabilities you need to successfully position your company for DoD Transition? If not, convince the reader you have a credible recruiting plan and can fill personnel gaps.
	PAST EXECUTION	Prove your team has executed well as a group. What milestones have you accomplished as a group in this company?
	QUALITY OF PROSE	Prove you write clearly and argue convincingly.
	DATA QUALITY & ATTRIBUTION	Support your arguments with relevant, properly attributed data to enhance your credibility.

Army SBIR 224 Topic Index
Release 10

A224-018 Staring Sensors for Pilot Situational Awareness
A224-019 Enzyme Fuel Cell
A224-020 Carbon-Free Soldier Power Generator (C-SPG)
A224-021 Advanced Circuit Breaker Tech for Power Distribution & Management Solutions
A224-022 Art + Science Geospatial Innovation

A224-018 Staring Sensors for Pilot Situational Awareness

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

TECHNOLOGY AREA(S): Sensors; Air platform

OBJECTIVE: NVESD through MANTECH has matured a high dynamic range, Long Wave Infrared (LWIR) 3K X 3K Focal Plane Array (FPA). The Apache pilots desire a staring pilotage sensor in place of the current gimbaled design to reduce latency and cockpit workload while increasing safety. This project would re-package the Integrated Detector Cooler Assembly (IDCA) to be more suitable for aircraft integration and stitch together three of the cameras to produce a seamless forward looking hemispherical image.

DESCRIPTION: Currently the AH-64E helicopter uses the Lockheed Martin Pilot Night Vision Sensor (PNVS) which is a mechanically gimbaled sensor that rotates and pivots. The IDCA is a second generation scanned 480 x 4 detector array which has the potential for becoming unsupported in the future.

The purpose of this topic is to repackage the IDCA and lens developed to support the LWIR 3Kx3K FPA into an integratable camera design. Stitch the camera imagery together to produce a staring sensor system. Conduct performance testing. Produce test reports. Deliver prototype miniaturized camera.

This large FPA and staring design configuration will increase sensor range as well as reduce the need for replacement or repair of the existing mechanically gimbaled PNVS system. The staring sensor configuration has no moving parts which will decrease any mechanical wear or breakage. A staring approach will eliminate latency and provide 2 simultaneous video streams to each pilot which will increase safety.

PHASE I: Integrate and design the 3Kx3K FPA into a miniaturized camera assembly. Deliver miniaturized Camera Design Documentation.

PHASE II: Design interfaces and integrate the miniaturized camera on to an AH-64E Army helicopter. Design must fit into same volume as the existing LM PNVS system. The design shall be a staring, non-gimbaled configuration. Deliver integration and Interface Design Documentation.

PHASE III DUAL USE APPLICATIONS: This technology has commercial helicopter and maritime applications, enabling pilots and unmanned systems to see in dark and adverse weather conditions

REFERENCES:

[*Industry Growth Insight*](#), [*Mordor Intelligence*](#), [*Allied Market Research*](#)

KEYWORDS: Sensor; night vision; camera; imagery; latency

A224-019 Enzyme Fuel Cell

OUSD (R&E) MODERNIZATION PRIORITY: Biotechnology Space

TECHNOLOGY AREA(S): Electronics; Materials

OBJECTIVE: This SBIR Direct to Phase II project will design and develop a 1 kW Enzyme based Fuel Cell capable of silent power generation and very high efficiency. An enzyme fuel cell is an excellent power source for electric vehicle range extension, auxiliary power, or robotic power for payloads. The technology is based on the use of enzymes to “digest” hydrocarbons successfully demonstrated on the clean up of oil spills and on lab scale demonstrations of JP-8 fuel to generate Hydrogen for use in fuel cells producing electrical power. A proof of concept 1 kW fully developed fuel cell is needed to verify the >70% JP-8 fuel to electric power efficiency as well as to determine the acoustic and thermal characteristics of this system.

DESCRIPTION: The purpose of this Direct to Phase 2 topic is to develop an enzyme fuel cell power generation system that uses JP-8 fuel to produce electrical power at high efficiency (>70%).

Currently, Large engines can get in the 40-50% efficiency range, but this is not likely using JP-8 fuel. Small engines can get in the 20-25% efficiency range but are very loud. Current JP-8 fuel cells utilizing fuel reformer technology is large and heavy, with 30% efficiency.

However, leveraging enzyme technology, JP-8 fuel cells can eliminate the need for the fuel reformer, leading to efficiencies over 70%. This concept will be successful because it leverages demonstrated technology utilizing enzyme hydrocarbon digestion. Engineering challenges, integration, and system scale up remain and will be the focus of this effort.

PHASE I: This Direct to Phase II will require demonstration of a 1 kW JP-8 fuel cell system with an enzyme hydrocarbon digester. A Lab-scale prototype with an electrode area of at least 1 cm² is encouraged. Companies must show the following technical feasibility to show proof of concept in Phase I: (1) enzyme activity already digests hydrocarbon fuels at a wide range of temperatures; (2) JP-8 fuel cell must have been evaluated in a lab-scale prototype with an electrode area of at least 1 cm²; and (3) must provide initial design concepts, start-up time estimations, scaling calculations and energy loss models.

PHASE II: Continue enzyme development to improve system performance. Develop a small-scale system and test the system to demonstrate high efficiency (>70%). Scale up the size of cells and design the mechanical structure for both larger cells and stack-level components. Design, build, and demonstrate a 1 kW JP-8 fuel cell system with an enzyme hydrocarbon digester. Perform a feasibility study on scaling up the power of the system to future customer power requirements.

PHASE III DUAL USE APPLICATIONS: Scale up to customer designed power range (5 kW, 10 kW, 25 kW). While this topic is mainly geared towards aviation use cases, the creation and adoption of this technology has the potential to significantly contribute to the commercial adoption and success of electric vehicles.

REFERENCES: Svoboda, Vojtech and Atanassov, Plamen, “Enzymatic Fuel Cell Design, Operation, and Application”, May 2014

KEYWORDS: Enzyme; Fuel cell; power generation; hydrocarbon digestion

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

TECHNOLOGY AREA(S): Soldier Platform; Materials; Power Systems

OBJECTIVE: The purpose of this Direct to Phase II is to develop a safe Carbon-Free 50W Soldier-worn fuel cell power generator (C-SPG) that uses Alane (Aluminum Hydride – AlH_3) an environmentally safe, high energy density solid fuel to provide users with a light weight power generator (delivered energy density that is ~ 3 times that of rechargeable batteries) to recharge batteries “on-the-move” or “at-the-halt”. Additional objectives of the project include 1) Examining the feasibility of making affordable Alane with green Hydrogen generated from renewable sources and 2) Enabling a US based supply chain for Power Generation systems and Alane Fuel. An Alane fuel based power generation system enables completely environmentally green – both energy source (fuel) and power generation (electricity) that is affordable, mobile, and safe for use and the environment.

DESCRIPTION: This is a Direct to Phase II topic. Dismounted Soldiers on extended missions lack the capability to recharge batteries “on-the-move.” Dismounted squads and platoons need to either carry additional batteries or rely on battery resupply to meet their power and energy demands. C5ISR is developing Soldier Wearable Power Generation technology that can facilitate battery recharging “on-the-move”. This enhances the Function Concept for Movement and Maneuver by enabling operation with fewer battery swaps and eliminating the need to carry additional batteries. Soldiers on extended missions equipped with the power generator experience a significant reduction in load since they need to carry only additional fuel for their energy needs.

Previously, the US Army developed a thin form factor 20W SPG that reached TRL-7 following the Army Expeditionary Warrior Experiments (AEWE) in 2016. SPG requirements increased due to new Soldier electronics with increased capabilities and power at 50 Watts. The Objective is to develop a 50W Alane SPG. Proposer will leverage the prior work on a 20 W SPG type system to demonstrate the following:

- Develop a 50 W Alane- SPG with a system weight of 6lbs (T) and 4lbs (O) including 250 Wh of Fuel
- The System shall have a charge controller capable of providing Level II SMBus adjustable voltage and current output to support BB-2525 and CWB battery charging
- System shall be capable of operating indoors and while worn by the Soldier on his back or in his ruck-sack
- The System shall have a volume of less than 60 cubic inches including fuel and with a length and width not exceeding 7 inches and a depth not to exceed 3 inches, with an objective of less than 45 cubic inches including a 3 times startup hybrid battery
- System design and implementation shall allow for Soldier operation between -20°C to $+55^{\circ}\text{C}$
- System shall be ruggedized (IAW MIL-STD-810 & MIL-STD-1472)

Upon success this C-SPG based on Alane fuel will enable environmentally green power generation, that is affordable, mobile, and safe for use by the Soldier and safe for the environment. The C-SPG is expected to meet the increased energy demand from Soldier Lethality Cross Functional Team (SL CFT) initiatives for Nett Warrior (NW) and Integrated Visual Augmentation System (IVAS). It will provide a lightweight power system to autonomously recharge batteries “on-the-move” and eliminate the need to either carry additional batteries or rely on battery resupply to meet their energy demands on extended missions.

PHASE I: This topic is intended for technology proven ready to move directly into Phase II. Therefore, a Phase I award is not required. The offeror is required to provide detail and documentation in the Direct to Phase II proposal which demonstrates accomplishment of a "Phase I-like" effort, including a feasibility study. This includes determining, insofar as possible, the scientific and technical merit and feasibility of an Alane-based fuel cell system to have commercial potential. Technical Feasibility and Proof of Concept may reference the Army reports on Alane SPGs from AEWE 2016.

PHASE II: Develop a Soldier Power Generator (C-SPG) system that provides a power output of 50 Watts; Update the size of Alane fuel cartridge to provide 250 Wh of energy; Participate in Soldier Touch Point exercises like AEWE and refine SPG design based on feedback from Soldier Touch Point exercise and for Tech Eval..

PHASE III DUAL USE APPLICATIONS: Ruggedization and refinement of C-SPG from Tech Eval; Perform Operational Eval at the squad level; Establish initial LRIP manufacturing capability. Acquisition of SPG systems based on Alane as a fuel is expected to set the stage for a wider adoption by DOD for power generation needs for UUVs, UAVs and UGVs. This technology is also applicable for urban mobility solutions like "electric scooters" leading to a significant reduction in carbon emissions.

REFERENCES:

1. Thampan and S. Shah; "Development of a Soldier Wearable Power System (WPS)", Proceedings of the 47th Power Sources Conference, Orlando, 2016.
2. T. Thampan, S. Shah, D. Shah, J. Novoa, and C. Cook; "Development and Evaluation of Portable and Wearable Fuel Cells for Soldier Use", Journal of Power Sources, Vol 259, pp 276-281, 2014.

KEYWORDS: Fuel Cell; Power System; Power Generation; Wearable; Renewable Hydrogen; Alane; Green Hydrogen; Battery Charging; On-the-Move.

OUSD (R&E) MODERNIZATION PRIORITY: Directed Energy

TECHNOLOGY AREA(S): Electronics

OBJECTIVE: The purpose of this Direct to Phase II topic is to develop and demonstrate an advanced solid-state circuit breaker that is Army Aviation qualifiable. Advanced solid-state circuit breakers can improve the capability of the Electrical Power System to intelligently manage the loads on the aircraft and reduce pilot workloads.

DESCRIPTION: This is a Direct to Phase II topic. Advanced power management systems will be needed to handle the increase in demands and complexity of platform and payload electrical loads. These power management systems will require the capability to turn loads quickly and reliably on and off without requiring pilot input.

Applicants should apply developments in industry of solid-state circuit breakers to develop software configurable circuit breakers and to allow the development of smart power management systems.

Current Army Aviation platforms (enduring fleet) use electromechanical relays and thermal circuit breakers to control distribution of electrical power to the various on-board loads and maintain safe operation of the aircraft in the event of overloads or other failures. Today's aircraft apply limited automated switching implemented through analog relay logic inherent in the electrical distribution system design of the aircraft. Some additional capability is provided through manual crew intervention in order to provide backup power in certain failure mode situations. Solid-State circuit breakers are currently qualified in accordance with DO-160, the solid-state circuit breakers demonstrated in this effort are required to qualifiable to Army safety standards.

Application of modern electronic circuit breaker technology will provide:

1. Flexibility in setting current limits for individual loads.
2. FACE conformant and controllable software interface
3. Measurement of key load parameters (current, voltage, power factor)
4. Improved monitoring of the EPS to allow anticipation and averting of problems/failures

These technologies are well-understood and applied in domains other than Army aircraft, so there is a high probability that they can be made to operate successfully on Army aviation platforms.

PHASE I: This topic is accepting Direct to Phase II (DP2) proposals only. Feasibility documentation must show detailed designs or prototypes of solid-state circuit breakers for other applications.

PHASE II: Demonstrate Army qualifiable electronic circuit breaker prototypes; Qualify circuit breakers for aviation platforms

PHASE III DUAL USE APPLICATIONS: While this topic was originally geared towards aviation use cases, this technology can be strongly applicable to electric vehicle use cases. With the proliferation of this tech, there is a higher chance of commercial EV adoption.

REFERENCES: Pilvelait, Bruce Gold, Calman Marcel, Mike. A High Power Solid State Circuit Breaker for Military Hybrid Electric Vehicle Applications. 2012. <https://apps.dtic.mil/sti/pdfs/ADA566841.pdf>

KEYWORDS: Power management; solid-state; pilot workloads; circuit breakers

OUSD (R&E) MODERNIZATION PRIORITY: AI/ML

TECHNOLOGY AREA(S): Causality and Inference Discovery, Machine Learning, Complex and Dynamic Graph Theory, Information Systems

OBJECTIVE: Applicants are to propose methodologies to analyze and describe operational environment (OE) complexity in terms of the above definition through development pathways to elevate the cognitive ability of machine learning (ML) and artificial intelligence (AI), and convergence of cognitive diversity into technology applications. The three levels cognitive ability is defined as follows: the lowest as ‘seeing and observing’ - detection of regularities in environments; the next level up as ‘doing’ - predicting effects of deliberate alterations to produce a desired outcome; the highest as ‘knowing’ - understanding the (causal inference) of why something works and what to do when it does not. Cognitive diversity is defined as different manners of thought, generating ideas, problem-solving methods and perspectives.

DESCRIPTION: Military commanders and key leaders are seeking and continually ask their staffs for the operational ‘so what?’ Conflict, social disruption, disease, strain on resources, climate change, and economic instability are formed upon obscured, complex and dynamic factors and make the identification of meaningful and actionable ‘so what’s’ extremely difficult. Understanding such complexity requires in-depth cognitive ability and cognitive diversity. Leaders, planning staff, analysts, operators must possess extensive expertise and pour through enormous data sets and information to understand what the ‘so what’ is and know how to present the ‘so what’ in a manner that commanders and leaders can make decisions from. Barriers to better understand the OE and plan for operations include: a lack of qualitative analytic outputs that provide multiple perspectives understanding; a lack of analytic capabilities to describe OE conditions in terms of system’s behavior and causation; and the inability to accurately and dynamically describe the attributes of edges within the system. To overcome these barriers, the Army should not simply build better “analytic mouse traps.” Current technology applications focus on ‘big data’ with limited means to provide meaningful interpretations and expressions of causation. Although ‘big data’ is in fashion, it is no panacea. It is neither an end state nor is it a way for gaining higher levels of cognitive capabilities. Rather, meaningful outputs are comprised of contextual descriptions of OE conditions and the progress towards or regress from specified objectives. This research proposal seeks to support the generation of means for creating technologic methodologies to make such determinations.

Enablement of cognitive ability and cognitive diversity offers pathways of discovery beyond identification of system nodes and their attributes. The vision behind this form of research is the generation of greater understanding of system behaviors (in context of operational variables) through exploration of system edges. The research seeks to support the development of methodologies for collectively identifying, examining, and systematically integrating edge attributes (e.g. relationship strategies, motivations, and expected outcomes) into a collaborative analytic platform for operational and strategic staffs to determine patterns of system behaviors within OEs. Central to this development is a novel integration of artist into the design and development process for this effort. As critical as the development of an analysis capability that can capture complex and dynamic system behavior that reveals actionable levers of control within that system with a focus on edge attributes, is the development of a visualization capability that both captures the richness and complexity of the system behavior in the OE, while, making it readily understandable what the levers of control are in the multi-domain environment and providing the ‘why’ and ‘how’ of these levers by providing a human understandable causal links to these levers. The key here is both to reduce the cognitive burden and training requirement for the tool, while providing the warfighter a capability that answers the critical “so what” question for the commander.

PHASE I: The objective of this phase will be to accomplish two primary tasks: a) develop technical approach that is capable of ingesting and analyzing a combination of warfighter gathered, open source and publicly available information and data to support the situational understanding required to identify the gap between a commander's current state in the mission space and their goal state, along multiple interrelated and interacting lines of effort. The second task, b) is to concurrently collaborate with artists and other researchers skilled in innovative interpretations and novel visualizations to collectively develop analytical visual outputs for this capability that is intuitive, minimizes cognitive burden and training, while providing actionable insights to the commander in a complex and dynamic environment. The goal would be to create a study that would include and assessment of alternative approaches, along with the risks of each approach and risk mitigation strategies for each alternative. Although not required, a simple prototype that demonstrates the offeror's best of breed approach for Phase 2, with a focus on novel visualization to reduce cognitive burden would be beneficial.

PHASE II: The objective of phase 2 would be to create a fully functional prototype of the capability design to support a small selection of use cases for operational warfighters that will be significantly impacted by the human element of the operational environment. By providing an operational use case to focus this effort, we provide a more realistic opportunity for the offeror to be able to deliver a practical capability that will meet the needs of operational users while also being able to demonstrate the power of this approach to analyze edge attributes and demonstrate levers of control or actionable information to the warfighter in a human explainable way.

PHASE III DUAL USE APPLICATIONS: The goal of this topic is to upgrade the cognitive ability of AI/ML when scanning the information environment. More intelligent, context-aware AI is in-demand for multiple industries. Therefore, in phase 3, the goal would be to expand this development into non-military domains that would include logistics, marketing campaigns, emergency response management and on-line information/disinformation campaigns, just to name a few non-military examples.

REFERENCES:

Page, Scott E. 2018. *The Model Thinker: What You Need to Know to Make Data Work for You*. Basic Books, Inc. New York, NY.

Pearl, Judea, and Dana Mackenzie. 2019. *The Book of Why: The New Science of Cause and Effect*. Harlow, England: Penguin Books.

Instride.com. "Cognitive diversity: The diversity your company isn't thinking about." September 6, 2021. Accessed from: <https://www.instride.com/insights/cognitive-diversity/#:~:text=What%20is%20cognitive%20diversity%3F,solving%20methods%20and%20mental%20perspectives>.

KEYWORDS: Geospatial; data analysis; visualization; risk mitigation