

AIR FORCE (AF)
20.1 Small Business Innovation Research (SBIR)
Direct to Phase II Proposal Instructions

The AF 20.1 Direct to Phase II proposal submission instructions are intended to clarify the Department of Defense (DoD) instructions as they apply to AF requirements. This Announcement is for Direct to Phase II proposals only.

The AF Program Manager is Mr. David Shahady. The AF SBIR/STTR Program Office can be contacted at afsbirsttr-info@us.af.mil. For general inquiries or problems with the electronic submission, contact the DoD SBIR/STTR Help Desk via email at dodsbirsupport@reisystems.com (9:00 a.m. to 5:00 p.m. ET, Monday through Friday). For technical questions about the topics during the pre-announcement period (10 December 2019 through 13 January 2020), contact the Topic Authors listed for each topic on the Web site. For information on obtaining answers to your technical questions during the formal announcement period (14 January 2020 through 12 February 2020), go to <https://sbir.defensebusiness.org>. Your complete proposal **must** be submitted via the submissions site at <https://www.dodsbirsttr.mil/submissions/> on or before the **8:00 pm ET, 12 February 2020 deadline**. A hardcopy **will not** be accepted.

All Phase II proposals must be prepared and submitted through the DoD SBIR/STTR electronic submission site: <https://www.dodsbirsttr.mil/submissions/>. The offeror is responsible for ensuring that their proposal complies with the requirements in the most current version of this instruction. In order for a Phase II proposal to be submitted to the component, click "Start New Phase II Proposal" from the "My Portal Page". After uploading your full proposal, you will need to click "Submit". This action will notify the agency your proposal submission is complete and ready for evaluation. Once submitted, no further changes may be made to the proposal. ****Note: If the proposal is not properly submitted in this manner by the solicitation close date/time identified above, it will receive no further consideration for evaluation/award.****

The AF recommends that you complete your submission early, as computer traffic gets heavy near the announcement closing and could slow down the system. **Do not wait until the last minute.** The AF will not be responsible for proposals being denied due to servers being "down" or inaccessible. **Please assure that your e-mail address listed in your proposal is current and accurate. The AF 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. Changes of this nature that occur after proposal submission or award (if selected) shall be sent to the Air Force SBIR/STTR site address, afsbirsttr-info@us.af.mil.**

Please note that changes have been made to these instructions. Firms must ensure their proposal meets all requirements of the Announcement currently posted on the DoD website at the time the Announcement closes. Incomplete proposals will be rejected.

I. DIRECT TO PHASE II

15 U.S.C. §638 (cc), as amended by NDAA FY2012, Sec. 5106, and further amended by NDAA FY2019, Sec. 854, PILOT TO ALLOW PHASE FLEXIBILITY, allows the Department of Defense to make an award to a small business concern under Phase II of the SBIR program with respect to a project, without regard to whether the small business concern was provided an award under Phase I of an SBIR program with respect to such project. Air Force is conducting a "Direct to Phase II" implementation of this

authority for this 20.1 SBIR Announcement and does not guarantee Direct to Phase II opportunities will be offered in future Announcements. Each eligible topic requires documentation to determine that Phase I feasibility described in the Phase I section of the topic has been met.

The Air Force Direct to Phase II Proposals are different than traditional Air Force Phase I SBIR/STTR proposals. The chart below explains some of these differences.

	STANDARD AIR FORCE SBIR/STTR PROCESS	AIR FORCE D2P2 PROCESS
PHASE 1 TYPICAL FUNDING LEVEL	~\$150k	None
PHASE 1 TECHNICAL *POP DURATION	9 months	None
PHASE I TECHNICAL REPORT	3 months	None
PHASE II TECHNICAL VOLUME	50 Page Technical Volume (pre 19.3) or 15 Page Technical Volume (Vol 2) 15 Slides/Pitch Deck (Vol 5) (Post 19.3)	15 Page Technical Volume (Vol 2) 15 Slides/Pitch Deck (Vol 5)
PHASE 2 TYPICAL MAX FUNDING LEVEL	~\$750k	\$1.6125M
PHASE 2 TECHNICAL *POP DURATION	24 months	12 months
PHASE 2 TECHNICAL REPORT	3 months	3 months
NOTES		

*POP= Period of Performance

II. INTRODUCTION

Direct to Phase II proposals must follow the steps outlined below:

1. Offerors must create a Cover Sheet using the DoD Proposal submission system (follow the DoD Instructions for the Cover Sheet located in section 5.4.a.). Offerors must provide documentation that satisfies the Phase I feasibility requirement* that will be included as an Appendix to the Phase II proposal. Offerors must demonstrate that they have completed research and development through means other than the SBIR/STTR program to establish the feasibility of the proposed Phase II effort based on the criteria outlined in the topic description.
2. Offerors must submit a Phase II proposal using the AF Phase II proposal instructions below.

* NOTE: Offerors are required to provide information demonstrating that the scientific and technical merit and feasibility has been established. The Air Force will not evaluate the offeror's related Phase II proposal if it determines that the offeror has failed to demonstrate that technical merit and feasibility has been established or the offeror has failed to demonstrate that work submitted in the feasibility documentation was substantially performed by the offeror and/or the principal investigator (PI). Refer to the Phase I description (within the topic) to review the minimum requirements that need to be demonstrated in the feasibility documentation. **Feasibility documentation MUST NOT be solely based on work performed under prior or ongoing federally funded SBIR or STTR work.**

III. PROPOSAL SUBMISSION

The complete proposal, i.e., DoD Proposal Cover Sheet, technical volume, and cost volume, must be submitted electronically at <https://www.dodsbirsttr.mil/submissions/>. Only one Phase II proposal file can be uploaded to the DoD Submission Site. Ensure your complete technical volume and additional cost volume information is included in this sole submission. The preferred submission format is Portable Document Format (.pdf). Graphics must be distinguishable in black and white. **VIRUS-CHECK ALL SUBMISSIONS.**

Complete proposals must include all of the following:

Volume 1: DoD Proposal Cover Sheet

Volume 2: Technical Volume

Volume 3: Cost Volume

Volume 4: Company Commercialization Report – not in use for 20.1

Volume 5: Supporting Documents, e.g., SBIR/STTR Environment, Safety and Occupational Health (ESOH) Questionnaire, DoD Form 2345, Militarily Critical Data Agreement (if applicable)

Volume 6: Fraud Waste and Abuse Training Completion

Phase II proposals require a comprehensive, detailed submission of the proposed effort. AF Direct to Phase II efforts are 15 months; 12 months for technical performance and three (3) months for completion of the final report. AF Direct to Phase II efforts are awarded up to a maximum value of \$1,612,500 per contract award. Commercial and military potential of the technology under development is extremely important. Proposals emphasizing dual-use applications and commercial exploitation of resulting technologies are sought.

All Phase II Research or Research and Development (R/R&D) must be performed by the small business and its team members in the United States, as defined in the DoD 20.1 BAA Announcement Instructions. The primary employment of the Phase II principal investigator must be with the small business concern at the time of award and during conduct of the entire proposed effort. Primary employment is defined as more than one-half of the principal investigator's time being spent working for the small business. This precludes full-time employment with another organization.

Knowingly and willfully making false, fictitious, or fraudulent statements or representations may be a felony under the Federal Criminal Statement Act, 18 U.S.C. Section 1001, punishable by a fine up to \$250,000, up to five years in prison, or both.

IV. PHASE II PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

The technical proposal is limited to 15 pages. The advocacy letters (if any), "SBIR/ STTR Environment, Safety and Occupational Health (ESOH) Questionnaire (Attachment 1 herein)" and the additional cost proposal itemized listing (17a through 17i) should be included in Volume 5, Supporting Documentation. This documentation and the Cover Sheet will not count toward the 15-page limitation. The Phase II proposal shall include a technical volume (uploaded in Volume 2) that shall not exceed 15 pages and a pitch/slide deck not to exceed 15 slides (uploaded in Volume 5). The technical volume and slide deck will be reviewed holistically and there is no set format requirements for the two documents. It is recommended (but not required) that more detailed information is included in the technical volume and higher level information is included in the slide deck.

Please note that the Fraud, Waste and Abuse Training must be completed prior to submission of your proposal. This is accomplished under Volume 6 of the DoD SBIR Web site (<https://www.dodsbirsttr.mil/submissions/>). When the training has been completed and certified, the DoD Submission Website will indicate this in the proposal which will complete the Volume 6 requirement. If the training has not been completed, you will receive an error message. Your proposal cannot be submitted until this training has been completed. The Fraud, Waste and Abuse Certificate of Training website can be found under Section 3.6 of the DoD 20.1 SBIR BAA Instructions. Your complete proposal **must be submitted via the submissions site on or before the **8:00 pm ET, 12 February 2020 deadline**. A hardcopy **will not** be accepted.**

A. Proposal Requirements. A Phase II proposal should provide sufficient information to persuade the AF the proposed advancement of the technology represents an innovative solution to the scientific or engineering problem and is worthy of support under the stated criteria. All sections below count toward the page limitation, unless otherwise specified.

B. Proprietary Information. Information constituting a trade secret, commercial or financial information, confidential personal information, or data affecting national security must be clearly marked. It shall be treated in confidence to the extent permitted by law. Be advised, in the event of proposal selection it is likely the Work Plan or Statement of Work (SOW) will be incorporated into the resulting contract, in whole or part, by reference or as an attachment. Therefore, segregate any information to be excluded from public release pursuant to the Freedom of Information Act (FOIA). See Section 5.3 of the DoD BAA Announcement regarding marking of proprietary information.

C. General Content. Proposals should be direct, concise, and informative. Type shall be no smaller than 11-point on standard 8 ½ X 11 paper, with one-inch margins and pages consecutively numbered. Offerors are discouraged from including promotional and non-programmatic items.

D. Proposal Format. The technical proposal includes all items listed below in the order provided.

- (1) **Proposal Cover Sheet**: Complete and submit the SBIR Proposal Cover Sheet in accordance with the instructions provided at <https://www.dodsbirsttr.mil/submissions/>. 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 key words/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. The term “Component” on the Cover Sheet refers to the AF organization requesting the Phase II proposal.
- (2) **Table of Contents**: A table of contents should be located immediately after the Cover Sheet.
- (3) **Glossary**: Include a glossary of acronyms and abbreviations used in the proposal.
- (4) **Milestone Identification**: Include a program schedule with all key milestones identified. If options are proposed, the schedule should provide notional option start date and period of performance.
- (5) **Identification and Significance of the Problem or Opportunity**: Briefly reference the specific technical problem/opportunity that will be pursued under this effort.
- (6) **Phase II Technical Objectives**: **Detail the specific objectives of the Phase II work, and describe the technical approach and methods to be used in meeting these objects.** The proposal should also include an assessment of the potential commercial application for each objective.
- (7) **Proposer-Prepared Statement of Work (SOW)**: The SOW shall be a separate and distinct part of the proposal package, using a page break to divide it from the technical proposal. The proposed SOW must contain a summary description of the technical methodology and task description in broad enough detail to provide contractual flexibility. The following is the recommended format for the SOW; begin this section on a new page. **DO NOT include proprietary information in the SOW.**
 - a) 1.0 – Objective: This section is intended to provide a brief overview of the specialty area. It should explain why it is being pursued and the expected outcome.
 - b) 2.0 – Scope: This section should provide a concise description of the work to be accomplished, including the technology area to be investigated, goals, and major milestones. However, the key elements of this section are task development and deliverables, i.e., the anticipated end result and/or product of the effort. This section must also be consistent with the information in 4.0 (below).
 - c) 3.0 – Background: The proposer shall identify appropriate specifications, standards, and other documents applicable to the effort. This section includes any information, explanation, or constraints to understanding the requirements. It may include relationships to previous, current, and/or future operations. It may also include

techniques previously found to be ineffective.

- d) 4.0 – Task/Technical Requirements: The detailed description of the individual tasks to accomplish the work to be performed is considered to be legally binding on the proposer. Therefore, it must be developed in an orderly progression with sufficient detail to establish overall program requirements and goals. The work effort must be segregated into major tasks and identified in separately numbered paragraphs.

Each numbered major task should delineate by subtask the work to be performed. The SOW MUST contain every task to be accomplished; they must be definite, realistic, and clearly stated. Use “shall” whenever the SOW expresses a binding provision. Use “should” or “may” to express a declaration or purpose. Use “will” when no contractor requirement is involved, i.e., “... power will be supplied by the Government.”

- (8) **Deliverables:** Include a section clearly describing the specific sample/prototype hardware/software to be delivered, as well as data deliverables, schedules, and quantities. Be aware of the possible requirement for unique item identification IAW DFARS 252.211-7003, Item Identification and Valuation, for hardware. If hardware/software will be developed but not delivered, provide an explanation. At a minimum, the following reports will be required under ALL Phase II contracts.

- a) Scientific and Technical Reports: Rights in technical data, including software, developed under the terms of any contract resulting from a SBIR Announcement generally remain with the contractor. The Government obtains a royalty-free license to use such technical data for Government purposes during the period commencing with contract award and ending five (5) years after submission of the last contract deliverable. Upon expiration of the five year restrictive license, the Government has unlimited rights to the SBIR data, unless the firm receives another contract under which the SBIR data rights may be asserted.
 - i. Final Report: The draft is due 30 days after completion of the Phase II technical effort. The first page of the final report will be a single-page project summary, identifying the purpose of the work, providing a brief description of the effort accomplished, and listing potential applications of the results. The summary may be published by DoD; therefore, it must not contain any proprietary or classified information. The remainder of the report should contain details of the project objectives met, work completed, results obtained, and estimates of technical feasibility.
 - ii. Status Reports: Status reports are due quarterly at a minimum.
 - iii. Small Business Online Success Stories: Success Story submissions are due at the end of the technical effort via the <http://launchstories.org/> website. Refer to the Contract Data Requirements List (CDRL) in your contract for submission instructions.
- b) Cost Reports: Required if a cost-type contract is awarded.
- c) Additional Reporting: AF may require additional reporting or documentation including:
 - i. Software documentation and users’ manuals;

- ii. Engineering drawings;
- iii. Operation and maintenance documentation;
- iv. Safety hazard analysis when the project will result in partial or total development and delivery of hardware; and
- v. Updates to the commercialization results.

(9) **Related Work:** Describe significant activities directly related to the proposed effort, including any previous programs conducted by the principal investigator, proposing firm, consultants, or others, and their application to the proposed project. Also list any reviewers providing comments regarding the offeror's knowledge of the state-of-the-art in the specific approach proposed.

(10) **Commercialization Potential:**

- a) The DoD requires a commercialization plan be submitted with the Phase II proposal, specifically addressing the following questions:
 - i. What is the first planned product to incorporate the proposed technology?
 - ii. Who are the probable customers, and what is the estimated market size?
 - iii. How much money is needed to bring this technology to market and how will it be raised?
 - iv. Does your firm have the necessary marketing expertise and, if not, how will your firm compensate?
 - v. Who are the probable competitors, and what price/quality advantage is anticipated by your firm?
- b) The commercialization strategy plan should briefly describe the commercialization potential for the anticipated results of the proposed project, as well as plans to exploit it. Commercial potential is evidenced by:
 - i. The existence of private sector or non-SBIR/STTR funding sources demonstrating commitment to Phase II efforts/results.
 - ii. The existence of Phase III follow-on commitments for the research subject.
 - iii. The presence of other indicators of commercial technology potential, including the firm's commercialization strategy.
- c) If awarded a Phase II contract, the contractor is required to periodically update the commercialization results of the Phase II project at <https://www.dodsbirsttr.mil/submissions/>. These updates will be required at completion of the Phase II effort, and subsequently when the contractor submits a new SBIR/STTR proposal to DoD. Firms not submitting a new proposal to DoD will be requested to provide updates annually after completion of the Phase II.

(11) **Military Applications:** Briefly describe the existing/potential military requirement and the military potential of the SBIR/STTR Phase II results. Identify the DoD agency/organization most likely to benefit from the project. State if any DoD agency has expressed interest in, or commitment to, a non-SBIR, Federally funded Phase III effort. This section should involve not more than one to two (1-2) paragraphs. Include agency

point of contact names and telephone numbers.

(12) Relationship with Future Research or Research and Development (R/R&D) Efforts:

- a) State the anticipated results of the proposed approach, specifically addressing plans for Phase III, if any.
- b) Discuss the significance of the Phase II effort in providing a basis for the Phase III R/R&D effort, if planned.

(13) **Key Personnel:** In the technical volume, identify all key personnel involved in the project. Include information directly related to education, experience, and citizenship. A technical resume for the principal investigator, including publications, if any, must also be included. Concise technical resumes for subcontractors and consultants, if any, are also useful. You must identify all non-U.S. citizens expected to be involved in the project as direct employees, subcontractors, or consultants. For these individuals, in addition to technical resumes, please provide countries of origin, type of visas or work permits under which they are performing, and explanation of their anticipated level of involvement in the project.

Foreign Nationals (also known as Foreign Persons) means any person who is NOT:

- a. a citizen or national of the United States; or
- b. a lawful permanent resident; or
- c. a protected individual as defined by 8 U.S.C. § 1324b

ALL offerors proposing to use foreign nationals MUST follow Section 5.4. c. (8) of the DoD Program Announcement and disclose this information regardless of whether the topic is subject to ITAR restrictions.

When the topic area is subject to export control, these individuals, if permitted to participate, are limited to work in the public domain. Further, tasks assigned must not be capable of assimilation into an understanding of the project's overall objectives. This prevents foreign citizens from acting in key positions, such as Principal Investigator, Senior Engineer, etc. Additional information may be requested during negotiations in order to verify foreign citizens' eligibility to perform on a contract awarded under this Announcement.

The following will apply to all projects with military or dual-use applications that develop beyond fundamental research (basic and applied research ordinarily published and shared broadly within the scientific community):

- (1) The Contractor shall comply with all U. S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, and the Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, in the performance of this contract. In the absence of available license exemptions/exceptions, the Contractor shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of (including deemed exports) hardware, technical data, and software, or for the provision of technical assistance.

- (2) The Contractor shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of this contract, including instances where the work is to be performed on-site at any Government installation (whether in or outside the United States), where the foreign person will have access to export-controlled technologies, including technical data or software.
 - (3) The Contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.
 - (4) The Contractor shall be responsible for ensuring that these provisions apply to its subcontractors.
- (14) **Facilities/Equipment:** Describe instrumentation and physical facilities necessary and available to carry out the Phase II effort. Justify equipment to be purchased (detail in cost proposal). State whether proposed performance locations meet environmental laws and regulations of Federal, state, and local Governments for, but not limited to, airborne emissions, waterborne effluents, external radiation levels, outdoor noise, solid and bulk waste disposal practices, and handling and storage of toxic and hazardous materials.
- (15) **Consultants/Subcontractors:** Private companies, consultants, or universities may be involved in the project. All should be described in detail and included in the cost proposal. **In accordance with the Small Business Administration (SBA) SBIR Policy Directive, a minimum of 50% of the R/R&D must be performed by the proposing firm, unless otherwise approved in writing by the Contracting Officer.** Signed copies of all consultant or subcontractor letters of intent must be attached to the proposal. These letters should briefly state the contribution or expertise being provided. Include a SOW and detailed cost proposal. Include information regarding consultant or subcontractor unique qualifications. Subcontract copies and supporting documents do not count against the Phase II page limit. Identify any subcontract/consultant foreign citizens per (13) above.
- (16) **Prior, Current, or Pending Support of Similar Proposals or Awards:** WARNING: While it is permissible, with proper notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous Federal program Announcements, it is unlawful to enter into contracts or grants requiring essentially equivalent effort. Any potential for this situation must be disclosed to the Announcement agency(ies) before award. If a proposal submitted in response to this Announcement is substantially the same as another proposal previously, currently, or in process of being funded by another Federal agency/DoD Component or the same DoD Component, the company must so indicate on the Cover Sheet and provide the following:
- a) The name and address of the Federal agency(ies) or DoD Component(s) to which proposals were or will be submitted, or from which an awarded is expected or has been received;
 - b) The date of proposal submission or date of award;
 - c) The title of the proposal;
 - d) Name and title of the principal investigator for each proposal submitted or award received; and
 - e) Title, number, and date of Announcement(s) under which the proposal was or will be submitted, or under which an award is expected or has been received.

- f) If award was received, provide the contract number.
- g) Specify the applicable topics for each SBIR proposal submitted or award received.

NOTE: If this section does not apply, state in the proposal, “No prior, current, or pending support for proposed work.”

- (17) **Cost Proposal:** A detailed cost proposal must be submitted. Cost proposal information will be treated as proprietary. Proposed costs must be provided by both individual cost element and contractor fiscal year (FY) in sufficient detail to determine the basis for estimates, as well as the purpose, necessity, and reasonableness of each. This information will expedite award of the resulting contract if the proposal is selected for award. Generally, cost plus fixed fee (CPFF) contracts are appropriate for Phase II awards but a firm fixed price contract may also be appropriate. The Contracting Officer will determine contract type during negotiations. Phase II contracts may include profit (Firm Fixed price) or fee (cost type).

Cost proposal attachments do not count toward Phase II proposal page limitations. The cost proposal includes:

- a) Direct Labor: Identify key personnel by labor category. Number of hours, actual hourly rates, labor overhead, and/or fringe benefits per contractor FY is also required.
- b) Direct Materials: Costs for materials, parts, and supplies must be justified and supported. Provide an itemized list of types, quantities, prices, and, where appropriate, purpose. If computer or software purchases are planned, detailed information such as manufacturer, price quotes, proposed use, and support for the need will be required.
- c) Other Direct Costs: This includes specialized services such as machining or milling, special test/analysis, and costs for temporary use/lease of specialized facilities/equipment. Provide usage (hours) expected, rates, and sources, as well as brief discussion concerning the purpose and justification. Proposals including leased hardware must include an adequate lease versus purchase rationale. Special tooling/test equipment/material costs are acceptable but will be carefully reviewed to determine the need/appropriateness of the work proposed. The Contracting Officer must decide whether these purchases are advantageous to the Government and are directly related to the proposed effort. Title to property furnished by the Government will be vested with the AF unless determined to be more cost-effective for transfer to the contractor. The Government’s intention is not to directly fund purchase of general purpose equipment.
- d) Subcontracts: Subcontract costs must be supported with copies of the subcontract agreements. Agreement documents must adequately describe the work to be performed and basis for cost. The agreement document should include a SOW, assigned personnel, hours and rates, materials (if any), and proposed travel (if any). A letter from the subcontractor agreeing to perform a task or tasks at a fixed price is not considered sufficient. The proposed total of all consultant fees, facility leases or usage fees, and other subcontract or purchase agreements may not exceed one-half of the total contract price or cost, unless otherwise approved in writing by the Contracting Officer.

IAW FAR 15.404-1, price analysis, including reasonableness, realism, and completeness, of the proposed subcontractor costs by the prime is required. If based

on comparison with prior efforts, identify the basis upon which the prior prices were determined to be reasonable. If price analysis techniques are inadequate or the FAR requires submission of subcontractor cost or pricing data, provide a cost analysis IAW FAR 15.404-1(c). Cost analysis includes, but is not limited to, consideration of materials, labor, travel, other direct costs, and proposed profit rates.

- e) Consultants: For each consultant, provide a separate agreement letter briefly stating the service to be provided, hours required, and hourly rate and include a short, concise resume.
- f) Travel: Each Phase II effort, at a minimum, should include a kickoff or interim meeting. Travel costs must be justified as related to the needs of the effort. Include destinations, the number of trips, number of travelers per trip, airfare, per diem, lodging, ground transportation, etc. Information regarding per diem and lodging rates may be found in the Joint Travel Regulation (JTR), Volume 2, www.defensetravel.dod.mil.
- g) Indirect Costs: Indicate the basis of the proposed rates, e.g., budgeted/actual rates per FY, etc. The proposal should identify the specific rates used and allocation bases to which they are applied. Do not propose composite rates; proposed rates and applications per FY throughout the anticipated performance period should be provided.
- h) Cost Share: Cost sharing is permitted. However, cost sharing is not required nor will it be an evaluation factor in the consideration of a proposal. Please note that cost share contracts do not allow fees.
- i) DD Form 2345: For proposals submitted under export-controlled topics (either International Traffic in Arms (ITAR) and Export Administration Regulations (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.dlis.dla.mil/jcp/>. Approval of the DD Form 2345 will be verified if proposal is chosen for award.

18. Feasibility Documentation – Should be uploaded to Volume 5, Supporting Documents

- a. Maximum page length for feasibility documentation is 25 pages. If you have references, include a reference list or works cited list as the last page of the feasibility documentation. This will count towards the page limit.
- b. Work submitted within the feasibility documentation must have been substantially performed by the offeror and/or the principal investigator (PI). If technology in the feasibility documentation is subject to intellectual property (IP), the offeror must provide IP rights assertions. Provide a good faith representation that you either own or possess appropriate licensing rights to all other IP that will be utilized under your proposal. Additionally, proposers shall provide a short summary for each item asserted with less than unlimited rights that describes the nature of the restriction and the intended use of the intellectual property in the conduct of the proposed research. Please see section 11.5 of the DoD instructions for information regarding technical data rights.
- c. DO NOT INCLUDE marketing material. Marketing material will NOT be evaluated and WILL be redacted.

V. METHOD OF SELECTION AND EVALUATION CRITERIA

A. Introduction: Phase II proposals are evaluated on a competitive basis by subject matter expert (SME) scientists, engineers, or other technical personnel. Throughout evaluation, selection, and

award, confidential proposal and evaluation information will be protected to the greatest extent possible. Phase II proposals will be disqualified and will not be evaluated if the Phase I equivalency documentation does not establish feasibility and technical merit of the proposed technical approach.

B. Evaluation Criteria: Phase II proposals will be reviewed for overall merit based on following criteria in descending order of importance:

- (1) Technical Merit – The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.
- (2) Potential for Commercial Application – The potential for commercial (Government or private sector) application and the benefits expected to accrue from this commercialization.
- (3) Qualifications of the Principal Investigator (and Team) – Qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also ability to commercialize the results.

Cost reasonableness and realism shall also be considered to the extent appropriate.

The primary basis for selecting proposals for award will be overall merit, importance to agency programs, and funds availability. Other factors considered during the selection process include appropriate demonstration of feasibility of the technology, equivalent to that resulting from Phase I type efforts; commitment for Phase III funding; possible duplication with other R/R&D; program balance; budget limitations; and potential, if successful, of leading to a product of continuing interest to DoD. Phase II evaluations may include on-site assessment of the offeror's research results to date, or of the Contractor's facility, by Government personnel. The reasonableness of proposed costs for the Phase II effort will be examined to determine proposals offering the best value to the Government.

NOTE: Restrictive notices notwithstanding, proposals may be handled for administrative purposes only, by support contractors; U. Group, Peerless Technologies, Engineering Services Network and/or Stealth Entry LLC. 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. If you have concerns about any of these contractors, you should contact the AF SBIR/STTR Contracting Officer, Kris Croake, kristina.croake@us.af.mil.

VI. CERTIFICATIONS

In addition to the standard Federal and DoD procurement certifications, the SBA SBIR/STTR Policy Directives require the collection of certain information from firms at the time of award and during the award life cycle. Each firm must provide this additional information at the time of the Phase II award, prior to receiving 50% of the total award amount, and prior to final payment.

VII. DEBRIEFINGS

In accordance with FAR 15.505, a debriefing may be requested in writing. Consistent with the DoD SBIR/STTR Announcements, the request must be received within 30 days after receipt of notification of non-selection. Written requests for debrief must be sent directly to the Contracting Officer named on your non-selection notification. Requests should include the company name and telephone number/email address for a company point of contact, as well as an alternate. Also include the topic number under which the proposal was submitted and the proposal number. Requests received more

than 30 days after receipt of notification of non-selection will be fulfilled at the Contracting Officers' discretion. Unsuccessful offerors are entitled to no more than one debriefing per proposal. NOTE: FAR15.505(a) (2) states, at the offeror's request, debriefs may be delayed until after award. Under the AF SBIR/STTR Programs, debriefs are automated and standardized. Therefore, pre- and post-award debriefs are identical.

**Attachment 1: SBIR/STTR Environment, Safety and Occupational
Health (ESOH) Questionnaire**

Company Name:

Title:

1. Will hazardous materials (as defined by Federal Standard 313D, Material Safety Data, Transportation Data and Disposal Data for Hazardous Material Furnished to Government Activities and 40 CFR Part 260 – 279) be used in the contract?

Yes No

If the answer is "yes," list materials:

2. Will explosives or ammunition be used in research? (See definitions listed below before answering.)

Yes No

Explosives and ammunition mean:

(a.) Liquid and solid propellants and explosives, pyrotechnics, incendiaries and smokes in the following:

- i. Bulk;
- ii. Ammunition;
- iii. Rockets;
- iv. Missiles;
- v. Warheads;
- vi. Devices; and
- vii. Components of (1) through (6), except for wholly inert items.

(b.) This definition does not include the following, unless the contractor is using or incorporating these materials for initiation, propulsion, or detonation as an integral or component part of an explosive, an ammunition or explosive end item, or of a weapon system.

1. Inert components containing no explosives, propellants, or pyrotechnics;
2. Flammable liquids;
3. Acids;
4. Oxidizers;
5. Powdered metals; or
6. Other materials having fire or explosive characteristics.

If the answer is "yes," list items:

3. Will any hazardous processes be performed under the contract? Examples include operation of heavy equipment or power tools, operation of lasers or radio frequency radiation emitters, use of high voltage (greater than 600 volts) equipment, or use of equipment operating at high pressure (greater than 60 psig) or high temperature (greater than 50°C).

Yes No

If the answer is "yes," list processes:

4. Will this research be completed on a U.S. Air Force installation?

Yes No

If the answer is "yes," list facilities:

5. Will the contract require the purchase, storage use or delivery of any chemicals or hazardous material to USAF facilities?

Yes No

If the answer is "yes," list chemicals or hazardous materials:

6. Will any hazardous chemical or waste be generated during the course of this research?

Yes No

If the answer is "yes," specify the hazardous chemical or waste to be generated:

7. Will any Class I ozone depleting substances (ODSs) be required in this research?

A list of Class I ODSs is located at the following website: <http://www.epa.gov/ozone/ods.html>

Yes No

If the answer is "yes," list substances:

8. Does this effort involve the purchase or use of any radioactive materials?

Yes No

If the answer is "yes," specify the radioactive materials:

9. Will this effort involve any asbestos, radiation, or chemical generating/using components that will be delivered to USAF facilities?

Yes No

If the answer is "yes," specify the components:

10. Are there any special atmospheric or water resource requirements?

Yes No

If "yes" specify the requirements:

AIR FORCE DIRECT TO PHASE II SBIR 20.1 Topic Index

AF201-D001	Interactive Multi-media Instruction Decision Tool for Aircraft Maintenance
AF201-D002	Airborne Radio Sustainment Modernization
AF201-D003	Development of Efficient Thermal Spray Coupon Metallurgical Laboratory Processing
AF201-D004	Mission Design for the New Space Environment

AIR FORCE SBIR 20.1 Topic Descriptions

AF201-D001 TITLE: Interactive Multi-media Instruction Decision Tool for Aircraft Maintenance

TECHNOLOGY AREA(S): Human Systems

RESEARCH & TECHNOLOGY AREA(S):

ADVANCED CAPABILITIES:

ACQUISITION & SUSTAINMENT AOR:

ACQUISITION PROGRAM: NPOESS - National Polar-Orbiting Operations Environmental Satellite System

OBJECTIVE: Develop a methodology and associated computer based tool to define the type of training delivery methods that are most effective and efficient to perform aircraft maintenance training.

DESCRIPTION: The USAF aircraft maintenance training community has identified a need for a tool to aid in the decision process for selecting the most appropriate training format for students to learn aircraft sustainment maintenance actions. Specific maintenance actions are derived from training requests from both training units and active aircraft maintenance units, which will have a varied set of constraints. Current practice is to utilize corporate knowledge, best practices, and maintenance training requesters' opinions, coupled with skilled maintainers (not educators or training specialists) to determine the appropriate training format. With the emergence of new technologies such as Virtual Reality, Augmented Reality, and Mixed Reality, the AF training community desires to evaluate the benefits they could bring to students' initial understanding, as well as knowledge retention. Part of that is also determining the most appropriate opportunities to insert the new technology into the current training curriculum. The ultimate objective is to identify the type of training delivery method that yields the most value.

PHASE I: USAF will only accept Direct to Phase II proposals.

PHASE II: Develop, demonstrate, and deliver a methodology and associated computer based tool to define the type of training delivery methods that are most effective and efficient to perform aircraft maintenance training, based on: learning objectives, student skill state, technology availability, resource/environment/programmatic/mission constraints, etc. The methodology shall incorporate the results of rigorous scientific and engineering research and analysis regarding education and training effectiveness. The methodology is expected to evaluate currently utilized training methods, to include, but not limited to, written, 2D/3D images, instructor presentation, computer based training (CBT), interactive CBT, hands-on instruction, etc. as well as state of the art instruction methods, to include, but not limited to, Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), environmental feedback, etc. The tool is to be utilized by USAF aircraft maintenance training content development teams who are trainers, not experts in the theory of education. Phase II deliverables will be a methodology to define the best suited training delivery method(s) and a computer based tool that follows the methodology that is to be used by training content developers.

PHASE III DUAL USE APPLICATIONS: Refine and mature the training delivery decision tool to be marketed to other defense and commercial customer who require the ability to determine which type of training delivery method is best for the learning objective(s) and constrains related to aircraft maintenance training.

REFERENCES:

1. Stacy, W., Walwanis, M. M., Wiggins, S. & Bolton, A. (2013, Nov). Layered Fidelity: An Approach to Characterizing Training Environments. Presentation at the 2013 Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC), Orlando, FL.
2. Department of Defense Handbook. (2001). Development of Interactive Multimedia Instruction (IMI) (Part 3 of 5 Parts). MIL-HDBK-29612-3A

KEYWORDS: training, education, virtual reality, augmented reality, mixed reality, learning objectives, immersive, interactive multi-media instruction, VR, AR, MR, IMI, XR, eXtended Reality, aircraft maintenance

TECHNOLOGY AREA(S):
RESEARCH & TECHNOLOGY AREA(S):
ADVANCED CAPABILITIES:
ACQUISITION & SUSTAINMENT AOR:
ACQUISITION PROGRAM: N/A

OBJECTIVE: Develop an Airborne Modernized Software Defined Radio (SDR) that uses Sensor Open System Architecture (SOSA) and is condensed enough to fit in the footprint of an RT-1505A version of the AN/ARC-164

DESCRIPTION: Modern radios in industry are now software defined radios that use common Commercial Off the Shelf (COTS) interfaces to allow manufacturers a greater source of parts versus using custom designed architecture. The Open Architecture also allows portability of software applications from one radio to the next. Some of these military airborne radios also have very small footprint requirements that have to be met. However, many of the current commercial radios do not meet MIL-SPEC and aircraft requirements. An opportunity exists to take advantage of SOSA requirements and condense the hardware down to a footprint that can be used. The opportunity also exists to take this design and make the internals common to all airborne communications even though the chassis footprint differs from aircraft to aircraft and system to system.

Currently, the technology exists to place a radio transceiver on a circuit card that is a 3U height. The software allows the transceiver card to be used in multiple radio bandwidths. Small businesses like Spectranetix⁴ and other companies like Epiq Solutions⁵ already market similar type hardware. However, the hardware will not fit in the 5.75 inches wide, 4.875 inches high, and 8.62 inches deep footprint needed by the legacy radio. Many of the parts also do not meet the MIL-STD-4616, MIL-STD-8107, and MIL-HDBK-5168 requirements. The current legacy radios are almost 30 years old design and custom made from discrete electronics. The radios are not upgradable to meet the new and changing threats faced by the warfighter. Also since all the different radios are unique design, parts are not swappable between systems and each system requires its own tailored repair line. The proposed research would consider existing SOSA compliance and tailor it to meet the unique requirements of the radio but still meet the openness and interoperability mandated by SOSA. Also, due to the high cost of aircraft integration, the proposed design must be able to drop into the existing footprint without forcing any changes to the aircraft mounting or wiring.

Development of this replacement will reduce the overhead cost associated with the sustainment of the legacy radio systems. Currently the Air Force Supply Chain manages thousands of piece parts associated with the legacy radios. This design will drastically reduce the number of parts due to internal commonality between the different radios. It will also reduce the support footprint needed by the depot due to not having to track, manage, and repair unique parts. By expanding this design to the different radios the Air Force can maintain a common supply chain for the hardware where the only difference is the software that is loaded on the circuit cards.

FEASABILITY DOCUMENTATION: For this Direct to Phase II topic, the Air Force is expecting that the submittal firm substantiate a present ability to:

- Develop a proof of concept non-airworthy prototype that can meet the aforementioned dimensional requirements while maintaining SOSA standards for open architecture.
- Develop a prototype capable of operating in the 225.00 to 399.975 MHz range and do basic AM and FM voice while allowing future software changes to add extra modes in future phases.

PHASE II: Develop a prototype based on the proof of concept in phase I. The radio must be able to fit in the dimensional foot print while allowing the housing of the front control panel similar to the RT-1505. It must also be able to demonstrate the ability to accept aircraft power, and operate with the following conditions:

- Transmits with a power output of 10 Watts on an RF Wattmeter with a 50 Ohm load
- Consume no more than 35W in receive and 110W in transmit
- Operate from 225.00 to 399.975 MHz

- Allow 7,000+ channels
- Operate with AM and FM voice
- Tone
- Automatic direction finder (ADF)
- Receive voice/data modulated signals using communications security devices
- Have a guard channel
- Use HAVE QUICK II
- Be able to tune within 7.5 milliseconds.

The prototype will also need to include MIL-SPEC parts to the greatest extent possible for this phase as some MIL-SPEC part changes may alter the design. The display and lighting should also include night vision goggle compliant parts to the greatest extent possible as well. The hardware and software must be compliant with SOSA standards for open architecture.

PHASE III DUAL USE APPLICATIONS: A successful prototype could market as a design option for other radios and avionics facing similar end of life limitations. Phase III will also address any design challenges that have not been addressed to make the prototype fully airworthy. It will also allow the groundwork to develop additional operational modes not currently in use.

REFERENCES:

1. "Software Defined Radio", Wikipedia, https://en.wikipedia.org/wiki/Software-defined_radio
2. "Sensor Open System Architecture, SOSA Website, <https://www.opengroup.org/sosa>
3. "AN/ARC-164(V) Radio Sets", Columbia Electronics, http://www.columbiaelectronics.com/id195.htm#anarc_164_late_models_
4. "Spectranetix Payload Cards", Spectranetix, Inc., <http://www.spectranetix.com/index.php/m-sys-products-2/a-comscan-2/m-payload-cards-2/m-sx430-2>

KEYWORDS: radio, sustainable, airborne

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AF201-D003

TITLE: Development of Efficient Thermal Spray Coupon Metallurgical Laboratory Processing

TECHNOLOGY AREA(S): Materials/Processes

RESEARCH & TECHNOLOGY AREA(S):

ADVANCED CAPABILITIES:

ACQUISITION & SUSTAINMENT AOR:

ACQUISITION PROGRAM: N/A

OBJECTIVE: Develop thermal spray coupon management, dispensing and process tracking system to reduce/eliminate mistakes, improve efficiency, eliminate unnecessary overtime for sample issuance, ensure compliance with coupon handling and tracking requirements.

DESCRIPTION: Mission critical components that are coated using thermal spray methods require process verification coupons to be coated simultaneously with the components. These coupons then undergo rigorous processing and inspection in the metallurgical laboratory to ascertain the coatings have achieved quality microstructure characteristics such as bond strength, porosity, unmelts, oxides, integrity, hardness, etc. There are many types of coupons used, depending on the component to be coated and the type of coating to be applied. The coupons must be serialized and carefully managed throughout the entire production coating process and the laboratory inspection process to ensure the coated component receives certification before being placed in service. Time is often of the essence, and the coated components can be delayed for production release if the coupons are not processed expeditiously. Additionally, due to the many types of coupons, the many types of coatings and the many types of laboratory inspection steps/processes, mistakes can be made that result in unnecessary re-coats and

component release delays. Most coupon operations are currently performed manually, requiring significant technician hours that could be better spent on more technical duties.

Development of a system is needed that will manage the thermal spray coupon inventory, provide automated coupon dispense with intelligent serialization at time of use (date, booth, operator, process, etc.) and provide a means of tracking the coupons throughout the entire process of coating application, sectioning, mounting, polishing and the various inspections/evaluations. The system needs to provide automated visibility of coupon status at any time to ensure delivery of high priority components are not delayed. Research is needed to determine the optimal system/process that would initially be used on currently operational thermal spray booths. The research would need to identify how this system could integrate with any existing thermal spray management processes and data. The research would also need to include identification of requirements to expand the use of the system by facilities within DOD. The above-mentioned data is not currently available but would be of great benefit in process tuning and continuous process improvement.

PHASE I: Proposal must provide:

- A) Feasibility analysis of automated dispensing of the thermal spray coupons and intelligent serialization at point of use.
- B) Analysis of tracking/scanning methodologies for the various metallurgical lab process steps and providing data that can be queried for various purposes.
- C) Feasibility analysis to achieve authority to operate adhering to Risk Management Framework (RMF) requirements.
- D) Feasibility analysis to integrate with any existing DOD thermal spray management processes and data.

FEASIBILITY DOCUMENTATION: Offerors interested in submitting a Direct to Phase II proposal in response to this topic must provide documentation to substantiate that the scientific and technical merit and feasibility described above has been met and to identify the potential commercial applications. The documentation provided must substantiate that the proposer has developed a preliminary understanding of the technology to be applied in their Phase II proposal to meet the objectives of this topic. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results. Read and follow all of the feasibility documentation portions of the Air Force 19.2 Instructions. The Air Force will not evaluate the offeror's related DP2 proposal where it determines that the offeror has failed to demonstrate the scientific and technical merit and feasibility of the Phase I project.

PHASE II: Develop prototype concepts and methodologies for thermal spray coupon management, dispensing and process tracking through the entire coating application and metallurgical laboratory inspection processes, including integration with current thermal spray operations and processes. Demonstrate down selected concept and methodology with a prototype system. Develop and initiate plan to achieve authority to operate adhering to Risk Management Framework (RMF) requirements on a production system.

PHASE III DUAL USE APPLICATIONS: DUAL USE APPLICATIONS: This technology has application at all the DOD depot facilities engaged in thermal spray coatings for critical weapons system repair. Additionally, this technology would be a good tool for any commercial entity engaged in thermal spray coatings of components that require coupon verification prior to production release of the product.

REFERENCES:

1. Cooray, P. & Rupasinghe, T., 2015, A Real Time Production Tracking and a Decision Support System (PTDSS): A Case Study from an Apparel Company. 12th International Conference on Business Management (ICBM)
2. Kelepouris, T. & Baynham, T. & Mcfarlane, D., 2006, Track and Trace Case Studies Report.
3. Sobotoval, L. & Demec, P., 2015, Laser Marking of Metal Materials, Science Journal.

KEYWORDS: Thermal spray, metallurgical laboratory, track & trace, automated dispensing, Certification and Accreditation (C&A)

TECHNOLOGY AREA(S): Space Platforms
RESEARCH & TECHNOLOGY AREA(S):
ADVANCED CAPABILITIES:
ACQUISITION & SUSTAINMENT AOR:
ACQUISITION PROGRAM: N/A

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 5.4.c.(8) of the Announcement and within the AF Component-specific instructions. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws. Please direct ITAR specific questions to the AF SBIR/STTR Contracting Officer, Ms. Kris Croake, kristina.croake@us.af.mil.

OBJECTIVE: Develop capability for rapid design of space missions that leverages new and evolving space services, commodity components, and emerging technologies. Establish and prove a rapid approach that involves specialist collaborators across multiple organizations.

DESCRIPTION: In the last several years, new developments in space access, small satellites and components, software and communications, combined with the investment of risk capital and other funding, have produced new capabilities for space services. These new services and the infrastructure that enables them have in turn created a fast-changing environment for further development. Mission planning now takes place in that dynamic context. The Air Force continues to deliver traditional capabilities but also has opportunities to do so more effectively and by wholly different approaches by exploiting and repurposing rapidly emerging space systems, services, components, and supporting infrastructure.

In previous generations, Air Force missions have been planned over extended time periods, assuming the availability of certain government assets, products and supporting services, with the government funding new developments that were required. Techniques for analyzing missions and performing trades were created and honed with each new application. Now, mission planners are presented with a fast-changing array of commercial services and unconventional mixes of commercially driven and government-driven capabilities including new technology and software-defined systems, commodity spacecraft components, small satellite buses, and launch and ground systems services. The environment is dynamic, choices are greater, and mission development, including rapid progression from concept to systems requirements to preliminary design, should adapt as well.

Given a set of needs and goals in a broad space-related area, the Air Force will benefit from a rapid capability to interpret needs and opportunities, structure candidate mission architectures, assess available and emerging services and technologies that may be relevant to solutions, and proceed systematically through trades to arrive at multiple feasible approaches. These in turn can be considered with respect to cost, schedule and risks, and the likelihood and degree of meeting goals. In most cases, the mission development capability will rapidly access and combine insight from multiple sources and companies.

Overlaps in different space-related domains have blurred the lines of simpler, focused mission development. Communications now involves GEO, MEO, and LEO over multiple wavelengths, with different antenna types and more use of relays. Satellites have greater on-board processing, increased potential for coordinated operation, more options for deployed subsystems and in-space changes. Launch services are lower cost, more frequent and agile, with emerging options for orbit insertions and transfers. Payloads are more programmable, adaptable and compact. In addition, information management for space systems increasingly leverages software-defined systems and the cloud, from data management to scheduling and operations.

Mission design should keep pace with and help manage the complexity brought by these fast-evolving

developments. It is envisioned this will involve model-based design processes, techniques and methodologies to develop conceptual designs that include expedient leveraging of the best new commercially-available and open source tools. A robust but flexible approach accessing knowledge across organizations will take appropriate advantage of software-driven automation and optimization.

PHASE I: Proposal must show, as appropriate to the proposed effort, technical feasibility or nascent capability of space mission design approach and techniques that are compatible with new modes of space development and operation. Proposal may provide example results from this new and enhanced mission design capability on a specific Air Force mission area. Demonstrate reduced time from concept to system requirements, flexible use of evolving architectures and services, and increased options for Air Force programs. Identify capability gaps that slow development, inadequately capture risks, or fail to explore and evaluate feasible but unconventional architectures.

FEASIBILITY DOCUMENTATION: Offerors submitting a Direct to Phase II proposal in response to this topic must provide documentation to substantiate that the scientific and technical merit and feasibility of the proposed development has been met, and to describe the potential commercial applications. The documentation provided must substantiate that the proposer has developed a preliminary understanding of the technology to be applied in their Phase II proposal to meet the objectives of this topic. Documentation should include all relevant information including, but not limited to: technical reports, test data, prototype designs/models, and performance goals/results. Read and follow all of the feasibility documentation portions of the Air Force 20.1 Instructions. The Air Force will not evaluate the offeror's related D2P2 proposal where it determines that the offeror has failed to demonstrate the scientific and technical merit and feasibility of the Phase I project.

PHASE II: Develop and enhance the rapid space mission design capability, and demonstrate the utility in several Air Force need areas for missions that are at different stages of conceptual maturity, including where conceptual development has not yet begun. Provide intermediate products to be assessed by planning teams, summarizing information that captures sensitivity of mission-level outcomes, including schedule, cost and risk, to key architecture and implementation decisions. Carry at least one mission through to system design and development, working with other performers to rapidly assess mission-level impacts of spacecraft, payload, operations, data processing and other elements.

PHASE III DUAL USE APPLICATIONS: The contractor will pursue commercialization of the technologies developed in Phase II for potential government and commercial applications. Government applications include rapid concept development and maturation for emerging military space missions. There are potential commercial applications to space system design, and evaluation and assessment of new business ventures.

REFERENCES:

1. Martin, Gary, (2016) NewSpace: The Emerging Commercial Space Industry, <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20160001188.pdf>
2. Datta, Anusuya, (2017) The NewSpace Revolution: The emerging commercial space industry and new technologies, <https://www.geospatialworld.net/article/emerging-commercial-space-industry-new-technologies/>
3. Malaek, Seyed. (2018). A Generic Method for Sizing Satellites Conceptual Design and Rapid Sizing Based on "Design for Performance" Strategy. IEEE Aerospace and Electronic Systems Magazine
4. Jones, Melissa & Chase, James. (2008). Conceptual Design Methods and the Application of a Tradespace Modeling Tool for Deep Space Missions. IEEE Aerospace Conference Proceedings. 1 – 15

KEYWORDS: space mission design, concept development, New space, Concurrent Engineering Models, commercial space, mission planning, simulation