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DEPARTMENT OF THE AIR FORCE 25.D SMALL BUSINESS TECHNOLOGY TRANSFER (STTR) PROPOSAL SUBMISSION INSTRUCTIONS Release 12

The Air Force intends these Phase I proposal submission instructions to clarify the Department of Defense (DoD) Broad Agency Announcement (BAA) as it applies to the topics solicited herein. **Offerors must ensure proposals meet all requirements of the STTR 25.D BAA posted on the Defense SBIR/STTR Innovation Portal (DSIP) at the proposal submission deadline date/time.**

Applicants are encouraged to thoroughly review the DoD Program BAA and register for the DSIP Listserv to remain apprised of important programmatic and contractual changes.

- Full component-specific instructions and topic descriptions are available on DSIP at <https://www.dodsbirsttr.mil/submissions/solicitation-documents/active-solicitations>. Be sure to select the tab for the appropriate BAA cycle.

Please ensure all e-mail addresses listed in the proposal are current and accurate. The DAF is not responsible for ensuring notifications are received by firms changing mailing address/e-mail address/company points of contact after proposal submission without proper notification to the AF. **If changes occur to the company mail or email addresses or points of contact after proposal submission, the information must be provided to the AF SBIR/STTR One Help Desk.** The message shall include the subject line, "25.D Address Change".

Points of Contact:

- General information related to the DAF SBIR/STTR program and proposal preparation instructions, contact the DAF SBIR/STTR One Help Desk at usaf.team@afsbirsttr.us. All applicants have ample opportunity to request clarifying information. **The DAF encourages applicants to request clarifying information as early as possible, as delays in such requests constrain the DAF's ability to provide satisfactory resolution to applicant concerns.**
- Questions regarding the DSIP electronic submission system, contact the DoD SBIR/STTR Help Desk at dodsbirsupport@reisystems.com.
- For technical questions about the topics during the pre-announcement and open period, please reference the DoD STTR 25.D BAA.
- Air Force SBIR/STTR Contracting Officer (CO):
 - Mr. Daniel J. Brewer, Daniel.Brewer.13@us.af.mil

General information related to the DAF Small Business Program can be found at the DAF Small Business website, <http://www.airforcesmallbiz.af.mil/>. The site contains information related to contracting opportunities within the DAF, as well as business information and upcoming outreach events. Other informative sites include those for the Small Business Administration (SBA), www.sba.gov, and the Procurement Technical Assistance Centers (PTACs), <http://www.ptacus.us.org>. These centers provide Government contracting assistance and guidance to small businesses, generally at no cost.

PHASE I PROPOSAL SUBMISSION: The DoD STTR 25.D Broad Agency Announcement, <https://www.dodsbirsttr.mil/submissions/login>, includes all program requirements. Phase I efforts should address the feasibility of a solution to the selected topic's requirements.

PHASE I PROPOSAL FORMAT

Complete proposals must include all of the following:

Volume 1: DoD Proposal Cover Sheet

Note: If selected for funding, the proposal's technical abstract and discussion of anticipated benefits will be publicly released. Therefore, do not include proprietary information in this section.

Volume 2: Technical Volume

Volume 3: Cost Volume

Volume 4: Company Commercialization Report

Volume 5: Supporting Documents

Volume 6: Fraud, Waste, and Abuse Training

Volume 7: Disclosures of Foreign Affiliations or Relationships to Foreign Countries

DoD PROPOSAL COVER SHEET (VOLUME 1)

Complete the proposal Cover Sheet in accordance with the instructions provided via DSIP. The technical abstract should include a brief description of the program objective(s), a description of the effort, anticipated benefits and commercial applications of the proposed research, and a list of keywords/terms. The technical abstract of each successful proposal will be submitted to the Office of the Secretary of Defense (OSD) for publication and, therefore, must not contain proprietary or classified information.

TECHNICAL VOLUME (VOLUME 2):

The Technical Volume should include all graphics and attachments but should not include the Cover Sheet, which is completed separately as Volume 1. The Phase I technical volume (uploaded in Volume 2) shall contain the required elements found below. Ensure that all graphics are distinguishable in black and white.

The Phase I Technical Volume page/slide limits identified for the topics do not include the Cover Sheet, Cost Volume, Cost Volume Itemized Listing (a-h). The Technical Volume must be no smaller than 10-point on standard 8-1/2" x 11" paper with one-inch margins. Only the Technical Volume and any enclosures or attachments count toward the page limit. In the interest of equity, pages/slides in excess of the stated limits will not be reviewed. The documents required for upload into Volume 5, "Other", do not count toward the specified limits.

These instructions supplement the 25.D STTR BAA. In addition to the requirements found in the 25.D STTR BAA, applicants are required to provide the following information in Volume 2:

Key Personnel: Identify in the Technical Volume all key personnel who will be involved in this project; include information on directly related education, experience, and citizenship.

- A technical resume of the principal investigator, including a list of publications, if any, must be included. [Only one principal investigator/project manager can be designated to a proposal at any given time.](#)
- Concise technical resumes for subcontractors and consultants, if any, are also useful.
- Identify all U.S. permanent residents to be involved in the project as direct employees, subcontractors, or consultants.
- Identify all non-U.S. citizens expected to be involved in the project as direct employees, subcontractors, or consultants. For all non-U.S. citizens, in addition to technical resumes, please provide countries of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project, as appropriate. Additional information may be requested during negotiations in order to verify the foreign citizen's

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eligibility to participate on a contract issued as a result of this announcement. **Note:** Do not upload information such as Permanent Resident Cards (Green Cards), birth certificates, Social Security Numbers, or other PII to the DSIP system.

Phase I Statement of Work Outline

NOTE: The DAF uses the work plan outline as the initial draft of the Phase I Statement of Work (SOW). Therefore, **do not include proprietary information in the work plan outline**. To do so will necessitate a request for revision, if selected, and may delay award.

Include a work plan outline in the following format:

Scope: List the effort's major requirements and specifications.

Task Outline: Provide a brief outline of the work to be accomplished during the Phase I effort.

Milestone Schedule

Deliverables

Progress reports

Final report with SF 298

COST VOLUME (VOLUME 3)

Cost information should be provided by completing the Cost Volume in DSIP and including the Cost Volume Itemized Listing specified below. The Cost Volume detail must be adequate to enable Air Force personnel to determine the purpose, necessity and reasonability of each cost element. Provide sufficient information (a.-g. below) regarding funds use. The DSIP Cost Volume and Itemized Cost Volume Information will not count against the specified page limit. The itemized listing also may be submitted in Volume 5 under the "Other" dropdown option.

a. **Direct Cost Materials:** Justify costs for materials, parts, and supplies with an itemized list containing types, quantities, prices and where appropriate, purpose. Material costs may include the costs of such items as raw materials, parts, subassemblies, components, and manufacturing supplies.

b. **Other Direct Costs:** This category includes, but is not limited to, specialized services such as machining, milling, special testing or analysis, and costs incurred in temporarily using specialized equipment. Proposals including leased hardware must include an adequate lease v. purchase justification.

c. **Direct Labor:** Identify key personnel by name, if possible, or by labor category, if not. Direct labor hours, labor overhead and/or fringe benefits, and actual hourly rates for each individual are also necessary for the CO to determine whether these hours, fringe rates, and hourly rates are fair and reasonable.

d. **Travel:** Travel costs must relate to project needs. Break out travel costs by trip, number of travelers, airfare, per diem, lodging, etc. The number of trips required, as well as the destination and purpose of each, should be reflected. Recommend budgeting at least one trip to the Air Force location managing the contract.

e. **Subcontracts:** Involvement of consultant in the project's planning and/or research stages may be appropriate. If so, describe in detail and include information in the Cost Volume. A minimum of 40% of each STTR project must be conducted by the SBC and a minimum of 30% of the effort performed by the single partnering Research Institution. Deviations from these performance of work requirements are not permitted. The STTR funded work percentage calculation considers both direct and indirect costs after removal of the SBC's proposed profit. Support subcontract costs with copies of executed agreements. The documents must adequately describe the work to be performed. At a minimum, include a Statement of

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Work (SOW) with a corresponding detailed Cost Volume for each planned subcontract. Additionally, see DoD STTR 25.D BAA for more information regarding the required Allocation of Rights Agreement.

f. Special Tooling, Special Test Equipment, and Material: The inclusion of equipment and materials will be carefully reviewed relative to need and appropriateness to the work proposed. Special tooling and special test equipment purchases must, in the CO's opinion, be advantageous to the Government and relate directly to the effort. These toolings or equipment should not be of a type that an offeror would otherwise possess in the normal course of business. These may include items such as innovative instrumentation and/or automatic test equipment.

g. Consultants: Provide a separate agreement letter for each consultant. The letter should briefly state what service or assistance will be provided, the number of hours required, and the hourly rate.

NOTE: If no exceptions are taken to an offeror's proposal, the Government may award a contract without negotiations. . Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. If there are questions regarding the award document, contact the Phase I CO identified on the cover page. The Government reserves the right to reopen negotiations later if the CO determines doing so to be necessary.

COMPANY COMMERCIALIZATION REPORT (VOLUME 4)

Completion of the CCR as Volume 4 of the proposal submission in DSIP is required. Please refer to the DoD STTR 25.D BAA for full details on this requirement. Information contained in the CCR will not be considered by the Air Force during proposal evaluations.

SUPPORTING DOCUMENTS VOLUME (VOLUME 5)

The following documents may be required if applicable to your proposal:

1. DD Form 2345: For proposals submitted under export-controlled topics, either International Traffic in Arms or Export Administration Regulations (ITAR/EAR), a copy of the certified DD Form 2345, Militarily Critical Technical Data Agreement, or evidence of application submission must be included. The form, instructions, and FAQs may be found at the United States/Canada Joint Certification Program website, <http://www.dla.mil/HQ/InformationOperations/Offers/Products/LogisticsApplications/JCP/DD2345Instructions.aspx>. DD Form 2345 approval will be required if proposal is selected for award.
2. Verification of Eligibility of Small Business Joint Ventures (Attachment 3 to the DOD STTR 25.D BAA)
3. Technical Data Rights Assertions (if asserting data rights restrictions)

FRAUD, WASTE AND ABUSE TRAINING (VOLUME 6)

Fraud, Waste and Abuse training material can be found in the Volume 6 section of the proposal submission module in DSIP and must be thoroughly reviewed once per year to proceed with proposal submission.

DISCLOSURES OF FOREIGN AFFILIATIONS OR RELATIONSHIPS TO FOREIGN COUNTRIES (VOLUME 7)

Small business concerns must complete the Disclosures of Foreign Affiliations or Relationships to Foreign Countries webform in Volume 7 of the DSIP proposal submission. Please be aware that the Disclosures of Foreign Affiliations or Relationships to Foreign Countries WILL NOT be accepted as a PDF Supporting Document in Volume 5 of the DSIP proposal submission. Do not upload any previous versions of this form to Volume 5. For additional details, please refer to the DoD STTR Program BAA.

DISCRETIONARY TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The Air Force does not participate in the Discretionary Technical and Business Assistance (TABA) Program. Proposals submitted in response to DAF topics shall not include TABA.

AIR FORCE PROPOSAL EVALUATIONS

Proposals will be evaluated for overall merit in accordance with the criteria discussed in the 25.D BAA. DAF is seeking varying technical/scientific approaches and/or varying and new technologies that would be responsive to the problem statement(s) and area(s) of interest in the topic. Multiple procurements are planned and anticipated to be awarded as a result of the topic, each proposal is considered a separate procurement and will be evaluated on its own merit, and that the Government may award all, some, or none of the proposals. Any per-award or per-topic funding caps are budgetary estimates only, and more or less funding may become available. Funding decisions are made with complete disregard to the other awards under the same topic.

In accordance with 15 USC 638(vv) (Section 4 of the SBIR and STTR Extension Act of 2022), and the Deputy Secretary of Defense Memorandum; Subject: Defense Small Business Innovation Research and Small Business Technology Transfer Due Diligence Program dated May 13, 2024, and the AF61-105 DAFGM 2025-1 “Department of the Air Force Guidance Memorandum to AFI 61-102, on DAF Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Due Diligence Program”, the DAF will review all proposals submitted in response to this BAA to assess security risks presented by small business concerns seeking a Federally funded award. The DAF will use information provided by the small business concern in response to the Disclosure of Foreign Affiliations or Relationships to Foreign Countries and the proposal to conduct a risk-based due diligence review on the cybersecurity practices, patent analysis, employee analysis, and foreign ownership of a small business concern, including the small business concern and employees of the small business concern to a foreign country, foreign person, foreign affiliation, or foreign entity. The DAF will also assess proposals utilizing open-source analysis and analytical tools, for the nondisclosures of the information set forth in 15 U.S.C. 638(g)(13). If DAF assesses that a small business concern has security risk(s), DAF will review the proposal, the evaluation, and the security risks and may decide not to select the proposal for award based upon a totality of the review.

MAJORITY OWNERSHIP IN PART BY MULTIPLE VENTURE CAPITAL, HEDGE FUND, AND PRIVATE EQUITY FIRMS

Small business concerns that are owned in majority part by multiple venture capital operating companies (VCOs), hedge funds, or private equity funds are not eligible to submit applications or receive awards for Department of Air Force Topics.

PERFORMANCE OF WORK REQUIREMENTS AND LOCATION OF WORK

For both Phase I and Phase II, a minimum of 40% of each STTR award must be conducted by the awardee and a minimum of 30% of the effort must be performed by the single partnering Research Institution. Note, applicants and awardees may partner with multiple entities that separately meet the definition of a “Research Institution” as indicated in the STTR BAA. Applicants may use only one partnering Research Institution to meet STTR eligibility requirements. The DAF will not consider requests for deviations to these performance of work requirements.

All R/R&D work must be performed in the United States. Based on a rare and unique circumstance, the DAF may approve a particular portion of the R/R&D work to be performed or obtained in a country outside of the United States. The awarding Funding Agreement officer must approve each specific

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condition in writing. Applicants seeking this approval must make such a request with their initial proposal submission. The DAF will not consider these requests prior to proposal submission.

DAF USE OF SUPPORT CONTRACTORS

Restrictive notices notwithstanding, proposals may be handled for administrative purposes only, by support contractors. These support contractors may include, but are not limited to TEC Solutions, Inc., APEX, Oasis Systems, Riverside Research, Peerless Technologies, HPC-COM, Mile Two, Montech, Wright Brothers Institute, and MacB (an Alion Company). In addition, only Government employees and technical personnel from Federally Funded Research and Development Centers (FFRDCs) MITRE and Aerospace Corporations working under contract to provide technical support to AF Life Cycle Management Center and Space and Missiles Centers may evaluate proposals. All support contractors are bound by appropriate non-disclosure agreements. Contact the DAF SBIR/STTR CO Daniel J. Brewer (Daniel.Brewer.13@us.af.mil) with concerns regarding the use of support contractors.

PROPOSAL STATUS AND FEEDBACK

The Principal Investigator (PI) and Corporate Official (CO) indicated on the Proposal Cover Sheet will be notified by e-mail regarding proposal selection or non-selection. Small Businesses will receive a notification for each proposal submitted. Please read each notification carefully and note the Proposal Number and Topic Number referenced.

Automated feedback will be provided for Phase I proposals designated Not Selected. Additional feedback may be provided at the sole discretion of the DAF.

IMPORTANT: Proposals submitted to the DAF are received and evaluated by different organizations, handled by topic. Each organization operates within its own schedule for proposal evaluation and selection. Updates and notification timeframes will vary. If contacted regarding a proposal submission, it is not necessary to request information regarding additional submissions. Separate notifications are provided for each proposal.

The Air Force anticipates that all proposals will be evaluated and selections finalized within approximately 90 calendar days of solicitation close. Refrain from contacting the BAA CO for proposal status before that time.

Refer to the DoD STTR 25.D BAA for procedures to protest the Announcement. As further prescribed in FAR 33.106(b), FAR 52.233-3, Protests after Award should be submitted to: Air Force SBIR/STTR Contracting Officer Daniel J. Brewer, Daniel.Brewer.13@us.af.mil.

AIR FORCE SUBMISSION OF FINAL REPORTS

All Final Reports will be submitted to the awarding DAF organization in accordance with Contract instructions. Companies will not submit Final Reports directly to the Defense Technical Information Center (DTIC).

PHASE II PROPOSAL SUBMISSIONS

DAF organizations may request Phase II proposals while Phase I technical performance is ongoing or at any time after the conclusion of the period of performance. This decision will be based on the awardee's technical progress, as determined by an DAF Technical Point of Contact review using the Phase II review criteria outlined above.

Phase II is the demonstration of the technology found feasible in Phase I. Only Phase I awardees are eligible to submit a Phase II proposal. All Phase I awardees will be sent a notification with the Phase II proposal submittal date and detailed Phase II proposal preparation instructions. If the physical or email

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addresses or firm points of contact have changed since submission of the Phase I proposal, correct information shall be sent to the AF SBIR/STTR One Help Desk. Phase II dollar values, performance periods, and proposal content will be specified in the Phase II request for proposal.

NOTE: The DAF primarily makes STTR Phase I and II awards as Firm-Fixed-Price contracts. However, awardees are strongly urged to work toward a Defense Contract Audit Agency (DCAA)-approved accounting system. If the company intends to continue work with the DoD, an approved accounting system will allow for competition in a broader array of acquisition opportunities, including award of Cost-Reimbursement types of contracts. Please address questions to the Phase II CO, if selected for award.

All proposals must be submitted electronically via DSIP by the date indicated in the Phase II proposal instructions. Note: Only ONE Phase II proposal may be submitted for each Phase I award.

AIR FORCE SBIR/STTR PROGRAM MANAGEMENT IMPROVEMENTS

The DAF reserves the right to modify the Phase II submission requirements. Should the requirements change, all Phase I awardees will be notified. The DAF also reserves the right to change any administrative procedures that will improve management of the DAF SBIR/STTR Program at any time.

TOPIC-SPECIFIC INFORMATION

Awards made under this topic will have a maximum value of \$250,000.00. Proposals that exceed this maximum value will not be considered for evaluations or award. Awards made under this topic will have a maximum period of performance of six (6) months. Proposals that exceed this duration will not be considered for evaluations or award. Technical volumes submitted under this topic have a page/slide limit of 10 pages. Pages/slides in excess of this amount will not be considered by the DAF during evaluations.

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**Department of the Air Force STTR 25.D Topic Index
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SF25D-T1201 TITLE: Adaptive and Intelligent Space (AIS)

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SF25D-T1201 TITLE: Adaptive and Intelligent Space (AIS)

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

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: The United States Space Force (USSF) is seeking innovative solutions to inform the future of autonomous, resilient, and intelligent space operations through the Futures Series: Adaptive and Intelligent Space (AIS) Challenge—a strategic initiative led by Task Force Futures in partnership with SpaceWERX. This topic invites proposals that investigate the technical and operational feasibility of emerging space concepts and dual-use technologies capable of supporting coordinated satellite operations across Low Earth Orbit (LEO), Geostationary Orbit (GEO), eXtended GEO (XGEO), and the cislunar environment.

In Phase I, offerors should focus on early-stage research activities—including literature reviews, modeling and simulation, trade space analyses, and university or non-profit research collaborations—to lay the groundwork for prototype or proof of concept demonstrations to be developed in a potential future Phase II. This exploration phase is intended to reduce risk, validate feasibility, and refine mission alignment before committing to integrated technology demonstrations. Objectives include:

1. Explore novel concepts and architectures that support enhanced autonomy, survivability, and responsiveness in degraded or adversarial space environments.
2. Assess the feasibility of onboard edge intelligence, predictive threat analytics, and autonomous decision-making systems suitable for bandwidth-limited or contested conditions.
3. Analyze modular, scalable systems—including sensor payloads, **computing** elements, and spacecraft buses—that can adapt to evolving missions and orbital domains.
4. Develop preliminary Concepts of Operations (CONOPS) aligned with future USSF mission needs and evaluate potential integration paths with Space Force operational constructs.

Proposals should clearly define their Phase I scope, research methods, and collaboration plan with a research institution. While transition and commercialization planning are not the primary focus of Phase I, proposers should briefly articulate how the work could inform a Phase II prototype or **proof-of-concept demonstration** and support longer-term mission relevance.

DESCRIPTION: This topic seeks to explore emerging technical concepts that could enable a future generation of autonomous, resilient, and networked satellite systems for U.S. Space Force (USSF) missions. The Adaptive and Intelligent Space (AIS) Challenge addresses foundational gaps in how space-based assets are allocated, coordinated, and managed under contested and communication-degraded conditions.

The objective of this Phase I effort is to investigate the scientific, operational, and engineering feasibility of novel technologies supporting space control and battle management, with the goal of improving autonomous behavior, real-time responsiveness, and adaptability in orbital environments including LEO,

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GEO, XGEO, and cislunar space. Offerors are encouraged to propose early-stage research concepts that address one or more of the following focus areas. All work should include collaboration with a qualified research institution, and clearly define the technical approach, scope of analysis, and expected outcomes of a successful Phase I study:

1. Edge **Computing** & Algorithms: Investigate edge processing architectures and AI/ML algorithms that can operate onboard spacecraft, enabling autonomous, low-latency decision-making in support of space domain awareness and battle management. **This topic area should improve the ability to autonomously manage space activities, and improve the ability to autonomously fuse, process, and filter data from multiple sources and sensors.** Desired capabilities may include:

- Technical feasibility of onboard threat analytics
- Architectures for resilient, secure, and radiation-tolerant edge computing
- Methods for reducing kill-chain latency by at least 50% and operator workload by at least 25%
- Potential test environments (digital or orbital) for future validation
- Discrimination in contested environments including resilience to data poisoning, sensor degradation, obfuscation, high noise

Desired technologies may include:

- Predictive threat analytics and orchestrated response
- Thermal management and radiation-hardened solutions for edge and next-gen processing technologies (e.g. neuromorphic)
- Data security
- Agile and assured use of high-partition data
- High-partition data agility and balanced software/AI integration
- Anomaly or maneuver detection AI/ML algorithms and SDA data processing with high throughput
- Tip & Cue capability between SDA and satellite coordination functions
- Memory-safe language applications for autonomy
- Improved 'do-no-harm' software for Autonomous Rendezvous and Proximity Operations
- Zero-trust for on-board **computation** methods
- Data compression algorithms
- Simulation of SDA data to improve training of robust maneuver detection models
- Cislunar simulation and visualization tools

2. Sensors Payloads: Explore modular sensor payload concepts with integrated processing that support multi-modal detection, threat characterization, and real-time insight generation. Emphasis should be placed on adaptability across mission profiles and orbital regimes. **This topic area should improve the ability of the USSF to monitor, characterize, and maintain custody of space objects for a comprehensive sight picture.** Desired capabilities may consider:

- Integrated sensor-computing packages for persistent tracking
- Techniques for novel SDA collection and data fusion
- Higher fidelity persistent space object custody
- Attribute in-space actions across multiple collection spectra (including visible, IR, RF, LiDAR)
- Solutions for software-defined or reconfigurable payloads
- Techniques for improving satellite change detection and maneuvers

Desired technologies may include:

- Passive RF, LIDAR, radar, IR, hyperspectral sensors
- HPC-S (high-performance computing at the sensor)
- Space-based sensing concepts suitable for GEO, XGEO, and cislunar

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3. Bus Design: Assess spacecraft bus concepts that are modular, autonomously managed, and designed for mission flexibility and lifecycle extension. This topic area should enable improved integration of the prior two topics for advanced sensing and computing capabilities. Desired capabilities include:

- Hardware modularity to allow rapid integration of emerging technology
- Software modularity to allow integration of autonomous capabilities
- Reconfigurability across mission profiles and unexpected orbit transfers
- All-of-vehicle (bus and payload) autonomous optimization
- Autonomous load-shedding method to maintain mission operation and payload prioritization under duress
- Autonomous maneuver for collision avoidance

Desired technologies may include:

- Architectures enabling lifecycle extension
- Modular tech, adaptive interfaces
- Bus platforms designed to adapt to technological change without re-architecture
- Integration-ready design for sensors, compute, and maneuver systems
- Highly maneuverable design to include high-delta V, thermal management, and on-board power systems capable of running edge-computing capability

Proposals must emphasize technical feasibility and clearly outline a Phase I research plan that includes modeling, simulation, literature review, or trade studies. While a Phase II transition concept may be outlined, Phase I deliverables are expected to focus on a feasibility study detailing USSF CONOPS and technical viability, as well as analytical findings, and early validation in collaboration with a university or research partner.

ANNEX I: Guidelines for CONOPS development and Feasibility Study

The Concept of Operations (CONOPS) should clearly communicate how the technology is intended to support a military mission within a defined system. The main purpose of the CONOPS is to facilitate a common understanding of a future system to help develop operational and system-level requirements. CONOPS should be written at the system level first and then expanded on how the technology functions enable successful military operations. The CONOPS needs to include, at a minimum:

- The USSF mission and the mission military objectives
- The problem being addressed by the technology in the context of the mission (e.g., existing capability gap)
- (preferred) An operational overview diagram along with supporting text
- (preferred) A system architecture overview diagram with all the elements needed to accomplish the mission to include
- Integration-ready design for sensors, computing, and maneuver systems

Operating Concept to Technology: Space Control and Battle Management are supported through total Space Domain Awareness. The first imperative is achieving persistent, predictive, and precise Space Domain Awareness (SDA). SDA must encompass not only tracking and characterization of objects in orbit, but also attribution of intent, behavioral analysis, and predictive targeting. This requires integration across commercial sensors, alongside AI-driven decision aids and real-time orbital maneuver detection.

Feasibility Study:

A feasibility study is an assessment of the practicality of developing and implementing a new technology within a given concept. The study aims to objectively and rationally uncover the strengths and weaknesses of the new technology, the feasibility of successful development of the technology, and the

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viability of the success of implementation of the technology in the proposed CONOPS. The study should:

- Identify the benefits of the new technology within the CONOPS over existing solutions (or lack thereof)
- Identify the risks, uncertainties/unknowns, and issues of the proposed CONOPS with mitigation and closure measures
- Identify the critical technology elements (CTEs) of the new technology
- Provide data to support the feasibility of technology development of each CTE to include: literature research supporting technical viability or historical usage, trade studies identifying existing technologies, current developments, and/or feasible development pathways, analysis demonstrating technical solutions, and heritage usage of similar technology with identified differences in operations and/or environment for proposed CONOPS.

PHASE I: Phase I should focus on developing a feasibility study detailing a technically sound solution to a USSF capability need. This can include evaluating the technical and operational feasibility of a proposed concept within one or more of the specified AIS technology focus areas: edge **computing** and algorithms, sensor payloads, or bus design. Offerors must develop an initial Concept of Operations (CONOPS) and conduct foundational studies to assess the viability, relevance, and potential impact of the proposed technology in future contested space environments. (See Annex I for guidelines on Feasibility study development and CONOPS in the Topic Description). The Phase I proposal will not exceed 15 pages in length. Efforts under Phase I may include:

- Literature reviews and state-of-the-art assessments
- Modeling, simulation, or analytical studies to explore performance, scalability, and mission relevance
- Preliminary architecture definitions and technology trade space analysis
- Operational use case development, mapped to current or projected Space Force mission needs
- Identification of technical risks and mitigation strategies

Offerors must clearly describe how the effort will:

- Leverage the capabilities and domain expertise of the affiliated research institution
- Advance the small business's internal research and development (IR&D) toward a defensible technical approach
- Inform a future Phase II prototype **or proof-of-concept demonstration** effort, including early thoughts on transition, testability, and alignment with Space Force capability development priorities

This topic modifies the traditional SBIR/STTR Phase I process, with an event called the Adaptive and Intelligent Space (AIS) Phase I Showcase serving as the basis for Phase II selection.

Phase I Deliverables and Milestones:

Phase I deliverables include an initial report, a documented feasibility assessment, initial CONOPS and architectural framework, a proposed Phase II development plan (including scope, goals, and transition relevance), the final report and the most critical deliverable is the required documentation for the AIS Phase I Showcase. This event will occur near the end of the Phase I Period of Performance (PoP). All Phase I applicants must include the AIS Phase I Showcase in their proposal milestone schedules, and all awards made under this topic will include the AIS Phase I Showcase as a contract deliverable. The following documentation must be submitted at the showcase **(not as part of the initial Phase I proposal submission)**:

- Proposal Cover Sheet (Volume 1)
- Technical Volume (Maximum 5 pages) (Volume 2)
- Cost Volume (Volume 3)
- Company Commercialization Report (Volume 4)

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- Fraud, Waste, and Abuse Training (Volume 6)
- Disclosures of Foreign Affiliations (Volume 7)
- Presentation Slide Deck (a maximum of 10 slides that includes summary information from the required volume sections listed above)

Note, the AIS Phase I showcase will constitute the Phase I awardees' Phase II proposal submission. No separate Phase II proposal will be requested. Applicants will be provided more specific submission information as part of their Phase I award instructions.

Travel Considerations:

The AIS Phase I Showcase will take place in El Segundo, CA, near the end of the Phase I PoP. Companies may include the cost of travel for up to two individuals in their Phase I budget to attend this event. The applicant/awardee is responsible for any transportation costs related to any additional individuals that attend this event.

The above-mentioned artifacts and the showcase presentation will constitute the Phase II proposal submission for purposes of the Phase II award decision. Phase II awardees will be determined based on the documentation submitted and the material presented during the AIS Phase I Showcase.

PHASE II: The Phase II shall focus on the development and demonstration of a functional prototype—**or proof-of-concept demonstration**-- software, hardware, or integrated systems—based on the feasibility studies and CONOPS defined in Phase I. This work should build on the small business's internal R&D, reduce technology development risk, and support alignment with future Space Force mission concepts. The prototypes or **proof-of-concept demonstration** should address specific operational challenges identified within the AIS Challenge's three core focus areas: Edge Computing & Algorithms, Sensor Payloads, and Bus Design.

The objective is to deliver and validate technologies that enhance space control, battle management, and space domain awareness capabilities under contested, degraded, or cislunar operational conditions. Potential examples of Phase II capabilities include:

Edge Computing and Algorithms Problems:

- Data Security
- Big Data Processing in Space
- Software/AI Balance, Decision making is slow on orbit, goal is on-orbit self-monitoring and healing
- Training vs. Inference
- Resilience to data/model poisoning

Potential Strategies & Solutions:

- Improved Battle Management, Proactive Predictive Threat Analysis, Collision Avoidance, Rendezvous Proximity Operations
- Spoofing Detection, Robust and Resilient Missions, Agile Multi-Domain Security
- Rapid ID of Anomalies to avoid Operational Surprises, Data filtering, Real Time processing, Sense to Action, Autonomy/Load Sharing Computing and Concurrency, AI technology, High Performance & Assured Data Transport
- AI Based/Real-Time Decision Making, Infusion of New AI/ML Architectures
- Consideration of Human Factors – in/on/out of loop
- Onboard orchestrated Threat Response, Better Space GPU, and processing, RPO System
- Secure Encryption of Trusted Agents, Quantum Encryption, Self-Healing Mesh Networks/Sensors

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- Deep Neural Networks for Space, Mesh Network Edge Computing, Data Processing Algorithms, Sharing of data among systems
- Federated AI -Agents across Systems/Payloads
- Standardized Test Regime, Standardized Models for ModSim, Orbital Test Bed, Unclass or CUI Test and Validation

Sensor Payload Problems:

- **Size, Weight, and Power** (SWaP) too large (Size Weight and Power)
- Phenomenology Restrictions, Focal Plane limitations, Solar Exclusion Angles causing blind spots, Cone of Shame (Blind Spots)
- Enable Distributed Sensor Systems
- Sensitivity Restrictions
- Perform multiple missions and potential Cislunar Space Sensing, Simultaneous multi-object tracking
- Red States (Adversaries) aware of Systems
- Resilience to sensor degradation
- PED; Process, Exploit, Disseminate
- Cost – Future Solutions are expensive
- All Weather sensing – i.e. Can look into Sun, etc.
- Power/Thermal Management

Potential Strategies & Solutions:

- SWaP reduction based on new technologies, materials, or designs
- Advanced approaches to Non-Traditional Methods of improving resolution in all domains, use more advanced versions of current sensors
- Mesh Network, Proliferate Sensor Network in Space, Fusionable Sensor Data capacity
- Re-configurable Sensors, SOI
- Quantum Processing
- Enable Distributed and/or multi-platform Sensing Systems, Real time data fusion from distributed sensor system, high-frame rate, IR Sensors (EO, Hyperspectral), Quantum Sensors, Use of SAR (Radar), Neuromorphic, Integrated LIDAR, Integrated Passive RF, Laser Detection
- Mesh Network Edge Computing, Data Processing Algorithms, Sensor Hardware/SW Adaptability, Autonomous Navigation, XGEO Sensors
- XGEO Sensors

Bus Design Problems:

- Need for more modularity
- Need for more maneuverability
- 10x GEO useability and Communications
- RPO Ability
- Better Thermal management

Potential Strategies & Solutions:

- Longer Mission Life, better SWaP, Improved Delta-V
- Bus is adaptable to more payloads and more solutions
- High Delta V, allow for rapid movements, high position predictability and navigation, better pointing accuracy
- 10x GEO useability and communications, High Delta V, **Radiation Hardened**, better deep space communication
- Improved Qualification and Validation of RPO Software and Hardware
- Less heat to manage, less power used, better payload performance, longer life, improved heat rejection

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- Improved Qualification and Validation of RPO Software and Hardware
- Thermal Scavenging Controls, Generative Design, improved heat rejection methods

PHASE III DUAL USE APPLICATIONS: Phase III efforts are intended to transition technologies developed under this topic into operational use and/or commercial markets, leveraging non-SBIR/STTR funding. Phase III work may include productization, integration, certification, and large-scale deployment of the capability developed in Phases I and II. Awardees should focus on the following key areas:

1. Commercialization and Scale-Up:

- Transition the technology developed in Phases I and II into commercial applications, leveraging non-SBIR/STTR funds for scale-up, production, and marketing
- Identify potential commercial partners, customers, or licensees interested in adopting the technology for commercial use in various industries, including aerospace and defense.

2. Regulatory Compliance and Certification:

- Obtain necessary government approvals, certifications, and accreditations required for the deployment and operation of the technology in military and commercial settings.

3. Transition Planning and Execution:

- Develop a comprehensive transition plan outlining the steps, milestones, and resources required to transition the technology from R&D to operational use.
- Coordinate with relevant stakeholders, including government agencies, industry partners, and end-users, to ensure seamless integration and adoption of the technology into operational workflows and systems.

4. Additional DAF Customer Opportunities:

- Explore additional opportunities for technology transition and adoption within the Department of the Air Force (DAF) and other military branches. Engage with DAF customers, such as the Space Force, Air Force Research Laboratory (AFRL), and other organizations, to identify specific mission needs and requirements that can be addressed by the developed technology.
- Collaborate with DAF customers to tailor the technology to their unique operational contexts and facilitate its adoption for mission-critical applications.

By effectively executing the Phase III effort and transitioning the technology into operational and commercial use, the project aims to maximize the impact and value of the SBIR/STTR-funded R&D efforts, ultimately contributing to national security, economic growth, and technological innovation.

REFERENCES:

1. <https://www.economist.com/united-states/2025/07/27/how-us-space-command-is-preparing-for-satellite-on-satellite-combat>.
2. [https://www.spaceforce.mil/Portals/2/Documents/SAF_2025/Space_Warfighting_-_A_Framework_for_Planners_BLK2_\(final_20250410\).pdf](https://www.spaceforce.mil/Portals/2/Documents/SAF_2025/Space_Warfighting_-_A_Framework_for_Planners_BLK2_(final_20250410).pdf).
3. https://www.rand.org/pubs/research_reports/RRA2318-1.html.
4. <https://ieeexplore.ieee.org/document/10115983>.
5. <https://ntrs.nasa.gov/api/citations/20240001139/downloads/Current%20Technology%20in%20Space%20v4%20Briefing.pdf>.
6. <https://www.lockheedmartin.com/content/dam/lockheed-martin/space/documents/ai-ml/PIRA-aiaa-6.2022-1472-aiml-mission-processing-onboard-satellites-paper.pdf>.

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KEYWORDS: Space Domain Awareness (SDA); Space Control (SC); Space Battle Management (SBM); Passive RF; LIDAR; Radar Detection Technologies; Next-Gen Sensor Solutions; Machine Learning; AI; Radiation-Hardened; Real-Time Data Processing; Rapid response