

AMENDMENT 1

The purpose of Amendment 1 to DARPA Release 3 is to update the topic number in the award structure chart on page 2 (changes highlighted)

Defense Advanced Research Projects Agency (DARPA) DoD 23.4 Small Business Innovation Research (SBIR) Annual BAA Proposal Submission Instructions Release 3

INTRODUCTION

To achieve DARPA's mission to create technological surprise, the agency makes strategic, early investments in science and technology that will have long-term positive impacts on our national security. The pace of discovery in both science and technology is accelerating worldwide, resulting in new fields of study and the identification of scientific areas ripe for small business utilization through the SBIR and STTR programs. Small businesses are critical for developing technology to support national security. Proposers are encouraged to consider whether the R/R&D being proposed to DoD Components also has private sector potential, either for the proposed application or as a base for other applications. The topics below focus on technical domains important to DARPA's mission pursuing innovative research concepts that fall within one of its technology offices. More information about DARPA's technical domains and research topics of interest may be found at: <http://www.darpa.mil/about-us/offices>.

Proposers responding to a topic in this BAA must follow all general instructions provided in the Department of Defense (DoD) SBIR Program BAA. DARPA 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 DARPA Program and these proposal preparation instructions should be directed to: DARPA Small Business Programs Office at SBIR_BAA@darpa.mil. DSIP Topic Q&A will NOT be available for these DARPA topics. Technical questions related to improving the understanding of a topic's requirements must be submitted to SBIR_BAA@darpa.mil by the deadline listed below.

The following dates apply to this DARPA Topic release:

- March 14, 2023:** Topic issued for pre-release
- March 29, 2023:** Topic opens; DARPA begins accepting proposals via DSIP
- April 25, 2023:** Deadline for technical question submission
- May 02, 2023:** Deadline for receipt of proposals no later than **12:00 pm ET**

DIRECT TO PHASE II PROPOSAL GUIDELINES

Proposers should refer to the DARPA Direct to Phase II SBIR XL Proposal Instructions, provided in Appendix A.

Current Release Award Structure by Topic

Topics	Period of Performance	Amount
HR0011SB20234XL-01 Subtopic 1	Base: 12-months	\$ 1,500,000
	Option 1: 12-months	\$ 1,000,000
	Option 2: 12 months	\$ 1,500,000
HR0011SB20234XL-01 Subtopic 2	Base: 12-months	\$ 750,000
	Option 1: 12-months	\$ 1,000,000
	Option 2: 12 months	\$ 2,250,000

Note: Please see Appendix A, section III (d) for complete instructions on the White Paper/Slide Deck technical volume format.

Content of the Technical Volume

Proposers should refer to the DARPA DP2 Proposal Instructions, provided in Appendix A and on the DARPA Small Business site (<https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>).

Cost Volume (Volume 3)

Please see the chart above for award amounts listed by topic. Proposers are required to use the Direct to Phase II – Volume 3: Cost Proposal Template (Excel Spreadsheet) provided on the DARPA Small Business site (<https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>). Subcontractors may also submit unsanitized costs using this template directly to DARPA at SBIR-BAA@darpa.mil.

Please review the updated Percentage of Work (POW) calculation details included in the DoD Program BAA. DARPA will occasionally accept deviations from the POW requirements with a letter of explanation or approval from the Funding Agreement officer.

Company Commercialization Report (CCR) (Volume 4)

Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD SBIR Program BAA for full details on this requirement. Information contained in the CCR will not be considered by DARPA during proposal evaluations.

Supporting Documents (Volume 5)

In addition to the documents required by DoD, small businesses may also submit additional documentation to support the Technical Volume (Volume 2) and the Cost Volume (Volume 3) in Volume 5.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TAB A)

DARPA does not offer TAB A funding.

EVALUATION AND SELECTION

All proposals will be evaluated in accordance with the evaluation criteria listed in the DoD SBIR 2023.4 BAA. DARPA 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 topic are considered non-conforming and therefore are 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, determine 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 DARPA topic.

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 DoD SBIR 2023.4 BAA and availability of funding. Given the limited funding available for each topic released, not all proposals considered selectable will be 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 SBIR 2023.4 BAA and DARPA topic, and the strengths of the overall proposal outweighs its weaknesses. Additionally, there are no accumulated weaknesses that would require extensive negotiations and/or a resubmitted 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 SBIR 2023.4 BAA and DARPA topic, and the strengths of the overall proposal do not outweigh its weaknesses.

Proposing firms will be notified of selection or non-selection status for a Phase I award within 90 days of the closing date of the DoD SBIR 2023.4 BAA. It is the policy of DARPA to treat all proposals as source selection information and to disclose their contents only for the purpose of evaluation. Restrictive notices notwithstanding, during the evaluation process, submissions may be handled by support contractors for administrative purposes and/or to assist with technical evaluation. All DARPA support contractors are expressly prohibited from performing DARPA-sponsored technical research and are bound by appropriate nondisclosure agreements. Input on technical aspects of the proposals may be solicited by DARPA from other Government and/or non-Government consultants/experts who are strictly bound by the appropriate non-disclosure requirements. No submissions will be returned. Upon completion of the evaluation and selection process, an electronic copy of each proposal received will be retained at DARPA.

Proposal titles, abstracts, anticipated benefits, and keywords of proposals that are selected for contract award will undergo a DARPA Policy and Security Review. Proposal titles, abstracts, anticipated benefits, and keywords are subject to revision and/or redaction by DARPA. Final approved versions of proposal titles, abstracts, anticipated benefits, and keywords may appear on the DoD SBIR/STTR awards website and/or the SBA's SBIR/STTR award website (<https://www.sbir.gov/sbirsearch/award/all>).

Refer to the DoD SBIR 2023.4 Program BAA for procedures to protest the Announcement. As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests regarding the selection decision should be submitted to:

DARPA
Contracts Management Office (CMO)
675 N. Randolph Street
Arlington, VA 22203
E-mail: scott.ulrey@darpa.mil and sbir@darpa.mil

AWARD AND CONTRACT INFORMATION

1. General Award Information

Multiple awards are anticipated. DARPA may award FAR-based government contracts (Firm-Fixed Price or Cost-Plus Reimbursement) or Other Transactions for Prototypes agreement (under the authority of 10 U.S.C. § 4022) subject to approval of the Contracting Officer. The amount of resources made available for each topic issued under this BAA will depend on the quality of the proposals received and the availability of funds.

Majority Ownership in Part. Proposers that are more than 50% owned by multiple venture capital operating companies (VCOC), hedge funds (HF), private equity firms (PEF), or any combination of these as set forth in 13 C.F.R. § 121.702, are eligible to submit proposals in response to DARPA topics advertised within this BAA.

For proposers that are a member of this ownership class the following must be satisfied for proposals to be accepted and evaluated:

- a. Prior to submitting a proposal, firms must register with the SBA Company Registry Database.
- b. The proposer within its submission must submit the Majority-Owned VCOC, HF, and PEF Certification. A copy of the SBIR VC Certification can be found on <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>, under SBIR/STTR BAA Forms. Include the SBIR VC Certification in the Supporting Documents (Volume 5).
- c. Should a proposer become a member of this ownership class after submitting its proposal and prior to any receipt of a funding agreement, the proposer must immediately notify the Contracting Officer, register in the appropriate SBA database, and submit the required certification which can be found under SBIR/STTR BAA Forms and Templates on <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this announcement and to make awards with or without communications with proposers. Additionally, the Government reserves the right to award all, some, one, or none of the options on the contract(s)/agreement(s) of the performers based on available funding and technical performance. If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, DARPA reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that DARPA desires to award only portions of a proposal, negotiations may be opened with that proposer. The Government reserves the right to fund proposals in phases with options for continued work, as applicable.

The Government reserves the right to request any additional, necessary documentation once it makes the award instrument determination. The Government reserves the right to remove a proposal from award consideration should the parties fail to reach agreement on award terms, conditions, and price within a reasonable time, and/or the proposer fails to provide requested additional information within three business days.

In all cases, the Government Contracting Officer reserves the right to select award instrument type, regardless of instrument type proposed, and to negotiate all instrument terms and conditions with selectees. DARPA will apply publication or other restrictions, as necessary, if it determines that the research resulting from the proposed effort will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Any award resulting from such a determination will include a requirement for DARPA permission before

publishing any information or results on the program. For more information on publication restrictions, see the DoD SBIR 2023.4 BAA.

Because of the desire to streamline the award negotiation and program execution process, proposals identified for negotiation will result in negotiating a type of instrument for award that is in the best interest of the Government. In the case of an OT for Prototype agreement under DARPA's authority to award OTs for prototype projects, 10 U.S.C. § 4022, use of an OT provides significant opportunities for flexible execution to assist in meeting DARPA's aggressive SBIR/STTR program goals.

All proposers that wish to consider an OT award should carefully read the following:

The flexibility of the OT award instrument is beneficial to the program because the Performer will be able to apply its best practices as required to carry out the research project that may be outside of the Federal Acquisition Regulation (FAR) process-driven requirements. Streamlined practices will be used, such as milestone-driven performance, intended to reduce time and effort on award administration tasks and permit performers to focus on the research effort and rapid prototyping. Because of this ability, OTs provide the Agreements Officer the flexibility to create an award instrument that contains terms and conditions that promote commercial transition, reduce some administratively burdensome acquisition regulations, and meet SBIR/STTR program goals.

Proposers must only propose an OT agreement with fixed payable milestones. Fixed payable milestones are fixed payments based on successful completion of the milestone accomplishments agreed to in the milestone plan. Refer to the Other Transactions for Prototypes Fact Sheet and Other Transaction for Prototype Agreement, available at <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>. Specific milestones will be based upon the research objectives detailed in the topic.

Please see <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program> for more information on OTs.

2. Transition and Commercialization Support Program (TCSP)

DARPA will provide services to Phase II or DP2 awardees upon contract execution through the Transition and Commercialization Support Program (TCSP) at no cost to awardees. The TCSP goal is to maximize the potential for SBIR/STTR companies to move their technology beyond Phase II and into other research and development programs for further maturity or into solutions or products for DoD acquisition programs, other Federal programs, and/or the commercial market. Please visit <https://www.darpa.mil/work-with-us/for-small-businesses/commercialization-continued> for more information on DARPA TCSP.

3. Embedded Entrepreneurship Initiative

Awardees of SBIR funding pursuant to this BAA may be eligible to participate in the DARPA Embedded Entrepreneurship Initiative (EEI) during the Period of Performance. Invitation to participate in EEI is at the sole discretion of the Government based on evaluation of technical and commercial factors and subject to program balance and the availability of funding. EEI is a limited scope program offered by DARPA, at DARPA's discretion, to a small subset of awardees. The goal of DARPA's EEI is to increase the likelihood that DARPA-funded technologies take root in the U.S. and provide new capabilities for national defense. EEI supports DARPA's mission "to make pivotal investments in breakthrough technologies and capabilities for national security" by accelerating the transition of innovations out of the lab and into new capabilities for the Department of Defense (DoD). EEI investment supports development of a robust and deliberate Go-to-Market strategy for selling technology product to the government and commercial markets and positions DARPA awardees to attract U.S. investment. The following is for informational and planning purposes only and does not constitute solicitation of proposals to the EEI.

There are three elements to DARPA's EEI: (1) A Senior Commercialization Advisor (SCA) from DARPA who works with the Program Manager (PM) to examine the business case for the awardee's technology and uses commercial methodologies to identify steps toward achieving a successful transition of technology to the government and commercial markets; (2) Connections to potential industry and investor partners via EEI's Investor Working Groups; and (3) Additional funding on an awardee's contract for the awardee to hire an embedded entrepreneur to achieve specific milestones in a Go-to-Market strategy for transitioning the technology to products that serve both defense and commercial markets. This embedded entrepreneur's qualifications should include business experience within the target industries of interest, experience in commercializing early stage technology, and the ability to communicate and interact with technical and non-technical stakeholders. Funding for EEI is typically no more than \$250,000 per awardee over the duration of the award. An awardee may apportion EEI funding to hire more than one embedded entrepreneur, if achieving the milestones requires different expertise that can be obtained without exceeding the awardee's total EEI funding. The EEI effort is intended to be conducted concurrent with the research program without extending the period of performance.

EEI Application Process:

After receiving an award under the solicitation, awardees interested in being considered for EEI should notify their DARPA Program Manager (PM) during the period of performance. Timing of such notification should ideally allow sufficient time for DARPA and the awardee to review the awardee's initial transition plan, identify milestones to achieve under EEI, modify the award, and conduct the work required to achieve such milestones within the original award period of performance. These steps may take 9-18 months to complete, depending on the technology. If the DARPA PM determines that EEI could be of benefit to transition the technology to product(s) the Government needs, the PM will refer the performer to DARPA Commercial Strategy.

DARPA Commercial Strategy will then contact the performer, assess fitness for EEI, and in consultation with the DARPA technical office, determine whether to invite the performer to participate in the EEI. Factors that are considered in determining fitness for EEI include DoD/Government need for the technology; competitive approaches to enable a similar capability or product; risks and impact of the Government's being unable to access the technology from a sustainable source; Government and commercial markets for the technology; cost and affordability; manufacturability and scalability; supply chain requirements and barriers; regulatory requirements and timelines; Intellectual Property and Government Use Rights, and available funding.

Invitation to participate in EEI is at the sole discretion of DARPA and subject to program balance and the availability of funding. EEI participants' awards may be subsequently modified bilaterally to amend the Statement of Work to add negotiated EEI tasks, provide funding, and specify a milestone schedule which will include measurable steps necessary to build, refine, and execute a Go-to-Market technology transition plan aimed at delivering new capabilities for national defense. Milestone examples are available at: <https://www.darpa.mil/work-with-us/contract-management>.

Awardees under this solicitation are eligible to be considered for participation in EEI, but selection for award under this solicitation does not imply or guarantee participation in EEI.

For more information please refer to the EEI website <https://eei.darpa.mil/>.

4. DARPA Toolbox Initiative

DARPA Toolbox is an Agency-wide effort to provide open licensing opportunities with commercial technology vendors to the researchers behind DARPA programs. DARPA Toolbox provides easy, low-cost, scalable access to state-of-the-art tools and intellectual property (IP) under predictable

legal terms and streamlined acquisition procedures. The goal is to reduce performer reliance on low-quality, low-cost tools and IP that increase execution risks and complicate post-DARPA transitions.

Through this initiative, DARPA performers are granted access to select vendor tools and technologies throughout the life of their contractual relationship with the Agency. The Toolbox suppliers bring to the table proven technologies commonly used in state-of-the art commercial microelectronics or system design methodologies.

DARPA Toolbox program information and a full list of participating suppliers can be found at <https://www.darpa.mil/work-with-us/darpa-toolbox-initiative>. If there are tool or technologies of interest, contact the Supplier POC listed for the product, referencing the DARPA Toolbox Initiative. The Supplier POC will provide advice on products and pricing information. Include any non-production pricing quotes in your proposal. Products and pricing are between you and the suppliers – *do not* contact DARPA directly.

ADDITIONAL INFORMATION

DARPA intends to use electronic mail for all correspondence regarding these topics. Questions related to the technical aspect of the research objectives and awards specifically related to a topic should be emailed to SBIR_BAA@darpa.mil. Please reference the topic number in the subject line. All questions must be in English and must include the name, email address, and the telephone number of a point of contact.

DARPA will attempt to answer questions in a timely manner; however, questions submitted within seven (7) calendar days of the proposal due date listed herein may not be answered. DARPA will post a consolidated Frequently Asked Questions (FAQ) document. To access the posting please visit: <http://www.darpa.mil/work-with-us/opportunities>. Under the topic number summary, there will be a link to the FAQ. The FAQ will be updated on an ongoing basis until one week prior to the proposal due date.

Technical support for the Defense SBIR/STTR Innovation Portal (DSIP) is available Monday through Friday, 9:00 a.m. – 5:00 p.m. ET. Requests for technical support must be emailed to DoDSBIRSupport@reisystems.com with a copy to SBIR_BAA@darpa.mil.

DARPA SBIR 23.4 Topic Index
Release 3

HR0011SB20234XL-01

Safe Food for Everyone (SaFE) - SBIR XL

HR0011SB20234XL-01 TITLE: Safe Food for Everyone (SaFE) - SBIR XL

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Weapons, Information Systems

OBJECTIVE: The goal of SaFE is to develop practical; low-cost; small size, weight, and power; non-isotopic sources for food irradiation and other applications requiring pathogen sterilization, supporting ubiquitous treatment at points of production and points of distribution, particularly in austere or compromised environments (e.g., expeditionary operations, humanitarian relief, or disaster response).

DESCRIPTION: This SBIR XL topic will focus on the development of compact, low-cost, high efficiency, and economically viable electron accelerator systems. The topic is composed of two linked subtopics: Subtopic 1 will develop accelerator technology, and Subtopic 2 will focus on distributed system designs and pilot demonstrations.

Accelerators developed as part of the first subtopic will be capable of generating continuous, high current electron beams at 2 to 10 MeV energies using 10 kW electric sources. 10 kW generators are commonly used in deployed support operations such as those found in containerized kitchens. Specifically, this subtopic will explore recent innovations resulting in accelerator designs that can be produced for tens of thousands of dollars compared to millions of dollars for traditional high power accelerators such as Rhodotrons and S-band LINACs, while being suitable for new distributed system architectures. High-gradient direct current (DC) accelerator structures, novel voltage multiplier designs, and new innovations in dielectric materials may provide viable technical approaches. Further, new solid state amplifiers could provide a potential path for radiofrequency (RF) approaches. Such configurations could present the highest potential for compact, low-cost, high wall-plug efficiency accelerator designs.

The second subtopic, system studies, will initially focus on two use cases: (1) a single 10 kW system for deployed or austere environments and (2) multiple distributed 10 kW systems for point of packaging applications. Subtopic 2 performers will conduct detailed economic analysis including capital costs and operations and maintenance costs. The analysis will define minimum viable product and systems characteristics that can be economically produced and address the maximum number of applications for wide-spread use while still achieving treatment and throughput requirements. Further, practical issues such as radiation shielding, automation, and regulatory concerns will be addressed. These analyses will be informed by strong food industry, U.S. Army Natick Soldier Center, Food and Drug Administration (FDA), and U.S. Department of Agriculture (USDA) engagements. Systems work will culminate in a proof-of-concept pilot demonstration of the specific subtopic accelerator technology. Such a demonstration aims to establish broader adoption of food irradiation and enhance food safety and security for both deployed and domestic applications. In addition, secondary applications such as sterilization and remediation will be examined.

It is envisioned that between the two subtopics, technical, economic, and regulatory hurdles currently hindering food irradiation adoption will be fully addressed. This, in turn, will jumpstart commercial activity in this sector leading to viable products, new industrial development, and overall greater food safety and security.

PHASE I: This topic is soliciting Direct to Phase II (DP2) proposals only. There is no Phase I; however, proposers must provide evidence of approach feasibility with results at a level commensurate with the conclusion of a Phase I effort. Examples of such evidence are included below for each subtopic.

Proposers to Subtopic 1 are required to provide documentation outlining success in high efficiency accelerator component technologies. Achievements must be substantial. For example, a key component

for a DC accelerator could be a Cockcroft-Walton voltage ladder. Such a ladder showing 1 MV and an efficiency of >70% into a representative load would be considered sufficient.

Proposers to Subtopic 2 are required to provide documentation outlining success in prior end-to-end system design, demonstration of hands-on work with analogous technologies (including core competencies with accelerator technologies), and experience working with regulatory agencies – specifically the FDA and state regulatory bodies for machine-produced radiation sources.

PHASE II: SaFE is composed of two linked subtopics over an anticipated 3-year period of performance. The period of performance is divided into a 12-month base and two 12-month option periods. Proposers may apply to one or both subtopics.

Subtopic 1: Accelerator technology development. The overall goal of Subtopic 1 is to produce and demonstrate a turn-key high efficiency, low cost, reasonably compact, irradiation accelerator prototype at technology readiness level 6 with the following characteristics:

Parameter	Threshold	Objective
Tunable electron energy range (MeV)	2-5	2-10
Max x-ray energy (MeV)	5	7.5
Wall plug efficiency (Pbeam/Pwall)	> 0.3	> 0.7
Unit cost (\$)	< \$100,000	< \$50,000

The accelerator must make use of 10 kW electric generator output such as 120V@100A or 208V@50A. The complete, turn-key system including controls, accelerator, RF generation (if appropriate), shielding, beam steering, and target must be compatible with a single 463L pallet. Additional suitability metrics include a removable x-ray converter (such as tantalum) to support x-ray production, continuous or near continuous operation, and targets compatible with conveyer-based operations.

The 12-month base period will focus on accelerator design, modeling, and component development. The design will progress through typical processes including a system requirements review, preliminary design review, and a critical design review. Components will be developed and tested supporting the overall accelerator design.

Base period (12 month) milestones:

- Month 1: Kickoff materials. Slide deck summarizing technical approach to meet overall goals, risks, and risk mitigations and quantified milestone schedule
- Month 3: System Requirements Review
- Month 6: Preliminary Design Review
- Month 12: Critical Design Review

During the 12-month Option 1 period, components will be refined and integrated into a prototype system. This system will be tested to verify performance and ultimately used in Subtopic 2's pilot system demonstration.

Option 1 period (12 month) milestones:

- Month 6: Complete Accelerator Prototype
- Month 9: Test and Eval of Prototype
- Month 10: X-ray Target Assessment
- Month 12: Integrated T&E of Prototype

During the 12-month Option 2 period, support will be provided to Subtopic 2's pilot system demonstration and the accelerator will be further refined to a minimum viable product using feedback from Subtopic 2.

Option 2 period (12 month) milestones:

- Month 6: Accelerator Integration Report
- Month 12: Final Accelerator and System Design

Monthly written technical progress reports will supplement the above milestones (see template under SBIR/STTR BAA DOCUMENTS at <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>).

Subtopic 1 performers are expected to collaborate with subtopic 2 performers in this program.

Subtopic 2: Irradiation system design and proof-of-concept pilot demonstration

Subtopic 2 will complete system studies for two use cases using the accelerator technology of Subtopic 1. As mentioned above, the first use case will examine operation in deployed or austere environments. Food-based logistical support aims to feed 300 troops from mobilized trailers or 800 troops from containerized kitchens. About 32 lbs. of food supplies (including packaging) are needed per troop per week. This is about 2 kg/day at an average density of ~0.5 g/cc. Detailed modeling and analysis will be carried out on various objects and package configurations, and optimization studies will be conducted to provide effective treatment per object at maximum throughput. In addition, Monte Carlo analysis will be used to study radiation shielding. Such shielding could make use of supplied or indigenous materials or combinations of both to minimize size and weight. Handling systems will also be developed and included in the design studies. Metrics for this use case are described in the table below.

Parameter	Threshold	Objective
Size and weight (463L pallets)	< 2	< 1
Throughput (kg/hr)	> 50	> 180
Dose/item (kGy)	> 0.4	> 1
Dose uniformity ratio	< 2.5	< 1.4

Size and weight metrics include the full accelerator of Subtopic 1. Object and packaging details as well as feedback on aspects of practical system suitability are anticipated through discussions with performer(s) and DoD stakeholders during the base period.

The second system study will examine using the accelerator of Subtopic 1 in a distributed architecture at the point of packaging. Perishable food such as lettuce or ground beef and associated packaging will be analyzed. Detailed technical analysis, economic analysis, and commercialization plans for the system will be completed with the goal of minimizing overall system costs. The specific use case will be proposed by the performer. Metrics for this use case are described in the table below.

Parameter	Threshold	Objective
Throughput (kg/hr)	> 1,000	> 3,600
Dose (kGy)	> 0.4	> 1
Dose uniformity ratio	< 2.5	< 1.4

In addition to system studies, Subtopic 2 will develop and demonstrate a proof of concept pilot for both of the use cases described above. This includes addressing all regulatory requirements and potentially crafting petitions to regulatory bodies describing the specific needs of distributed systems.

The 12-month base period will focus on separate design studies for the use cases described above and progress through typical design review elements, including a system requirements review and preliminary design review. In addition, all relevant regulations will be identified.

Base period (12 month) milestones:

- Month 1: Kickoff materials. Slide deck summarizing approaches to meet overall goals, risks, and risk mitigations and quantified milestone schedule
- Month 3: System Requirements Review
- Month 9: Preliminary Design Review
- Month 12: Final base period report and design update

During the 12-month Option 1 period, systems will be refined through a critical design review. A minimum viable product will be defined for the accelerator system of Subtopic 1. Pilot plans will be progressed and address all regulations.

Option 1 period (12 month) milestones:

- Month 3: 1) Critical Design Review, including summary of minimum viable product findings for accelerator technology, and 2) Preliminary pilot plan
- Month 6: Interim pilot plan
- Month 12: Final pilot plan

During the 12-month Option 2 period, the accelerator from Subtopic 1 will be used to complete a concept pilot demonstration.

Option 2 period (12 month) milestones:

- Month 3: Initial pilot operation report
- Month 6: Interim pilot operation report
- Month 12: Final pilot operation report

Monthly written technical progress reports will supplement the above milestones (see template under SBIR/STTR BAA DOCUMENTS at <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>).

Subtopic 1 and 2 are linked. Monthly coordination meetings between the teams are anticipated to facilitate communication and successful completion of overall program goals.

PHASE III DUAL USE APPLICATIONS: While the U.S. food supply is among the safest in the world, the FDA estimates that there are about 48 million cases of foodborne illness annually—the equivalent of sickening 1 in 6 Americans each year. And each year these illnesses result in an estimated 128,000 hospitalizations and 3,000 deaths. More significantly, the USDA estimates that food waste is between 30 and 40 percent of the U.S. food supply, with spoilage being a significant contributor. Based on estimates from USDA's Economic Research Service of 31 percent food loss at the retail and consumer levels, this corresponded to approximately 133 billion pounds and \$161 billion worth of food in 2010. Globally, about 1.4 billion tons of food is wasted every year. From a food security perspective, the U.S. imports 94% of its seafood, 55% of fruit, and 32% of vegetables, while the FDA is only able to inspect 1-2% of these foodstuffs. Lastly, there is a need to treat food for improved safety and stability during expeditionary operations or in environments where food quality may be compromised, such as in disaster

response or humanitarian relief operations. Development of “in-house,” port-of-entry, or expeditionary irradiation capabilities would provide a new means to avoid or significantly improve these food safety and waste issues. For food safety applications, the availability of in-house technologies will help reduce and control costs, provide greater flexibility in managing inventory, facilitate new product formulations, protect against supply chain disruption, and decrease the impact of waste management. Being able to cold pasteurize food at points of production, import, or distribution and in austere environments could present a transformational ability to improve food safety and security and reduce the threat from natural, accidental, or intentional food contamination. Further, these sources could also be used for a range of other applications. For example, low-cost e-beam technology can be employed to remediate urgently needed capabilities to degrade per- and polyfluoroalkyl substances (PFAS) in groundwater and soils. In-situ sterilization of medical devices is a further need for such sources. Overall, advancement in improving food safety, availability, and security could have global impacts and significantly advance U.S. national security agendas. By enabling safe and secure food supplies in underdeveloped countries, there are new opportunities for the U.S. to provide additional stability in these regimes.

Successful proposals for this SBIR offering must make significant arguments supporting the commercial viability of their approach. Hence, proposals to Subtopic 1 must provide initial evidence that their technical approach will allow accelerator structures that are much lower cost to produce (>10-100x) and operate (>10x) than traditional accelerator systems such as S-band LINACs and rhodotrons, while still achieving required beam powers for high throughput food treatment. Proposals for Subtopic 2 must make arguments that, should the above accelerator technology be available, it would enable highly economic treatment of foodstuffs at points of production/packaging and ports of entry. Transition and commercialization (T-C) milestones have been added as part of the option phases to aid in assuring commercial viability.

REFERENCES:

1. <https://www.aiche.org/resources/publications/cep/2016/november/introduction-electron-beam-food-irradiation>
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4. <https://www.usda.gov/foodwaste/faqs#>
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KEYWORDS: Food irradiation, cold pasteurization, medical sterilization, x-rays, linear accelerators, radiation dose

TPOC-1: DARPA BAA Help Desk
Email: SBIR_BAA@darpa.mil

APPENDIX A: DARPA DIRECT TO PHASE II (DP2) PROPOSAL INSTRUCTIONS

I. Introduction

A complete proposal submission consists of:

- Volume 1: Proposal Cover Sheet
- Volume 2: Technical Volume (feasibility documentation and technical proposal)
- Volume 3: Cost Volume
- Volume 4: Company Commercialization Report
- Volume 5: Supporting Documents
- Volume 6: Fraud, Waste and Abuse Training

The Defense SBIR/STTR Innovation Portal (DSIP) provides a structure for building the proposal volumes and submitting a consolidated proposal package. If this is your first time submitting an SBIR or STTR proposal using DSIP, please review detailed training guides at <https://www.dodsbirsttr.mil/submissions/learning-support/training-materials>. It is the responsibility of the proposing firm to ensure that a complete proposal package is certified and submitted by the close date listed in the topic to which they are responding.

To assist in proposal development, templates for Volume 2: Technical Volume and Volume 3: Cost Volume have been provided as attachments to the announcement posted at <https://www.dodsbirsttr.mil/submissions/login>. Use of these templates is mandatory.

NOTE: All proposers are required to submit Volume 4: Company Commercialization Report (CCR).

II. Proprietary Information

Proposers that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall follow instructions in section 4.5 regarding marking propriety proposal information.

III. DP2 Proposal Instructions

a. Proposal Cover Sheet (Volume 1)

The Cover Sheet must include a brief technical abstract of no more than 3000 characters 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.

b. Content of the Technical Volume (Volume 2) – White Paper & Slide Deck

White Paper (NTE 20 pages). Provide the following information:

Goals and Impact: Clearly describe what is being proposed and what difference it will make (qualitatively and quantitatively), including a brief discussion on how this directly relates to the topic.

1. Phase I Feasibility: This topic is accepting Direct to Phase II proposals ONLY. To be eligible, proposers must demonstrate that the feasibility requirements outlined in the topic have been met, and achieved outside of the SBIR program.

2. **Technical Plan:** Outline and address all technical areas and challenges inherent in the approach and possible solutions for overcoming potential problems. Provide specific objectives, metrics, and milestones at intermediate stages to demonstrate a plan for accomplishment of the project objectives. Propose additional appropriate qualitative and quantitative metrics specific to the approach, as needed. Intermediary milestones should occur at no greater than 1-month increments.
3. **Management and Capabilities:** Designate key personnel who will be involved in the Phase II effort. Provide a brief summary of expertise of the team, including subcontractors and key personnel. Describe the organizational experience in this technology area, previous work not directly related to the proposed effort but similar, existing intellectual property required to complete the project, and any specialized facilities to be used as part of the project. List Government-furnished materials or data assumed to be available. Describe any specialized facilities to be used as part of the project, the extent of access to these facilities, and any biological containment, biosafety, and certification requirements.
4. **Transition and Commercialization Plan:**
 - a. Describe the commercial product or DoD system to be developed.
 - b. Discuss the potential end users – DoD, Federal, and/or private sector customers. Discuss your business model for this technology (i.e., how do you anticipate generating revenue with this technology?). Who are you selling to directly or indirectly, a supplier, an integrator, or an end user?
 - c. Describe your company’s funding history. Discuss how much additional funding above this proposed effort (include additional required technology development, staffing requirements, infrastructure requirements, IP strategy costs, etc.) that will be required to bring this technology to market and how you anticipate going about getting that funding (e.g., Govt S&T contracts, investment).
 - d. Describe the timeline to maturity for sales or transition to an end user. Describe your IP strategy.
 - e. Describe the technology, market, team and business risks associated with this proposed effort and your plan to mitigate these risks.

Slide Deck (NTE 15 slides). Provide the following information (convert the completed deck to a pdf and attach it to the white paper):

1. What are you trying to do and how does this directly relate to the topic?
2. **Technology and commercial product:** Specifically, what are you proposing to produce – software, system, application? Be specific on what your proposed technology development is targeting as an end state.
3. How is the technology approached today? Who is doing the research, development and delivering products/services? What are the current limitations in the technology and commercial marketplaces?
4. **Technical and commercial value proposition:** How have you substantiated the feasibility of your approach? What is innovative in your approach and how does it compare to the state-of-the-art? Why do you think it will be successful both from a technical and commercial perspective? If you are successful what difference will it make? Discuss your proposed business model – how do you expect to generate revenue from your technology?

5. Technical and commercial risks: What are the key technical and commercial challenges and how do you plan to address/overcome these?
6. Technical and commercial market analysis: Who will care and what will the impact be if you are successful? What/who are the markets/industries/integrators/stakeholders that would/should care?
7. Cost, schedule and milestones: Provide a summary of your cost volume. Provide a summary of your schedule and milestones. How much will your proposed effort cost in total? How long will it take? What are your technical milestones for achieving the proposed efforts? What are your transition and commercialization plan milestones? Discuss how much funding will be required to bring your proposed technology to market and execute on your proposed transition and commercialization plan. Include any funding raised to date and expected plans for raising any additional required funding (government contracting revenue, product sales, internal R&D investment, loan, angel or Venture Capital investment, etc.). Describe timeline to maturity for operational use or commercial sales.
8. Management: Overview of team, facilities and qualifications.
9. Technical summary quad chart: Use template provided at <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>.
10. Commercialization summary quad chart: Use the DARPA Transition and Commercialization Strategy Plan (TCSP) template, located at <https://www.darpa.mil/work-with-us/for-small-businesses/commercialization-continued>.

NOTE: All letters of recommendation and CVs can be loaded in Volume 5: Supporting Documents.

c. Format of Cost Volume (Volume 3)

Proposers are required to use the Direct to Phase II – Volume 3: Cost Proposal Template (Excel Spreadsheet) provided as an attachment to this announcement. The Cost Volume (and supporting documentation) DOES NOT count toward the page limit of the Technical Volume.

d. Content of the Cost Volume (Volume 3)

Some items in the Cost Breakdown Guidance below may not apply to the proposed project. If such is the case, there is no need to provide information on each and every item.

ALL proposed costs should be accompanied by documentation to substantiate how the cost was derived. For example, if you proposed travel cost to attend a project-related meeting or conference, and used a travel website to compare flight costs, include a screen shot 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 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.

Cost Breakdown Guidance:

1. 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 DARPA; unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment by the DARPA.
2. Cost for travel funds must be justified and related to the needs of the project.
3. 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.
4. 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.

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>.

e. Company Commercialization Report (Volume 4)

The Company Commercialization Report (CCR) allows companies to report funding outcomes resulting from prior SBIR and STTR awards. The Company Commercialization Report (CCR) is required for Phase I and Direct to Phase II proposals. Please refer to the DoD STTR Program BAA for full details on this requirement. Information contained in the CCR will not be considered by DARPA during proposal evaluations.

f. Supporting Documents (Volume 5)

In addition to required DoD documentation and certifications, small businesses may also submit additional documentation to support the Technical Volume (Volume 2) and the Cost Volume (Volume 3) in Volume 5.

g. Fraud Waste and Abuse (Volume 6)

The Fraud, Waste and Abuse (FWA) training is required for Phase I and Direct to Phase II proposals. FWA training provides information on what represents FWA in the SBIR/STTR program, the most common mistakes that lead to FWA, as well as the penalties and ways to prevent FWA in your firm. This training material must be thoroughly reviewed once per year. Plan ahead and leave ample time to complete this training based on the proposal submission deadline. Knowingly and willfully making any false, fictitious, or fraudulent statements or representations may be a felony under the Federal Criminal False Statement Act (18 U.S.C. Sec 1001), punishable by a fine of up to \$10,000, up to five years in prison, or both. Understanding the indicators and types of fraud, waste, and abuse that can occur is critical for the SBIR/STTR awardees’ role in preventing the loss of research dollars.