

Defense Advanced Research Projects Agency (DARPA)
DoD 24.D Small Business Technology Transfer (STTR) Annual Broad Agency Announcement
(BAA)
Proposal Submission Instructions Release 3

INTRODUCTION

DARPA's mission is to make strategic, early investments in breakthrough science and technology that will have long-term positive impacts on our national security. As part of this mission, DARPA makes high-risk, high-reward investments in science and technology that have the potential to disrupt current understandings and/or approaches. 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 Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Small businesses are critical for developing technology to support national security. Proposers are encouraged to consider whether the Research/Research and Development (R/R&D) being proposed to Department of Defense (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 DoD STTR Program BAA. DARPA requirements in addition to or deviating from the DoD Program BAA are provided in the instructions below. All DARPA SBIR and STTR proposals must be submitted electronically through the Defense SBIR/STTR Innovation Portal (DSIP) as described in the Proposal Preparation and Submission sections of these instructions. It is recommended that firms register as soon as possible upon identification of a proposal opportunity to avoid delays in the proposal submission process. Proposers are encouraged to submit proposals as early as possible to avoid unexpected delays due to a high volume of traffic during the final hours before a BAA closes. *DARPA is unable to accept any late proposals.*

Proposers are encouraged to thoroughly review the DoD Program BAA and register for the Defense SBIR/STTR Innovation Portal (DSIP) Listserv to remain apprised of important programmatic and contractual changes.

- The DoD Program BAA is located at: <https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/#announcements>. Be sure to select the tab for the appropriate BAA cycle.
- Register for the DSIP Listserv at: <https://www.dodsbirsttr.mil/submissions/login>.

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:

April 16, 2024: Topics issued for pre-release
May 16, 2024: Topics open; DARPA begins accepting proposals via DSIP
June 6, 2024: Deadline for technical question submission
June 13, 2024: Deadline for receipt of proposals no later than **12:00 pm ET**

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 Appendix A.

Current Release Award Structure by Topic

White Paper & Slide Deck Proposal

| Topic Number | Phase I | | | |
|------------------|------------------|------------|--------------|-----------------------------|
| | Technical Volume | | Award Amount | Period of Performance (PoP) |
| | White Paper | Slide Deck | | |
| HR0011ST2024D-03 | 15 pages | 5 pages | \$250,000 | 9 months |

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

Technical Volume (Volume 2) – White Paper & Slide Deck Format

The white paper shall not exceed 15 pages, and the slide deck shall not exceed 5 pages. For information on the content of these elements of the technical proposal and the commercialization strategy, please see Attachment A: DARPA Phase I Instructions.

Content of the Technical Volume

Proposers should refer to the DARPA Phase I Proposal Instructions in Appendix A of these Instructions.

Cost Volume (Volume 3)

Please see the chart above for award amounts listed by topic. Proposers are required to use the Phase I – Volume 3: Cost Proposal Template (Excel Spreadsheet) provided on the DARPA Small Business site under SBIR/STTR BAA FORMS & TEMPLATES (<https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>). Please be sure to complete both tabs of the Cost Proposal Template (Cost Model & Milestone Chart).

Content of the Cost Volume

Proposers should refer to the DARPA Phase I Proposal Instructions, provided in Appendix A. Please review the updated Percentage of Work (POW) calculation details included in the DoD Program BAA. DARPA cannot accept deviations from the POW requirements for STTR proposals.

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 STTR 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. See Appendix A Introduction for required certifications that must be included in

Volume 5. For additional information, see the SBIR 24.D Annual Program BAA at <https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/>.

PHASE II PROPOSAL GUIDELINES

Phase II proposals may only be submitted by Phase I awardees. Should DARPA have funding available and decide to proceed with a Phase II, proposers awarded a Phase I contract will be eligible to submit a proposal for Phase II and will be contacted by the DARPA Small Business Programs Office at the appropriate time during their Phase I period of performance. Phase II proposals will be evaluated in accordance with the applicable DoD or DARPA SBIR/STTR BAA. Phase II selection(s) are at the sole discretion of the Government and are subject to funding availability and Phase I performance. Phase II Instructions are available at <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>.

Current Release Award Structure by Topic

| Topic Number | Phase II | | | | |
|------------------|------------------|--------------|-----------------------------|---------------|------------|
| | Technical Volume | Award Amount | Period of Performance (PoP) | Option Amount | Option PoP |
| HR0011SB2024D-03 | 25 pages | \$1,800,000 | 12 months | N/A | N/A |

Technical Volume (Volume 2)

The technical volume is not to exceed 20 pages. The Phase II commercialization strategy shall not exceed 5 pages. This should be the last section of the Technical Volume and is included in the 20-page total. Any pages in the technical volume over 25 pages will not be considering in proposal evaluations.

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 STTR 24.D 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 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, 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 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 STTR 24.D BAA and availability of 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 BAA and 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 BAA and 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 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 Small Business Administration's (SBA's) SBIR/STTR award website (<https://www.sbir.gov/sbirsearch/award/all>).

Refer to the DoD STTR 24.D 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: CMO_SBIRProtests@darpa.mil and sbir@darpa.mil

AWARD AND CONTRACT INFORMATION

1. General Award Information

Multiple awards are anticipated. DARPA may award Federal Acquisition Regulation (FAR)-based Government contracts (Firm-Fixed Price or Cost-Plus Reimbursement) or Other Transactions (OT) for Prototypes agreement (under the authority of 10 U.S.C. § 4022) subject to approval of the Contracting Officer or Agreements Officer, respectively. Phase I awards will most likely be issued as Purchase Orders per FAR Part 13. The resources made available under each topic issued under this BAA will depend on the quality of the proposals received and the availability of funds.

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. Should DARPA desire 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 STTR 24.D Program 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 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 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 STTR funding pursuant to this BAA may be eligible to participate in the DARPA Embedded Entrepreneurship Initiative (EEI). 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 DARPA-funded advanced technology, into high-value products and capabilities for the government and commercial markets, and positions DARPA awardees to attract U.S. private 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 U.S. industry and private investor partners via EEI's Investor Working Groups; and (3) Additional funding to hire an embedded entrepreneur to achieve specific milestones in a Go-to-Market strategy for transitioning the technology into 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, and customers. Funding for EEI is typically no more than \$310,000 per awardee over the duration of the award. An awardee will attend one commercialization workshop, and also may apportion EEI funding to hire more than one embedded entrepreneur, if achieving the milestones requires a unique expertise that can be obtained without exceeding the awardee's total EEI funding.

EEI Application Process:

After receiving an SBIR/STTR award, awardees interested in being considered for EEI should notify their DARPA Program Manager (PM) during the period of performance. 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 the DARPA Commercial Strategy Team. A Senior Commercial Advisor will then contact the performer, assess fitness for EEI and determine, in consultation with the PM, and Commercial Strategy Team, whether or not 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.

After SCA review, the Commercial Strategy Team may request the SBIR/STTR awardee to submit additional tasks for review and/or apply separately to the Commercial Strategy "Commercial Solutions Opening" for additional review at <https://sam.gov/opp/0b1cda40f5f0486a9180649312107987/view>

EEI awards are at the sole discretion of DARPA and subject to program balance and the availability of funding. For more information, please refer to the EEI website <https://eei.darpa.mil/>.

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.

Appendix A: DARPA PHASE I PROPOSAL INSTRUCTIONS

I. Introduction

A complete proposal submission consists of:

Volume 1: Proposal Cover Sheet

Volume 2: Technical Volume

Volume 3: Cost Volume

Volume 4: Company Commercialization Report

Volume 5: Supporting Documents

a. Contractor Certification Regarding Provision of Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Attachment 1)

MANDATORY

b. Disclosures of Foreign Affiliations or Relationships to Foreign Countries (Attachment 2)

MANDATORY

c. Verification of Eligibility of Small Business Joint Ventures (Attachment 3), if applicable

d. Disclosure of Funding Sources (Attachment 4) **MANDATORY**

e. Other supporting documentation

A completed proposal submission in DSIP does NOT indicate that the mandatory supporting documents have been uploaded. It is the responsibility of the proposing small business concern to ensure that the mandatory documents listed above have been uploaded and included with the proposal submission.

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 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. *DARPA cannot accept late proposals.*

To assist in proposal development, templates for Volume 2: Technical Volume and Volume 3: Cost Volume have been provided as attachments on the DARPA Small Business website, under SBIR/STTR Forms and Templates at <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>. Use of the DARPA Cost Proposal template is mandatory.

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 the DoD STTR 24.D BAA regarding marking propriety proposal information.

III. Phase I 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.

a. Format of the Technical Volume (Volume 2) – White Paper & Slide Deck

1. The Technical Volume must include two parts, PART ONE: white paper, and PART TWO: slide deck, combined as a single Portable Document Format (PDF) for upload to DSIP.
2. Type of File: The Technical Volume must be a single 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.
3. Length: The length of the white paper shall not exceed 15 pages, and the slide deck shall not exceed 5 pages/slides. The Government will not consider pages in excess of the page count limitations.
4. Layout: 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.

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

White Paper (NTE 15 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. Technical Plan: Provide an explicit, detailed description of the Phase I approach. The Statement of Work should indicate what tasks are planned, how and where the work will be conducted, a schedule of major events, and the final product(s) to be delivered. The Phase I effort should attempt to determine the technical feasibility of the proposed concept. The methods planned to achieve each objective or task should be discussed explicitly and in detail.
2. Management and Capabilities: Designate key personnel who will be involved in the Phase I effort. Provide a brief summary of the 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.
3. Transition and Commercialization Plan (not to exceed 5 pages):
 - 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 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 (not to exceed 5 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. Management: Overview of team, facilities, and qualifications.
5. Technical summary quad chart: Use template provided at <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>.

NOTE: All letters of recommendation and CVs can be loaded in Volume 5: Supporting Documents. In accordance with section 3-209 of DOD 5500.7-R, Joint Ethics Regulation, letters from government personnel will NOT be considered during the evaluation process.

c. Format of Cost Volume (Volume 3)

Proposers are required to use the Phase I – Volume 3: Cost Proposal Template (Excel Spreadsheet) provided at <https://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program>.

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 every item.

For Phase I proposals, proposers should NOT provide documentation to substantiate how all proposed costs were derived. However, proposers should be prepared to provide such documentation should the Contracting Officer request this documentation. If any substantiating documentation is requested by the Contracting Officer, it is important to respond as quickly as possible to the request as to not delay contract negotiation.

Examples of substantiating documentation are as follows, 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 be able to 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.

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 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.
- 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.
- If Subcontractors will be performing Fundamental Research under the effort, please incorporate the following into proposal: 1) a separate SOW outlining the specific work that the proposer finds to qualify as Fundamental Research; OR 2) Within Prime contractor SOW identify which tasks are to be performed that are fundamental research.
- Proposers should complete both tabs within the Cost Proposal Spreadsheet (Cost Model & Milestone Chart)

For more information about cost proposals and accounting standards associated with contract awards, see the Defense Contract Audit Agency (DCAA) publication titled "Audit Process Overview – Information for Contractors" available at <http://www.dcaa.mil>.

Please note, a separate, more detailed cost proposal spreadsheet will be provided for any Phase II Proposals.

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. See Introduction for **required** certifications that must be included in Volume 5. For additional information, see the STTR 24.D Annual

Program Broad Agency Announcement (BAA) at <https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/>.

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.

DARPA STTR 24.D Topic Index
Release 3

HR0011ST2024D-03 Window-glass Telescope for Highly-compensated Ubiquitous Sensing (WITH
US)

OUSD (R&E) CRITICAL TECHNOLOGY AREA(S): Space Technology

OBJECTIVE: The objective of the Window-glass Telescope for Highly-compensated Ubiquitous Sensing (WITH US) STTR program is to design, develop and study a large collecting area telescope system that can be utilized for detection of faint objects in space, where the main light-collecting optical surface would be window(s) already installed on a commercial office building. The eventual end-goal is to utilize the massive quantity of in-situ commercial building windows as a tool for sensing faint objects, or alternatively as a relay optic for sending light to a remote object such as an aircraft or spacecraft. The WITH US telescope would accept light bounced off the window surface and perform measurements to permit detection and characterization of very faint observed objects. This STTR seeks to (1) design a machine-learning or other system trained to characterize the surface shape of float glass on already-installed commercial-office window panes, particularly the departure from flatness across the full surface; (2) while utilizing the majority of the surface area available, design a computational imaging or other system to perform hardware or numerical corrections, ultimately enabling compensated image reconstruction for beams reflected from the surface; (3) design the physical realization of such a telescope system, with consideration that the overall size and cost low is of key interest, to ensure proliferation to hundreds of thousands of potential locations that number in the hundreds of thousands.

DESCRIPTION: Detection of very faint objects in the sky from ground-based telescopes is an area of active research both for military (Space Situational Awareness) and civilian (astronomy) applications. Due to short flyover times and relatively low altitude, any system intended to detect Low Earth Orbit satellites needs to reside within a relatively narrow geographical path of the asset's ground track to detect and then characterize it, and can only do so during local night hours. Detecting and tracking very faintly illuminated objects (visual magnitude $M_v < 18$), such as cube-satellites, are a particular challenge, and typically require large-aperture ground-based telescope systems. One type of optical surface for such purposes is a common window, such as those found on commercial high-rise buildings. Window surfaces tend to be transparent and flat, with minimal ability to concentrate optical signals. Small-scale surface imperfections and waviness degrade imaging quality through large sections of the window. WITH US aims to explore the impact of certain favorable attributes that make these surfaces potentially attractive to concentrate large amounts of light in such a way that very dim air- or space-based objects could be detected (Figure 1):

- Curvature. As a result of weather and structural loading effects, a slight concave shape is common; this provides magnification for faint object detection.
- Ubiquity. Millions of square meters of installed windows across hundreds of cities.
- Shape stability and smoothness. Commercial float glass has an inherently ultra-smooth surface ideal for reflecting optical signals and is highly stable (excepting windy conditions).
- Passive use. The surfaces of (and reflections from) most such windows are publicly accessible.
- Nearby tools for metrology references. For example, using bounced-collection of edges of neighboring buildings.
- Low-E coating for infrared functionality. Most commercial float glass has a posterior "Low-E" or low-emissivity coating (Figure 1, right panel) that is partially transmissive (50-60% visible light transmission) but also highly reflective in the near-infrared. The use of such windows as ad-hoc telescope mirrors provides a dramatic boost in light-gathering ability. A typical silicon optical sensor would be able to collect in excess of 60% of the light from this surface across the visible and near-infrared spectrum, as compared with a more typical glass reflectivity of ~3% per surface.¹

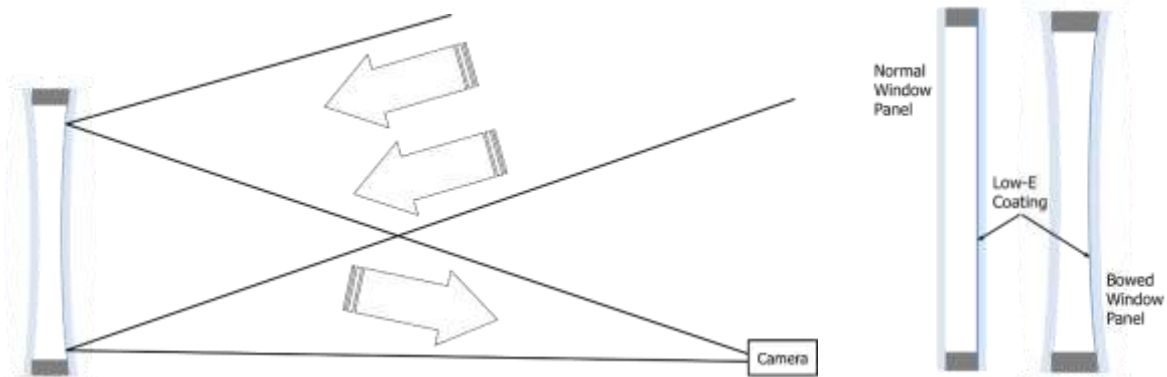


Figure 1. (Left) An installed window panel commonly has bow that can magnify incoming light substantially. Placing a camera with corrector lenses at the focal point potentially allows faint object detection. For this configuration, the camera is likely tens of meters away from the window. (Right) Standard double-pane window glazing panel. The low-E coated surface is commonly on the inside surface of the outward-facing pane.

Methods of applying numerical processing to sensor data, or machine learning algorithms, may provide substantial improvements to overall sensing capability. Developed algorithms should aim to be self-calibrating, i.e., even if the window glass mirror slowly changes its shape and distortion, the algorithm would be able to recalibrate or retrain to preserve performance. This increases the commercial return on investment even over extremely long periods of time. Performers are encouraged to propose alternative use cases, optical lineups, and/or novel processing methodologies that would result in the same end goal: ubiquitous proliferation of low cost optical and signal processing systems using commercial float glass that can detect faint space-based objects by making use of the large surface area available.

PHASE I: Phase I consists of a base period of twelve (12) months that will result in the design, and determination of the overall system parameters, required to develop a working method of sensing faint air and space objects based on commercial float glass. Methods for characterization, compensation, and correctable system design, must be included. Error analysis must include, at a minimum: (1) surface waviness, on the order of 2-3 microns peak-to-valley over surface areas of several centimeters, (2) bounce angle², (3) rapid motion compensation, on the order of <250 msec of object transit across the sensor, and (4) stray light compensation, particularly in a nighttime city imaging environment. Methods to counter these (and other expected) systemic errors must be clearly addressed in the proposal. System design must also address the ability to detect objects in the infrared portions of the spectrum (NIR and/or SWIR bands), and characterize the sensitivity in any band with respect to conventional telescopes. Finally, a notional configuration that can be tested in Phase II must be shown, and developed further in Phase I. A successful Phase 1 effort should involve modeling and simulation to achieve this goal. This modeling should include a general caustic image simulator that simulates detector images from arbitrary “focal planes” and with arbitrary scenes, across a variety of commonly anticipated window shape configurations (e.g., surface concavity, undulation, reflectivity, angle of incidence/reflectance, etc.). It should also include adaptive optical systems incorporating wavefront correction and/or zonal masking (among other methods) to enhance utilization of available photons.

Phase I fixed payable milestones for this program should include:

Phase I Base period (required): 12 months

- Month 2: Concept Design Review (CoDR) that expands on the proposed anticipated modeling and simulation approach in detail; defines the properties of the float glass being modeled; defines the architecture for computational imaging, with initial results; and proposes quantitative metrics that may be used to track progress toward the items above.
- Month 6: Mid-term Review. Initial report on the overall system parameters, anticipated imaging results, compensation mechanisms, and adaptive optical systems (if any). Present the initial

general caustic image simulator and the phase space that it can explore. Define the greatest sources of errors, limiting factors, and ways forward. Define progress toward metrics defined at Month 3. DARPA will issue specific guidance on PDR deliverables at this time.

- Month 12: Preliminary Design Review (PDR) with all deliverables defined during Month 6. Updated and final report defining a large collecting area telescope system that can be utilized for detection of faint objects in space, based on window(s) installed on a commercial office building (referred to henceforth as the WITH US telescope system). Initial report on scalability of this concept. Present plan for Phase II in updated detail.
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Phase I metrics: Present the design, at a PDR level, of a WITH US telescope system, to include:

- Clear definition of all relevant system parameters;
- Automated characterization of surface waviness of a given piece of window glass, to within one-eighth wave ($\lambda/8$) across the surface;
- Dimmest space object detectable, for both Low Earth and Geostationary Orbits (LEO and GEO), by the system, as determined by quantitative modeling and simulation;
- Error analysis, to include at a minimum surface waviness, bounce angle, rapid motion compensation and stray light compensation for a nighttime city imaging environment;
- A method by which to characterize the surface shape of the imaging surface, and apply necessary compensation;
- An image simulator by which to visualize detected images across a range of possible scenes, glass configurations, and background/stray light/other errors, and characterize notional system performance.

PHASE II: Phase II seeks to further develop modeling methods, and validate the capabilities determined during Phase I through the hardware design, construction, and testing of prototype subsystems. Phase II seeks to advance methods of image compensation particular to the unconventional WITH US system to invert the encoded spatial, spectral, and even temporal optical information from the digital sensor and maximize the performance of window-glass systems. Even in a “bumpy” window glass case, this distorted reflector still deterministically encodes the light flux distribution from the scene onto the detector pixels. The developed compensation approach should be adaptable to a new window configuration (e.g., requiring a new set of corrector lenses), since each window will have a unique pattern of needed correction. The most efficient techniques will vary depending on how distorted the glass is and how much angular resolution and intensity contrast is required from the scene. Some examples of scenarios that narrow dimensionality for convergence might include:

1. Looking at a scene moving with respect to the pseudo mirror,
2. Isolating high contrast points in the image,
3. Use the information in simultaneous images obtained at slightly different distances from the “wavy” mirror,
4. Isolating known isolated point-like sources that exist in the scene.
5. Object smear during image exposure, due to motion and/or wavefront error.

Additionally, the Phase II base effort includes a small-scale laboratory demonstration of the window characterization/measurement software, its optical correction subsystem, its incorporation with a physical installed window, and resulting image compensation results. Based on demo results, Phase II efforts should project the notional ability for a larger system to accomplish sufficient resolution for faint object detection at realistic standoff measurement distances typical of an urban environment. The Phase II base effort should include a scalability study, culminating in a report detailing methods to commercialize or transition the WITH US concept into a product that can be manufactured on a larger scale, baselined in results of prototype subsystem testing. Overall size and low cost is of key interest, to ensure proliferation to hundreds of thousands of potential locations that number in the hundreds of thousands. The Phase II option effort should also include a task dedicated to determining the feasibility for the integration of

components into a fieldable system at a prototype level, capable of performing astronomical measurements of known dim objects (e.g., stars), while including corrections in the field.

Phase II fixed payable milestones for this program should include:

Phase II Option period (required): 12 months

- Month 13: DARPA to provide updated metrics for the Phase II effort based on Phase I achievements.
- Month 14: Concept Design Review (CoDR) for small-scale laboratory demonstration. Present technical plan for improved modeling, and scalability study. Present technical plan for achieving metrics defined in Month 13. Present initial test and evaluation plan, hardware purchase plan, and safety plan for Phase II testing.
- Month 18-19: Laboratory test #1. Written report summarizing results of modeling and experimentation. DARPA will issue specific guidance on CDR deliverables at this time.
- Month 21-22: Laboratory test #2. Updated written report summarizing results of modeling and experimentation. Initial report on scalability, including details on commercialization, cost and scaling.
- Month 23: Critical Design Review (CDR) with all deliverables defined during Month 18.

Updated and final report defining the WITH US telescope system and the range of its possible performance based directly on experimental results. Updated and final report on scalability, to include projections for larger future systems based directly on quantitative modeling and simulation results. Performers may perform additional lab or bench-scale testing to increase design fidelity as desired, as long as this does not negatively impact the design review schedule. Performers will work with DARPA to identify potential transition partners for demonstrations in Phase II.

PHASE III DUAL USE APPLICATIONS: Using ordinary mm-scale thickness window glass, in combination with numerical algorithms, to generate accurate images of distant (telescopic) scenery, will be a paradigm shift for numerous imaging applications. For ground-to-space, this includes ground-based Space Domain Awareness (SDA) and satellite surveillance. For air-to-air, this includes the creation of advanced targeting pod sensors for low-cost Unmanned Aerial Systems. Due to the intrinsically inexpensive nature of this concept (only requiring GPU-scale processing and simple, commercially available float-glass), this development is expected to be broadly commercializable. For ground-based telescopes, the possibility of creating thin (mm-scale) glass mirrors opens the opportunity of much lower mass (by an order of magnitude or more) platforms, and new ways to scale to inexpensive, Very Large Telescope (VLT) systems. These systems address problems such as distant (GEO, cislunar) satellite tracking from the Earth, and commercial astronomy. Ground-based imaging systems for Space Situational Awareness (SSA) and SDA will directly benefit from a WITH US system. Proliferation of SSA/SDA imaging to cities across the world, together with the potential for cost- and size-scalable Very Large Telescope (VLT) systems, are expected to play directly into existing architecture goals specified by the United States Strategic Command (USSTRATCOM) for Space Domain Awareness (SDA). Successful demonstrations will also have widespread commercial and civil astronomy applications.

[Footnotes]

1. When combined with the large dimensions (exceeding two square meters typically) of individual commercial building windows, the light gathering capability offers approximately 2 orders of magnitude improvement in light gathering ability as compared with a 300mm F/6 camera and lens system.
2. Variance or distortion in the bounce angle introduces wavefront error that is asymmetric across the window, decreasing the focal length along one direction while leaving it unchanged across the other. This optical phenomenon can typically be corrected for using “toroid” optical components, or optics with cylinder applied (used to correct for astigmatism). Most windows have a difference in the vertical and horizontal dimensions that will result in different radii of curvature along each direction: this is likely to facilitate observation at a specific angle where the astigmatism will be minimal.

REFERENCES:

1. Review article: V. Boominathan, J. T. Robinson, L. Waller, and A. Veeraraghavan, “Recent advances in lensless imaging,” *Optica* 9, pp. 1–16, Jan 2022.
2. S. Nayar, “Computational cameras redefining the image,” *Computer* 39, pp. 30–38, Jan 2006.

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