

**Small Business Innovation Research (SBIR) and
Small Business Technology Transfer (STTR)
Opportunity Announcement
HR001120S0019-12
Tough Self-Decontaminating Surfaces (TSDS)**

Which program will fund this topic?

SBIR

What type of proposals will be accepted?

Both Phase I and Direct to Phase II (DP2)

Technology Area(s): Battle Space, Chemical/Biological Defense, Ground/Sea Vehicles, Materials/Processes

I. INTRODUCTION

The Defense Advanced Research Projects Agency (DARPA) Small Business Programs Office (SBPO) is issuing an SBIR/STTR Opportunity (SBO) inviting submissions of innovative research concepts in the technical domain(s) of Battle Space, Chemical/Biological Defense, Ground/Sea Vehicles, Materials/Processes. In particular, DARPA is interested in understanding the feasibility of Tough Self-Decontaminating Surfaces (TSDS).

This SBO is issued under the Broad Agency Announcement (BAA) for SBIR/STTR, HR001120S0019. All proposals in response to the technical area(s) described herein will be submitted in accordance with the instructions provided under HR001120S0019, found here: <https://beta.sam.gov/opp/b8abeb02f16a4450b2c2f859fc00c177/view>.

a. Eligibility

The eligibility requirements for the SBIR/STTR programs are unique and do not correspond to those of other small business programs. Please refer to Section 3.1, Eligible Applicants, of HR001120S0019 for full eligibility requirements.

b. Anticipated Structure/Award Information

Please refer to Section 1, Funding Opportunity Description provided in HR001120S0019 for detailed information regarding SBIR/STTR phase structure and flexibility.

If a proposer can provide adequate 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, the Direct to Phase II (DP2) authority allows the Department of Defense (DoD) to make an award to a small business concern under Phase II of the SBIR program without regard to whether the small business concern was provided an award under Phase I of an SBIR program. This SBO is accepting DP2 proposal submissions.

For this SBO, DARPA will accept Phase I proposals for cost of up to \$200,000 for a 6-month period of performance.

DARPA will accept DP2 proposals for cost of up to \$1,250,000. This includes a 24-month base period not to exceed a cost of \$1,000,000. A separately priced option of up to \$250,000 may also be proposed for contractors who would like to be considered for participation in the DARPA Entrepreneurial Investigator Initiative. Refer to Section 2.6, DARPA Embedded Entrepreneur Initiative, of HR001120S0019 for detailed information on EEI.

Proposers should refer to Section 4, Application and Submission Information, of HR001120S0019 for detailed proposal preparation instructions. Proposals that do not comply with the requirements detailed in HR001120S0019 and the research objectives of this SBO are considered non-conforming and therefore are not evaluated nor considered for award.

Phase I proposals shall not exceed 20 pages. Phase I commercialization strategy shall not exceed 5 pages. This should be the last section of the Technical Volume and will not count against the 20-page limit. Please refer to Appendix A of HR001120S0019 for detailed instructions on Phase I proposal preparation.

DP2 Feasibility Documentation shall not exceed 20 pages. DP2 Technical Proposal shall not exceed 40 pages. Phase II commercialization strategy shall not exceed 5 pages. It should be the last section of the Technical Volume and will not count against the 40-page limit. Please refer to Appendix B of HR001120S0019 for detailed instructions on DP2 proposal preparation.

c. Evaluation of Proposals

Section 5, Evaluation of Proposals, in HR001120S0019 provides detailed information on proposal evaluation and the selection process for this SBO.

d. Due Date/Time

Full proposal packages (Proposal Cover Sheet, Technical Volume, Price/Cost Volume inclusive of supporting documentation, and Company Commercialization Report) must be submitted via the DoD SBIR/STTR Proposal Submission website per the instructions outlined in HR001120S0019 no later than **2:00 pm ET, August 10, 2020**.

II. TOPIC OVERVIEW

a. Objective

The effort seeks to develop tough multi-functional coatings and systems that are self-decontaminating with minimal need to service the coating/system and an additional capability to provide wear and abrasion resistance for the underlying substrate.

b. Description

Novel formulation technologies for use as coating systems or appliques hold the potential to revolutionize conventional decontamination in demanding military vehicle environments. A key objective of this program is to develop coating systems that are antimicrobial at the surface and maintain antimicrobial activity despite wear and

environmental exposure. Antimicrobial activity desired includes demonstrated reduction of viable bacteria, spores and viruses on a surface by >99% within 5 minutes. The antimicrobial mode of action is open to the proposers, but must be active throughout an at least 5 year coating lifespan. Limited replenishment (every 6+ months) of the function of the coating is acceptable using methods such as transfer of matter, physical abrasion, and use of <5V of electrical potential. Low adhesion or self-cleaning behavior, or other modes of action to maintain interaction of actives with microbes on the coating surface, is highly desired to maintain the ability of the surface to continue to exhibit self-decontamination capability during repeated use. It is desired that proposed coatings and appliques be compatible with, or have characteristics similar to extant chemical agent resistant coatings (CARC). Approaches that enable simultaneous destruction of microbes and chemical weapons agents are highly encouraged. Proposers should consider applications with substantial robustness considerations, preferably high-touch surfaces (grab handles, doorknobs, floor coverings, etc.) with wear requirements comparable to toughened thermoplastics (TPO, polyurethane) and exterior vehicle surfaces (e.g. top surface of a naval vessel or military vehicle) with cost, fluid exposure, and UV exposure requirements comparable to state-of-the-art vehicle paints and top coats.

c. Phase I

It is expected that Phase I efforts will demonstrate enhanced abrasion, chemical, UV, and temperature resistance commensurate with environmental and operational exposure of military vehicles and systems similar to chemical agent resistant coatings (CARC). Additionally, the coatings will demonstrate measurable antimicrobial activity for common chemical and biological simulants. It is expected that if the proposed coatings require replenishment, the robustness and antimicrobial activities will be measured over time to allow for predictions of performance over the lifetime of service.

i. Schedule/Milestones/Deliverables Phase I fixed payable milestones for this program should include:

- Month 1: Report on initial coating design, coating application procedure, and proposed testing and evaluation metrics
- Month 3: Interim report describing performance of prototype system for wear performance
- Month 5: Interim report describing performance of prototype system for antimicrobial performance with representative simulants
- Month 6: Final Phase I Report summarizing approach; prototype architectures and application protocols; and predication of performance over the lifetime of service

d. Phase II

It is expected the Phase II efforts will demonstrate prototype coatings with enhanced durability and broad spectrum antimicrobial properties for common chemical and biological simulants. Reports on final prototypes should include application and renewal procedures as well as timelines associated with maintenance of the coatings. Additionally measured antimicrobial performance characteristics in representative environments over time should be included in delivered reports detailing performance of

final coating prototypes. Samples of interim prototype and final prototype coatings will be delivered to facilitate potential independent verification of coating performance.

i. **Schedule/Milestones/Deliverables** Phase II fixed milestones for this program should include:

- Month 2: Report on coating design, operation, and initial performance measures
- Month 6: Report on Phase II comparative real-world data sets for durability performance, proposed evaluation metrics and initial analysis results
- Month 12: Report on Phase II comparative real-world data sets for antimicrobial performance, proposed evaluation metrics and initial analysis results
- Month 14: At least two coupons of at least 3cm x 3cm size of the interim prototype coatings on a relevant substrate (e.g. aluminum 5083 or 6061, 464 naval brass, or AR500 carbon steel)
- Month 16: Interim report quantifying system performance, comparing with alternative state-of-the art coatings for independent measurements of durability and antimicrobial activity.
- Month 20: Report quantifying system performance, comparing with alternative state-of-the art coatings for combined measurements of durability and antimicrobial activity
- Month 22: Month 14: At least two coupons of at least 3cm x 3cm size of the final prototype coatings on a relevant substrate (e.g. aluminum 5083 or 6061, 464 naval brass, or AR500 carbon steel)
- Month 24: Final Phase II report documenting final prototype architectures, application instructions, maintenance procedures and schedules, and antimicrobial performance and performance as a result of degradation

e. **Dual Use Applications (Phase III)**

It is expected that the outcome of successful SBIR efforts will generate coating technologies and systems for high-touch surfaces (grab handles, doorknobs, floor coverings, etc.) with wear requirements comparable to toughened thermoplastics (TPO, polyurethane) and exterior vehicle surfaces (e.g. top surface of a naval vessel or military vehicle) with cost, fluid exposure, and UV exposure requirements comparable to state-of-the-art vehicle paints and top coats. Additionally these surfaces will provide antimicrobial performance and/or self-cleaning properties with limited required maintenance.

f. **References**

[1] Kennedy et al., Journal of Materials Processing Technology 77 (1998) 246–253.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.469.1208&rep=rep1&type=pdf>

[2] Cenciarelli et al., J Microb Biochem Technol 2014, 6:7.
<http://dx.doi.org/10.4172/1948-5948.1000172>

[3] James et al., J Appl Toxicol. 2018;38:113–121.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5725685/pdf/JAT-38-113.pdf>

[4] Munson et al. Spectrochimica Acta Part B 60 (2005) 1217 – 1224.
doi:10.1016/j.sab.2005.05.017

Keywords

Nano-manufacturing, painting, coating process, self-cleaning, antimicrobial, antiviral, coatings, manufacturing process

III. SUBMISSION OF QUESTIONS

DARPA intends to use electronic mail for all correspondence regarding this SBO. Questions related to the technical aspect of the research objectives and awards specifically related to this SBO should be emailed to HR001120S0019@darpa.mil. Please reference BAA HR001120S0019-12 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 HR001120S0019-12 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.

In addition to the FAQ specific to this SBO, proposers should also review the SBIR/STTR General FAQ list at: <http://www.darpa.mil/work-with-us/opportunities?tFilter=&oFilter=29934>. Under the HR001120S0019 summary, there is a link to the general FAQ.

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 HR001120S0019@darpa.mil.