Broad Agency Announcement

Atmosphere as a Sensor (AtmoSense)

Defense Sciences Office

HR001120S0036

March 4, 2020

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PART I: OVERVIEW INFORMATION

- **Federal Agency Name:** Defense Advanced Research Projects Agency (DARPA), Defense Sciences Office (DSO)

- **Funding Opportunity Title:** Atmosphere as a Sensor (AtmoSense)

- **Announcement Type:** Initial Announcement

- **Funding Opportunity Number:** HR001120S0036

- **Catalog of Federal Domestic Assistance (CFDA) Number(s):** 12.910 Research and Technology Development

- **Dates** (All times listed herein are Eastern Time.)
  - Posting Date: 03/04/2020
  - Proposers Day: 02/14/2020. See Section VIII.C.
  - Abstract Due Date: 03/13/2020, 4:00 p.m.
  - FAQ Submission Deadline: 04/10/2020, 4:00 p.m. See Section VIII.A.
  - Full Proposal Due Date: 04/22/2020, 4:00 p.m.

- **Types of Instruments that May be Awarded:** Procurement contracts, grants, cooperative agreements or other transactions.

- **Agency contacts**

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  - **DARPA/DSO Opportunities Website:** http://www.darpa.mil/work-with-us/opportunities

- **Teaming Information:** See Section VIII.B for information on teaming opportunities.

- **Frequently Asked Questions (FAQ):** FAQs for this solicitation may be viewed on the DARPA/DSO Opportunities Website. See Section VIII.A for further information.

PART II: FULL TEXT OF ANNOUNCEMENT

I. Funding Opportunity Description

This Broad Agency Announcement (BAA) constitutes a public notice of a competitive funding opportunity as described in Federal Acquisition Regulation (FAR) 6.102(d)(2) and 35.016 as well as 2 CFR § 200.203. Any resultant negotiations and/or awards will follow all laws and regulations applicable to the specific award instrument(s) available under this BAA, e.g., FAR 15.4 for procurement contracts.

A. Introduction

The Defense Sciences Office (DSO) at the Defense Advanced Research Projects Agency (DARPA) is soliciting innovative research proposals in the area of modeling, simulating, and experimentally observing transient disturbances (both mechanical and electromagnetic) in the Earth's atmosphere (from the troposphere through the ionosphere) due to meteorological and geophysical sources. Proposed research should investigate innovative approaches that enable revolutionary advances in science, prediction, or devices. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.

B. Background

AtmoSense seeks to develop the scientific understanding to exploit signatures for geolocation of natural sources that disturb the Earth's atmosphere, which are fundamentally different than those relied upon by direct observation approaches.

It has been observed that various natural processes such as earthquakes[1], hurricanes[2], and tornadoes[3] measurably impact the ionosphere. In 2013, a bolide event generated a trail of ionospheric disturbances that spanned the entire North American continent[4]. It also has recently been discovered that bombing in continental Europe during WWII was accompanied by measurable changes in the ionosphere over Great Britain[5]. In fact, examination of the literature reveals a rich history of observing ionospheric disturbances due to a multitude of sources. Figure 1 is one particular way to depict how ionospheric perturbations (measured in total electron content units (TECUs)) correlate with the energetic magnitude (shown as approximate TNT equivalents) of various event sources.

[1] https://doi.org/10.5047/eps.2011.06.035
[2] https://doi.org/10.1134/S000143381109012X
[3] https://doi.org/10.1002/2013GL057963
[4] https://doi.org/10.1002/2013RS005344
[5] https://doi.org/10.5194/angeo-36-1243-2018

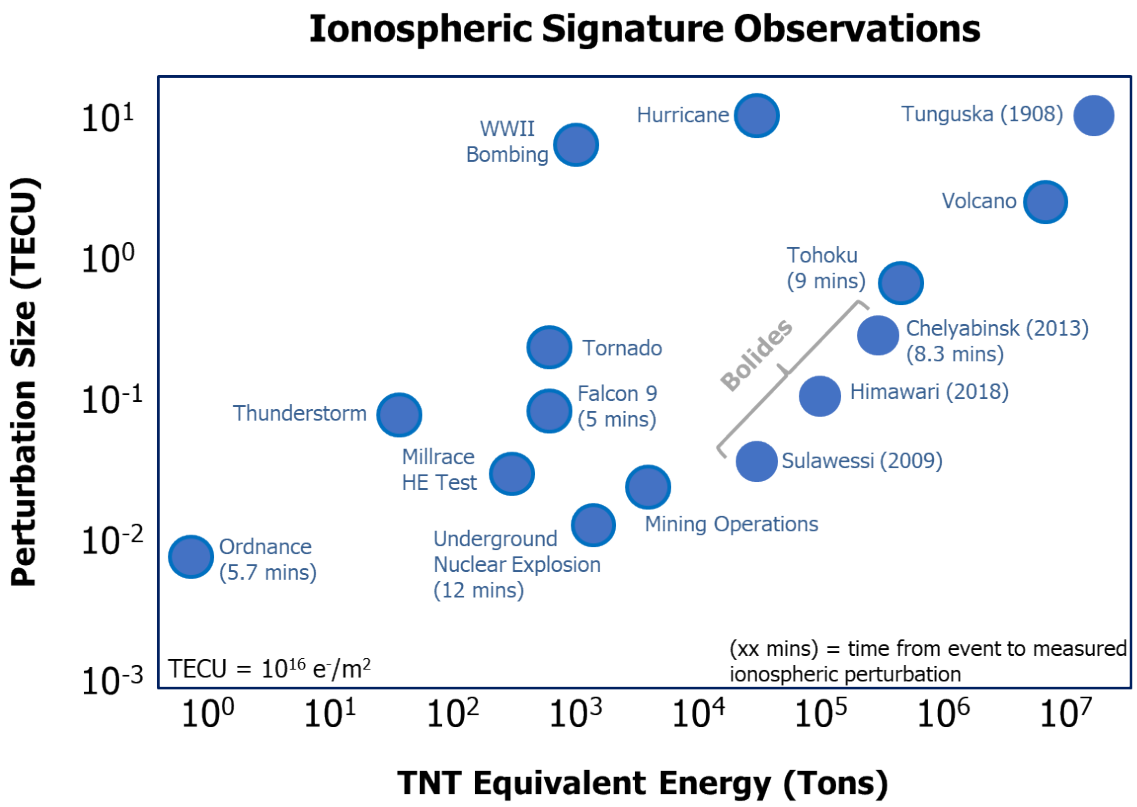

Figure 1: A plot of observed ionospheric disturbances measured in TECU vs. the approximate TNT equivalent energy of the source that disturbed the atmosphere. Also listed, where described in the literature, is the time of flight from the generation of the atmospheric disturbance to when it was observed to impact the ionosphere. Note that the way the transient energy disturbance interacts with the ionosphere can vary greatly. Some sources produce shockwave-like disturbances. Others emanate prolonged atmospheric mechanical and electromagnetic waves. Still others interact directly with the ionosphere. Sometimes the disturbance is a combination of any or all of these sources.

In almost all of these cases, the ionospheric disturbances are thought to be due to acoustic and/or gravity waves that are produced by the interaction between the source and the atmosphere. The qualitative physical explanation for how this occurs is fairly straightforward. Ground based sources of disturbance such as mining operations or storm cells can launch mechanical waves spanning from the infrasonic to the ultrasonic. As these transient disturbances travel radially outward from the source, those wave components that propagate low in altitude along the surface of the Earth are dampened by the troposphere. However, those wave components that travel along the Earth's radial direction (i.e. higher in altitude) experience less dampening as the mean free path between atmospheric constituents increases due to decreasing air density. As this energy propagates, it can evolve into phenomena such as acoustic waves, gravity waves, or acoustic-gravity waves, as well as any non-linearly triggered transformations. Passing from the troposphere, through the stratosphere, and into the mesosphere, this energy eventually strikes the ionosphere. Because the electrons in the ionosphere must follow the Earth's magnetic field lines, compression occurs, and the ionosphere responds by launching traveling disturbances. These disturbances are what are captured in Figure 1.

With this mechanistic picture in mind, the neutral atmosphere-ionosphere system can be thought

of as a dynamic information reservoir that contains characteristics (e.g., size, duration, location) of the event source disturbance. Understanding the physics of how disturbances translate into information that can be measured in the atmosphere forms the basis for this program.

C. Program Description/Scope

Program Approach

AtmoSense will attempt to understand the fundamentals of energy propagation from the ground to the ionosphere in order to determine if the atmosphere can be used as a sensor. This entails developing new modeling and simulation capabilities as well as new sensing modalities that can be combined to answer a set of fundamental questions that will help determine the feasibility of the AtmoSense concept. Among these basic science questions to be answered are:

1. What is the nature of transmitted signals?
2. What mode structure (mechanical and electromagnetic) can the mesosphere and lower ionosphere support?
3. What dynamic variables are best measured and at what altitude to capture source disturbed information?

The AtmoSense approach will consist of three technical areas (TAs) designed to answer these general basic science questions in order to demonstrate the viability of the AtmoSense concept. TA1 - Modeling and Simulation will develop the model and simulation (M&S) and analytical approximations to connect near-field disturbances to far-field mechanical and electromagnetic perturbations. TA2 - Characterization of the Background will experimentally characterize the background and mode structure of the mesosphere and lower ionosphere. TA3 - Sensing Modalities will develop new sensing modalities, use old sensing modalities in new ways, and/or exploit natural/non-natural emitters to detect mechanical and electromagnetic variations of the atmosphere. Note that while there appears to be overlap between TA2 and TA3, TA2 is primarily focused on measuring the background or noise of the atmosphere, whereas TA3 is focused on measuring the transient signal through the noise background. Thus, there will be stricter requirements in TA3 regarding required sensitivities as well as a focus on developing innovative measurement techniques that are "noise resistant."

In addition to the three technical areas, an Independent Verification and Validation (IV&V) team will evaluate the research products of each performer and provide expert analysis of the capabilities developed for potential application spaces. The findings of the IV&V team will help inform the Government's decision regarding continuation of research into Phase 2. The IV&V team is not being solicited at this time.

Out of Scope

DARPA considers approaches that are based upon direct active sensing of disturbance sources to be inappropriate for AtmoSense, and these will be deemed non-responsive. Sources of interest under the AtmoSense BAA are limited to geological and/or meteorological disturbances.

D. Program Structure

DARPA intends to use a phased acquisition approach for the AtmoSense program. The AtmoSense program consists of two phases: Phase 1 (a 27-month base period) and Phase 2 (a 12-

month period). Proposers are strongly encouraged to form teams capable of proposing to all three TAs described in Section I.C., Program Approach, above. However, proposals with a strongly unique approach to an individual TA will be considered solely for Phase 1.

Proposals from integrated teams should address both phases and provide details for Phase 1, as outlined in Section E below, and a rough order of magnitude (ROM) for Phase 2, including ROM costs, a draft statement of work (SOW), and any additional information on anticipated program plans. Proposals responding to all three TAs that do not address these Phase 2 goals may be deemed nonconforming.

Section I.F. of this BAA, "Phase 2 (12 months): Proof of Principle Field Testing," notionally describes a test campaign consisting of three field tests spaced 3 months apart. For purposes of costing, the ROM should describe the nature of the tests to be performed and the cost per test. Potential field tests include mining operations, storm cells in the US, earthquakes in active Pacific Rim areas, or breaking mountain waves in North or South America. Notional costs for each field test should include, but are not limited to, optimized model and simulation of the testing scenario(s), the number of tests, deployment and operation of sensing modalities, personnel costs, field test logistics, and post-test activities and analysis.

Prior to the completion of Phase 1 (at approximately Month 24), DARPA intends to request updated technical and cost proposals for Phase 2 per specifications/guidance provided by DARPA. Only Phase 1 integrated teams will be eligible to receive an invitation to submit an updated Phase 2 proposal; however, integrated teams may invite successful individual TA Phase 1 performers to join their teams as part of their Phase 2 proposals.

Evaluation of Phase 2 proposals will be based on criteria to be specified in the Phase 2 proposal requests. The Phase 2 evaluation criteria will be consistent with the evaluation criteria in this solicitation, but may be tailored to the Phase 2 requests for updated proposals. Phase 2 proposal evaluations will be conducted through a scientific and technical review process in accordance with Section V.B. The Government reserves the right to issue a new solicitation for Phase 2 with a new award instrument if programmatic circumstances dictate.

Participation in Phase 1 does not guarantee funding in Phase 2; progression to the next phase will be contingent on evaluation of Phase 2 proposals and availability of funds. See Section I.E below for specific milestones and a required timeline.

E. Technical Area Descriptions

Phase 1

Phase 1 includes the following three Technical Areas (TAs):

Technical Area 1: Modeling and Simulation

The goal of TA1 is to develop the M&S and analytical approximations to connect near-field disturbances to far-field mechanical and electromagnetic perturbations. This supports the first technical question posed above - *What is the nature of transmitted signals?* The technical

challenge is to understand how to model, simulate, and predict the evolution of energy propagation from the near-field source that caused the mechanical and/or electromagnetic disturbance to far-field atmospheric perturbations. This challenge involves developing creative ways to evolve assumptions in each regime over multiple scales.

As an example, consider the challenges in modeling the atmospheric disturbances created by a bolide event. High fidelity computational fluid dynamics (CFD) can be used to understand the flow of air near the body. Statistical mechanics can take this atmospheric heating and determine thermodynamically when the bolide is about to break up or explode sending out shocks. The computational domain used for these calculations does not extend more than a few 10s of body lengths (~decameters) in each direction, assumes a steady atmosphere, and assumes a constant gravitational field. However, as implied in Figure 1, transient disturbances due to meteorological or geophysical sources can propagate distances on the order of 10-100 kilometers into the far-field where the assumptions used in CFD break down.

A foundational question of what assumptions should be considered over spatial temporal scales to predict how near-field strong waves and shocks evolve to far-field weak, linear, and non-linear waves will need to be answered to understand if the atmosphere can be used as a sensor.

Performers will utilize and develop high-fidelity M&S capabilities that can seamlessly connect meteorological or geophysical sources (such as thunderstorms, tornadoes, bolides, earthquakes, mining operations, etc.) to resultant kilometer-scale atmospheric disturbances and large-scale general circulation models. These modeling capabilities will have to span multiple physics domains including, for example, fluid dynamics, atmospheric turbulence, electromagnetics, and multi-fluid magnetohydrodynamics.

Proposers should describe what types of models will be used for disturbance sources, models for the various atmospheric and ionospheric constituents, and how these models will be represented for computation. In terms of simulation, proposers are expected to explain how spatial and temporal solvers will be implemented, especially with respect to various time scales (e.g. fast modes and slow modes). As for prediction, proposals should describe what dynamic variables can be predicted with current capability and propose new variables (or combinations thereof) that might inform new ways of sensing the atmosphere.

Proposers should describe the computational platform(s) needed to simulate these models such as high-performance computers, graphics processing units, tensor processing units, etc. Proposers should provide an estimate of how much computing power and resources are needed for their approach and account for these in the proposal. Proposers should not assume that DARPA will provide additional computational resources not included in the proposal.

Technical Area 2: Characterization of the Background

The goal of TA2 is to experimentally characterize the background and mode structure of the mesosphere and lower ionosphere. This supports the second question posed above - *What mode structure (mechanical and electromagnetic) can the mesosphere and lower ionosphere support?* The technical challenge is to understand what modes of energy propagation can the atmosphere

support, and how does the atmospheric background, particularly the mesosphere, destroy that information? In technical terms, what frequency components propagate through the upper atmosphere, what passband or noise band structures exist, and how do dispersion relationships evolve as a function of, for example, altitude?

As the transient disturbances propagate through the troposphere, stratosphere, mesosphere, and into the ionosphere, several background dynamic variables such as pressure, temperature, neutral mass species density, ion species density, etc. drastically change. It is well known that the troposphere acts as a low pass filter allowing infrasound energy to propagate easily while higher frequencies are dampened. Does this same trend follow in the stratosphere and more so in the mesosphere? At what point does the well mixed atmosphere assumption break down and affect energy propagation? Additionally, once ionization becomes a factor, which occurs in the mesosphere and the ionosphere, then new modes are available that involve electromagnetic energy. Not only can the atmosphere itself dictate what modes are allowable, the nominal background serves as a reservoir of entropy that can destroy the information contained within. Researching these challenges is vital to understanding whether the atmosphere can be used as a sensor.

Performers will devise observational techniques and conduct experiments to understand and observe the nominal background characteristics of the atmosphere from approximately 30 km to 90 km and determine what modes of propagation this region can support.

Proposers should describe what type of observation platforms will be used, the types of systems that might be used for direct measurements and/or remote measurements of the atmosphere, what altitudes of the atmosphere will be the focus of the selected observational campaign, and how long or how many experiments will take place over Phase 1.

Due to the nature of TA2, every TA2 performer will be required to share the raw data collected from their experimental observation campaigns with all of the other performers in this program.

Technical Area 3: Sensing Modalities

The goal of TA3 is to develop new sensing modalities, use old sensing modalities in new ways, and/or exploit natural/non-natural emitters to detect mechanical and electromagnetic variations of the atmosphere. This TA supports the last technical question - *What dynamic variables are best measured and at what altitude to capture source disturbed information?* The technical challenge is to understand what sensing modalities are best suited to measure atmospheric and ionospheric dynamic variables, either directly or remotely, and at what altitude those variable are best measured.

Traditional and operational tropospheric methodologies typically rely on using active systems such as LIDAR or radar; however, due to power challenges these systems nominally have altitude limitations of ceilings around 15-30 km. Traditional and operational ionospheric methods typically utilize electromagnetic energy through GPS TEC measurements or bottomside high frequency (HF) soundings. What is not routinely measured is the region roughly between 30 and 90 km, which is sometimes referred to in the literature as the “ignorosphere.” AtmoSense

seeks to exploit sensing modalities that can mutually observe propagating energy through the troposphere, stratosphere, mesosphere, and the ionosphere with enough sensitivity in space and time to extract information about the disturbance source. Performers will develop and test novel approaches to measuring the disturbed atmospheric and ionospheric environment. Performers may develop new realizations of existing modalities (e.g. lower SWaP to utilize new platforms) or may propose new measurements that can be used to realize AtmoSense goals. Proposers are discouraged from pursuing measurements on satellite-based platforms unless sufficient capability can be provided at a cost that is demonstrably competitive with ground- or atmospheric-based sensors and can be manifested and launched within the timeframe of the AtmoSense program

Proposers should describe how they will use TA1 and TA2 results to drive what sensitivities need to be measured and experimentally determine what can realistically be measured, as well as how they plan to arrive at recommendations for which sensing modalities are best suited for Phase 2 field testing.

Phase 2: Proof of Principle Field Testing

Note: Phase 2 does not include TAs.

DARPA may elect to enter into Phase 2 proof of principle field testing with a single or multiple Phase 1 integrated team performers that meet the Phase 1 program metrics. The location and type of field tests will be determined based on what type of disturbance will be tracked. In general these disturbances fall into two categories: static and dynamic. An example of a static test would be to geolocate the epicenter of an earthquake or mining operation based on its atmospheric perturbations to the same or better degree than seismometry. An example of a dynamic test would be to find and fix a thunderstorm cell to the same or better degree than Doppler radar.

F. Milestones

Below is a projected timeline of major milestones that proposers should include in their schedule.

Note: IV&V testing will be conducted by third-party organizations, to be identified and retained by DARPA. These third party IV&V organizations will be responsible for establishing and executing the testing procedures in accordance with the metrics outlined below, with supervision from DARPA.

Phase 1 (24 months): Concept Viability

Technical Area 1: Modeling and Simulation (M&S)

- 12-month milestone: Reproduce in M&S ionospheric meteorological and/or geophysical TEC signatures that have been observed and reported in literature.
    - Metrics: 1) IV&V verification of M&S ability to replicate ionospheric TEC signatures within the threshold metrics as shown in Table 1 below and 2) a path to achieving the goal replication metrics by month 24 of the Phase 1 program

	Comparison Metrics to all Observed Slant dTEC Single Rx Sites				All Rx Sites dTECu = 0
	Time of Flight/Onset of Disturbance (Time)	Duration of Disturbance (Time)	Max/Min Amplitude of Disturbance (dTECu)	Temporal Track (dTECu)	Duration of Total Disturbance (Time)
Threshold	+/- 15% (absolute)	+/- 15% (absolute)	+/- 25% (relative)	+/- 70% (relative)	+/- 20% (absolute)
Goal	+/- 5% (absolute)	+/- 3% (absolute)	+/- 10% (relative)	+/- 20% (relative)	+/- 10% (absolute)

Table 1: 12-Month TA1 Metrics

- 24-month milestone: Refine and expand 12-month M&S with background spectrum.
    - Metric: IV&V verification of M&S ability to incorporate background spectrum based on TA2 measurements and achieve goal replication metrics

Technical Area 2: Characterization of the Background

- Quarterly milestones: Report of atmospheric and background measurement campaign results shared with TA1, TA3 and IV&V performers at technical interchange meetings.
    - Metric: IV&V verification that quality of data is meeting program needs

Technical Area 3: Sensing Modalities

- 12-month milestone: Present and technically justify the measured/projected performance and value of atmospheric sensing techniques and modalities for the purpose of the assessment by DARPA and the IV&V Team. These may include traditional sensor modalities used in new ways; newly developed, innovative atmospheric noise resistant techniques; or unique platforms developed to measure never-before observed atmospheric altitudes.
    - Metric: IV&V assessment that sensor modalities are likely to achieve the sensitivity (based on IV&V analysis) needed to exploit atmospheric and ionospheric phenomena

- 24-month milestone: Further refine promising sensing modalities, including incorporation of background characterization and results of TA1. Present and technically justify recommendations of atmospheric and ionospheric sensing techniques to DARPA and the IV&V Team for Phase 2 field testing.
    - Metric: IV&V assessment that sensing modalities are suitable for field testing

Phase 2 (12 months): Proof of Principle Field Testing

Successful completion of the 24-month program review will initiate requests to select performers to submit revised plans for an optional Phase 2 effort that will evaluate an integrated approach to demonstrating proof of principle for identifying and geolocating both static (e.g. earthquake or mining operations) and dynamic (e.g. thunderstorm) near earth disturbances. Potential field tests include mining operations, storm cells in the US, earthquakes in active Pacific Rim areas, or

breaking mountain waves in North or South America. Notionally, a test campaign consisting of three field tests spaced 3 months apart is projected. This is subject to change based on the nature of the source tested against.

The disturbances that will be tested fall into two general categories: static and dynamic. An example of a static test would be to geolocate the epicenter of an earthquake or mining operation based on its atmospheric perturbations to the same or better degree than seismometry. An example of a dynamic test would be to find and fix a thunderstorm cell to the same or better degree as Doppler radar. DARPA with support from the IV&V team will shape the metrics of the field tests based on analysis of Phase 1 results.

G. Deliverables

Performers will be expected to provide at a minimum the following deliverables:

- Negotiated deliverables specific to the objectives of the performer's efforts. These may include registered reports; computational protocols; publications; intermediate and final versions of software libraries; code; APIs, including documentation; user manuals and/or a comprehensive assemblage of design documents, models, modeling data, and results; and any validation data
- Comprehensive quarterly technical reports due within ten days of the end of each quarter to update the DARPA PM on progress made on specific milestones as laid out in the SOW
- A phase completion report submitted within 30 days of the end of each phase, summarizing accomplishments
- Reporting as outlined in Section VI.C.

H. Government-furnished Property/Equipment/Information

It is anticipated that as the AtmoSense program matures, government furnished information in the form of space environmental data sets and data streams could be provided to help the development of TAs 1 and 2. The government may also furnish data and information for capability evaluation and testing during Phase 1 and may, contingent upon demonstrated need and value to the program, arrange for the use of sensors to provide operational benchmarking during field tests.

I. Other Program Objectives and Considerations

1. Collaboration

It is strongly suggested that proposals address all three TAs in order to develop a coherent approach for determining the ability to use the atmosphere as a sensor. Proposals with a unique approach to address a single TA may be selected for Phase 1 funding only. Such proposals will not be eligible for stand-alone Phase 2 funding, but may be incorporated into successful Phase 1 integrated efforts for the purpose of executing Phase 2.

2. Intellectual Property

It is desired that all noncommercial software (including source code), software documentation, hardware designs and documentation, and technical data generated by the program be provided as deliverables to the Government, with a minimum of Government Purpose Rights (GPR), as lesser rights may adversely impact the lifecycle costs of affected items, components, or

processes.

3. Security Clearance Requirements

Technical Areas 1-3 are expected to involve only unclassified work and will not require clearances.

4. General Proposal Guidance

Proposals should include the following:

- A technical and programmatic strategy that conforms to the entire program schedule and presents an aggressive plan to fully address all program goals, metrics, milestones, and deliverables
- A task structure that is consistent across the proposed schedule, Statement of Work (SOW), and cost volume
- A target start date of November 2020 for planning purposes
- The following meetings and travel in the proposed schedule and costs:
    - A two-day Principal Investigator (PI) meeting held approximately every six months with locations split between the East and West Coasts of the United States. For budgeting purposes, plan for seven two-day meetings over the course of 36 months: four meetings in the Washington, D.C. area and three meetings in the San Francisco, CA area.
    - Regular teleconference meetings will be scheduled with the Government team for progress reporting as well as problem identification and mitigation. Proposers should also anticipate at least three site visits per phase by the DARPA Program Manager during which they will have the opportunity to demonstrate progress towards agreed-upon milestones.

Schedules will be synchronized across performers, as required, and monitored/revised as necessary throughout the program.

II. Award Information

A. General Award Information

DARPA anticipates multiple awards.

The level of funding for individual awards made under this BAA will depend on the quality of the proposals received and the availability of funds. Awards will be made to proposers[6] whose proposals are determined to be the most advantageous to the Government, all evaluation factors considered. See Section V for further information.

The Government reserves the right to:

[6] As used throughout this BAA, "proposer" refers to the lead organization on a submission to this BAA. The proposer is responsible for ensuring that all information required by a BAA--from all team members--is submitted in accordance with the BAA. "Awardee" refers to anyone who might receive a prime award from the Government, including recipients of procurement contracts, grants, cooperative agreements, or Other Transactions. "Subawardee" refers to anyone who might receive a subaward from a prime awardee (e.g., subawardee, consultant, etc.).

- select for negotiation all, some, one, or none of the proposals received in response to this solicitation;
- make awards without discussions with proposers;
- conduct discussions with proposers if it is later determined to be necessary;
- segregate portions of resulting awards into pre-priced options;
- accept proposals in their entirety or to select only portions of proposals for award;
- fund awards in increments with options for continued work at the end of one or more phases;
- request additional documentation once the award instrument has been determined (e.g., representations and certifications); and
- remove proposers from award consideration should the parties fail to reach agreement on award terms within a reasonable time or the proposer fails to provide requested additional information in a timely manner.

Proposals identified for negotiation may result in a procurement contract, grant, cooperative agreement, or other transaction (OT), depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors.

Proposers looking for innovative, commercial-like contractual arrangements are encouraged to consider requesting Other Transactions. To understand the flexibility and options associated with Other Transactions, consult http://www.darpa.mil/work-with-us/contract-management#OtherTransactions.

In accordance with 10 U.S.C. § 2371b(f), the Government may award a follow-on production contract or Other Transaction (OT) for any OT awarded under this BAA if: (1) that participant in the OT, or a recognized successor in interest to the OT, successfully completed the entire prototype project provided for in the OT, as modified; and (2) the OT provides for the award of a follow-on production contract or OT to the participant, or a recognized successor in interest to the OT.
In all cases, the Government contracting officer shall have sole discretion to select award instrument type, regardless of instrument type proposed, and to negotiate all instrument terms and conditions with selectees. DARPA will apply publication or other restrictions, as necessary, if it determines that the research resulting from the proposed effort will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Any award resulting from such a determination will include a requirement for DARPA permission before publishing any information or results on the program. For more information on publication restrictions, see the section below on Fundamental Research.

B. Fundamental Research

It is DoD policy that the publication of products of fundamental research will remain unrestricted to the maximum extent possible. National Security Decision Directive (NSDD) 189 defines fundamental research as follows:

> 'Fundamental research' means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development,

design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

As of the date of publication of this BAA, the Government expects that program goals as described herein may be met by proposers intending to perform fundamental research and does not anticipate applying publication restrictions of any kind to individual awards for fundamental research that may result from this BAA. Notwithstanding this statement of expectation, the Government is not prohibited from considering and selecting research proposals that, while perhaps not qualifying as fundamental research under the foregoing definition, still meet the BAA criteria for submissions. If proposals are selected for award that offer other than a fundamental research solution, the Government will either work with the proposer to modify the proposed statement of work to bring the research back into line with fundamental research or else the proposer will agree to restrictions in order to receive an award.

Proposers should indicate in their proposal whether they believe the scope of the research included in their proposal is fundamental or not. While proposers should clearly explain the intended results of their research, the Government will have sole discretion to determine whether the proposed research will be considered fundamental. Appropriate language will be included in resultant awards for non-fundamental research to prescribe publication requirements and other restrictions, as appropriate. This language can be found at www.darpa.mil/work-with-us/additional-baa.

For certain research projects, it may be possible that although the research to be performed by a potential awardee is non-fundamental research, its proposed subawardee's effort may be fundamental research. It is also possible that the research performed by a potential awardee is fundamental research while its proposed subawardee's effort may be non-fundamental research. In all cases, it is the potential awardee's responsibility to explain in its proposal which proposed efforts are fundamental research and why the proposed efforts should be considered fundamental research.

III. Eligibility Information

A. Eligible Applicants

All responsible sources capable of satisfying the Government's needs may submit a proposal for DARPA's consideration.

1. Federally Funded Research and Development Centers (FFRDCs) and Government Entities

a. FFRDCs

FFRDCs are subject to applicable direct competition limitations and cannot propose to this BAA in any capacity unless they meet the following conditions. (1) FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector. (2) FFRDCs must provide a letter, on official letterhead from their sponsoring organization, that (a) cites the specific authority establishing their eligibility to propose to Government solicitations and compete with industry, and (b) certifies the FFRDC's compliance with the associated FFRDC

sponsor agreement's terms and conditions. These conditions are a requirement for FFRDCs proposing to be awardees or subawardees.

b. Government Entities

Government Entities (e.g., Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations. Government entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority and contractual authority, if relevant, establishing their ability to propose to Government solicitations. This information is required for Government Entities proposing to be awardees or subawardees.

c. Authority and Eligibility

At the present time, DARPA does not consider 15 U.S.C. § 3710a to be sufficient legal authority to show eligibility. While 10 U.S.C.§ 2539b may be the appropriate statutory starting point for some entities, specific supporting regulatory guidance, together with evidence of agency approval, will still be required to fully establish eligibility. DARPA will consider FFRDC and Government Entity eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the proposer.

2. Foreign Participation

Non-U.S. organizations and/or individuals may participate to the extent that such participants comply with any necessary nondisclosure agreements, security regulations, export control laws, and other governing statutes applicable under the circumstances. For classified submissions, this includes mitigating any Foreign Ownership Control and Influence (FOCI) issues prior to transmitting the submission to DARPA. Additional information on these subjects can be found at https://www.dcsa.mil/mc/ctp/foci/.

B. Organizational Conflicts of Interest

FAR 9.5 Requirements

In accordance with FAR 9.5, proposers are required to identify and disclose all facts relevant to potential OCIs involving the proposer's organization and *any* proposed team member (subawardee, consultant). Under this Section, the proposer is responsible for providing this disclosure with each proposal submitted to the BAA. The disclosure must include the proposer's, and as applicable, proposed team member's OCI mitigation plan. The OCI mitigation plan must include a description of the actions the proposer has taken, or intends to take, to prevent the existence of conflicting roles that might bias the proposer's judgment and to prevent the proposer from having unfair competitive advantage. The OCI mitigation plan will specifically discuss the disclosed OCI in the context of each of the OCI limitations outlined in FAR 9.505-1 through FAR 9.505-4.

Agency Supplemental OCI Policy

In addition, DARPA has a supplemental OCI policy that prohibits contractors/performers from concurrently providing Scientific Engineering Technical Assistance (SETA), Advisory and Assistance Services (A&AS) or similar support services and being a technical performer. Therefore, as part of the FAR 9.5 disclosure requirement above, a proposer must affirm whether

the proposer or *any* proposed team member (subawardee, consultant) is providing SETA, A&AS, or similar support to any DARPA office(s) under: (a) a current award or subaward; or (b) a past award or subaward that ended within one calendar year prior to the proposal's submission date.

If SETA, A&AS, or similar support is being or was provided to any DARPA office(s), the proposal must include:

- The name of the DARPA office receiving the support;
- The prime contract number;
- Identification of proposed team member (subawardee, consultant) providing the support; and
- An OCI mitigation plan in accordance with FAR 9.5.

Government Procedures
In accordance with FAR 9.503, 9.504 and 9.506, the Government will evaluate OCI mitigation plans to avoid, neutralize or mitigate potential OCI issues before award and to determine whether it is in the Government's interest to grant a waiver. The Government will only evaluate OCI mitigation plans for proposals that are determined selectable under the BAA evaluation criteria and funding availability.

The Government may require proposers to provide additional information to assist the Government in evaluating the proposer's OCI mitigation plan.

If the Government determines that a proposer failed to fully disclose an OCI; or failed to provide the affirmation of DARPA support as described above; or failed to reasonably provide additional information requested by the Government to assist in evaluating the proposer's OCI mitigation plan, the Government may reject the proposal and withdraw it from consideration for award.

Include any OCIs affirmations and disclosures in Attachment G Proposal Template Vol. 3-Admin and National Policy Requirements.

C. Cost Sharing/Matching

Cost sharing is not required; however, it will be carefully considered where there is an applicable statutory condition relating to the selected funding instrument (e.g., OTs under the authority of 10 U.S.C. § 2371). 10 U.S.C. § 2371). Cost sharing is encouraged where there is a reasonable probability of a potential commercial application related to the proposed research and development effort.

For more information on potential cost sharing requirements for Other Transactions for Prototype, see http://www.darpa.mil/work-with-us/contract-management#OtherTransactions.

IV. Application and Submission Information

Prior to submitting a full proposal, proposers are *strongly encouraged* to first submit an abstract as described below. This process allows a proposer to ascertain whether the proposed concept is: (1) applicable to the AtmoSense BAA and (2) currently of interest. For the purposes of this BAA, applicability is defined as follows:

- The proposed concept is applicable to the technical areas described herein.
- The proposed concept is important to DSO's current investment portfolio.
- The proposed concept investigates an innovative approach that enables revolutionary advances, i.e., will not primarily result in evolutionary improvements to the existing state of practice.
- The proposed work has not already been completed (i.e., the research element is complete but manufacturing/fabrication funds are required).
- The proposer has not already received funding or a positive funding decision for the proposed concept (whether from DARPA or another Government agency).

Abstracts and full proposals that are not found to be applicable to the AtmoSense BAA as defined above may be deemed non-conforming[7] and removed from consideration. All abstracts and full proposals must provide sufficient information to assess the validity/feasibility of their claims as well as comply with the requirements outlined herein for submission formatting, content and transmission to DARPA. Abstracts and full proposals that fail to do so may be deemed non-conforming and removed from consideration. Proposers will be notified of non-conforming determinations via letter.

A. Address to Request Application Package

This document contains all information required to submit a response to this solicitation. No additional forms, kits, or other materials are needed except as referenced herein. No request for proposal or additional solicitation regarding this opportunity will be issued, nor is additional information available except as provided at the beta.sam.gov website (http://beta.sam.gov), the Grants.gov website (http://www.grants.gov/), or referenced herein.

B. Content and Form of Application Submission

1. Abstract Information

As stated above, proposers are strongly encouraged to submit an abstract in advance of a full proposal to minimize effort and reduce the potential expense of preparing an out of scope proposal. The abstract provides a synopsis of the proposed project by briefly answering the following questions:

- What is the proposed work attempting to accomplish or do?
- How is it done today, and what are the limitations?
- Who will care and what will the impact be if the work is successful?
- How much will it cost, and how long will it take?

DARPA will respond to abstracts with a statement as to whether DARPA is interested in the idea. If DARPA does not recommend the proposer submit a full proposal, DARPA will provide feedback to the proposer regarding the rationale for this decision. Regardless of DARPA's response to an abstract, proposers may submit a full proposal. DARPA will review all

[7] "Conforming" is defined as having been submitted in accordance with the requirements outlined herein.

conforming full proposals using the published evaluation criteria and without regard to any comments resulting from the review of an abstract.

Proposers should note that a favorable response to an abstract is not a guarantee that a proposal based on the abstract will ultimately be selected for award negotiation.

While it is DARPA policy to attempt to reply to abstracts within thirty calendar days, proposers to this solicitation may anticipate a response within approximately three weeks. These official notifications will be sent via email to the Technical POC and/or Administrative POC identified on the abstract coversheet.

a. Abstract Format

All proposers are required to use Attachment A: Abstract Summary Slide Template and Attachment B: Abstract Template provided to this solicitation on http://beta.sam.gov and http://www.grants.gov. Attachment A Abstract Summary Slide Template described herein must be in .ppt or .pptx format and should be attached as a separate file to this document.

2. Full Proposal Information

Proposals consist of Volume 1: Technical and Management Volume, Volume 2: Cost Volume, and Volume 3: Administrative and National Policy Requirements Volume.

To assist in proposal development, various attachments have been provided along with the BAA posted on http://beta.sam.gov (Attachment C: Proposal Summary Slide Template, Attachment D: Proposal Template Volume 1 Technical & Management Volume, Attachment E: Proposal Template Volume 2 Cost Volume, Attachment F: Proposal Template Volume 2 Cost Summary Spreadsheet, and Attachment G: Proposal Template Volume 3 Administrative & National Policy Requirements Volume).

Full proposals requesting a procurement contract or other transaction (OT) must use the following attachments:

- Attachment C
- Attachment D
- Attachment E
- Attachment F
- Attachment G

Full proposals requesting a grant or cooperative agreement must use the following attachments in addition to the Grants.gov application package:

- Attachment C
- Attachment D
- Attachment F
- Attachment G

*Note – Budget Justification should be provided as Section L of the SF 424 Research & Related Budget form provided via Grants.gov. The Budget Justification should include the following information for the recipient and all subawardees: (1) Direct

Labor: Detail the total number of persons and their level of commitment for each position listed (in sections A and B), as well as which specific tasks (as described in the SOW) they will support.(2) Equipment (section C) Provide an explanation for listed requested equipment exceeding $5,000, properly justifying their need to meet the objectives of the program. (3) Travel (section D) Provide the purpose of the trip, number of trips, number of days per trip, departure and arrival destinations, number of people, etc. (4) Other Direct Costs (section F). Provide a justification for the items requested and an explanation of how the estimates were obtained.

DARPA Embedded Entrepreneur Initiative (optional sub-section; does not count toward page count): To catalyze the conversion of scientific discovery to impact, the Defense Sciences Office offers applicants the opportunity for additional funding and transition assistance through participation in the Embedded Entrepreneur Initiative. The DARPA Embedded Entrepreneur Initiative will provide additional funding, up to $250,000, to employ one entrepreneur-in residence or one corporate business development lead. The entrepreneurial lead's ultimate goal is to develop a robust go to market strategy for entering into defense and commercial markets.

All commercialization and transition activities will be timed to suit the Performer's stage of maturity. Often, the Embedded Entrepreneurial work is most useful in year two or three of a Program. Activities conducted can include, but are not limited to; cost modeling, end user engagement, market analysis and mapping, competitive analysis, techno-economic analysis, manufacturing and scale-up strategy, IP securement strategy, and financial plan creation.

Embedded Entrepreneur participants will work closely with DARPA's Commercial Strategy team and their extensive network of U.S. investors, strategic partners, and mentors.

Proposers wishing to participate in the Embedded Entrepreneur Initiative must:

- Include an initial hypothesis describing how the proposed technology will transition from its current state to future integration into a product or capability.
- Include separately costed tasks describing plans to build and refine a viable Go to Market Strategy over the course of the DARPA program. Tasks contributing to the build of a robust Go to Market Strategy can include, but are not limited to; cost modeling, end user engagement, market analysis and mapping, competitive analysis, techno-economic analysis, manufacturing and scale-up strategy, IP securement strategy, and financial plan creation.

Participation in the Embedded Entrepreneur Initiative is voluntary but highly recommended.

Participants are not expected to form a new company or leave their current research positions to pursue transition, but are expected to, throughout the lifecycle of the proposed effort, identify appropriate partners for enabling transition. Embedded Entrepreneur Initiative funding requests should be consistent with the proposed work scope and proposed timeline, but are anticipated to be in the range of $250,000 per Performer.

Proposals not meeting the format prescribed herein may not be reviewed.

a. Full Proposal Format

All proposers are required to use the templates provided as attachments to this solicitation on http://beta.sam.gov and http://www.grants.gov. Formatting instructions are provided therein.

3. Proprietary Information

Proposers are responsible for clearly identifying proprietary information. Submissions containing proprietary information must have the cover page and each page containing such information clearly marked with a label such as "Proprietary" or "Company Proprietary." NOTE: "Confidential" is a classification marking used to control the dissemination of U.S. Government National Security Information as dictated in Executive Order 13526 and should not be used to identify proprietary business information. See Section V.B.1 for additional information.

4. Security Information

DARPA anticipates that submissions received under this BAA will be unclassified. However, should a proposer wish to submit classified information, an *unclassified* email must be sent to the BAA mailbox requesting submission instructions from the DARPA/DSO Program Security Officer (PSO).

Security classification guidance and direction via a Security Classification Guard (SCG) and/or DD Form 254, "DoD Contract Security Classification Specification," will not be provided at this time, since DARPA is soliciting ideas only. If a determination is made that the award instrument may result in access to classified information, a SCG and/or DD Form 254 will be issued by DARPA and attached as part of the award.

C. Submission Dates and Times

Proposers are warned that submission deadlines as outlined herein are in Eastern Time and will be strictly enforced. When planning a response to this solicitation, proposers should take into account that some parts of the submission process may take from one business day to one month to complete (e.g., registering for a Data Universal Numbering System (DUNS) number or Taxpayer Identification Number (TIN)).

DARPA will acknowledge receipt of *complete* submissions via email and assign identifying numbers that should be used in all further correspondence regarding those submissions. If no confirmation is received within two business days, please contact the BAA Administrator at AtmoSense@darpa.mil to verify receipt.

1. Abstracts

Abstracts must be submitted per the instructions outlined herein *and received by DARPA* no later than the due date and time listed in Part One: Overview Information. Abstracts received after this time and date may not be reviewed.

2. Full Proposals

Full proposal packages--full proposal (Technical and Management Volume, Cost Volume,

National and Administrative Requirements) and, as applicable, proprietary subawardee cost proposals, classified appendices to unclassified proposals-- must be submitted per the instructions outlined herein *and received by DARPA* no later than the due date and time listed in Part One: Overview Information. Proposals received after this time and date may not be reviewed.

D. Funding Restrictions

Not applicable.

E. Other Submission Requirements

1. Unclassified Submission Instructions

Proposers must submit all parts of their submission package using the same method; submissions cannot be sent in part by one method and in part by another method nor should duplicate submissions be sent by multiple methods. Email submissions will not be accepted. Failure to comply with the submission procedures outlined herein may result in the submission being deemed non-conforming and withdrawn from consideration.

a. Abstracts

DARPA/DSO will employ an electronic upload submission system (https://baa.darpa.mil/) for all UNCLASSIFIED abstracts sent in response to this solicitation. *Abstracts must not be submitted via Grants.gov.*

First time users of the DARPA BAA Submission website must complete a two-step account creation process. The first step consists of registering for an extranet account by going to the URL listed above and selecting the "Account Request" link. Upon completion of the online form, proposers will receive two separate emails; one will contain a user name and the second will provide a temporary password. Once both emails have been received, the second step requires proposers to go back to the submission website and log in using that user name and password. After accessing the extranet, proposers may then create a user account for the DARPA BAA Submission website by selecting the "Register your Organization" link at the top of the page. Once the user account is created, proposers will be able to see a list of solicitations open for submissions, view submission instructions, and upload/finalize their abstract.

Proposers who already have an account on the DARPA BAA Submission website may simply log in at https://baa.darpa.mil/, select this solicitation from the list of open DARPA solicitations and proceed with their abstract submission. Note: proposers who have created a DARPA BAA Submission website account to submit to another DARPA Technical Office's solicitations do not need to create a new account to submit to this solicitation.

All abstracts submitted electronically through the DARPA BAA Submission website must meet the following requirements: (1) uploaded as a zip file (.zip or .zipx extension); (2) only contain the document(s) requested herein; (3) only contain unclassified information; and (4) must not exceed 100 MB in size. Only one zip file will be accepted per abstract and abstracts not uploaded as zip files will be rejected by DARPA.

Technical support for the DARPA BAA Submission website is available during regular business

hours, Monday – Friday, 9:00 a.m. – 5:00 p.m. Requests for technical support must be emailed to BAAT_Support@darpa.mil with a copy to AtmoSense@darpa.mil. Questions regarding submission contents, format, deadlines, etc. should be emailed to AtmoSense@darpa.mil. Questions/requests for support sent to any other email address may result in delayed/no response.

Since proposers may encounter heavy traffic on the web server, DARPA discourages waiting until the day abstracts are due to request an account and/or upload the submission.
Note: Proposers submitting an abstract via the DARPA BAA Submission site MUST (1) click the "Finalize" button in order for the submission to upload AND (2) do so with sufficient time for the upload to complete prior to the deadline. Failure to do so will result in a late submission.

b. Proposals Requesting a Procurement Contract or Other Transaction

Proposers requesting procurement contracts or other transactions may submit full proposals through ONE of the following methods: (1) electronic upload (DARPA-preferred); or (2) direct mail/hand-carry.

i. Electronic Upload

DARPA/DSO encourages proposers to submit UNCLASSIFIED proposals via the DARPA BAA Submission website at https://baa.darpa.mil/.

First time users of the DARPA BAA Submission website must complete a two-step account creation process. The first step consists of registering for an extranet account by going to the URL listed above and selecting the "Account Request" link. Upon completion of the online form, proposers will receive two separate emails; one will contain a user name and the second will provide a temporary password. Once both emails have been received, the second step requires proposers to go back to the submission website and log in using that user name and password. After accessing the extranet, proposers may then create a user account for the DARPA BAA Submission website by selecting the "Register your Organization" link at the top of the page. Once the user account is created, proposers will be able to see a list of solicitations open for submissions, view submission instructions, and upload/finalize their proposal.

Proposers who already have an account on the DARPA BAA Submission website may simply log in at https://baa.darpa.mil/, select this solicitation from the list of open DARPA solicitations and proceed with their proposal submission. *Note: proposers who have created a DARPA BAA Submission website account to submit to another DARPA Technical Office's solicitations do not need to create a new account to submit to this solicitation.*

All full proposals submitted electronically through the DARPA BAA Submission website must meet the following requirements: (1) uploaded as a zip file (.zip or .zipx extension); (2) only contain the document(s) requested herein; (3) only contain unclassified information; and (4) must not exceed 100 MB in size. Only one zip file will be accepted per full proposal and full proposals not uploaded as zip files will be rejected by DARPA.

Technical support for the DARPA BAA Submission website is available during regular business hours, Monday – Friday, 9:00 a.m. – 5:00 p.m. Requests for technical support must be emailed to BAAT_Support@darpa.mil with a copy to AtmoSense@darpa.mil. Questions regarding

submission contents, format, deadlines, etc. should be emailed to AtmoSense@darpa.mil. Questions/requests for support sent to any other email address may result in delayed/no response.

Since proposers may encounter heavy traffic on the web server, DARPA discourages waiting until the day proposals are due to request an account and/or upload the submission. Note: Proposers submitting a proposal via the DARPA BAA Submission site MUST (1) click the "Finalize" button in order for the submission to upload AND (2) do so with sufficient time for the upload to complete prior to the deadline. Failure to do so will result in a late submission.

ii. Direct Mail/Hand-carry

Proposers electing to submit procurement contract or other transaction proposals via direct mail or hand-carried must provide one paper copy and one electronic copy on CD or DVD of the full proposal package. All parts of the proposal package must be mailed or hand-carried in a single delivery to the address noted in Section VII below.

c. Proposals Requesting a Grant or Cooperative Agreement

Proposers requesting grants or cooperative agreements may only submit proposals through ONE of the following methods: (1) electronic upload at Grants.gov (DARPA-preferred); or (2) direct mail/hand-carry to DARPA. If proposers intend to use Grants.gov as their means of submission, then they must submit their entire proposal through Grants.gov; applications cannot be submitted in part to Grants.gov and in part as a hard-copy. Proposers using Grants.gov do not submit hard-copy proposals in addition to the Grants.gov electronic submission.

To evaluate compliance with Title IX of the Education Amendments of 1972 {20 U.S.C. A§ 1681 Et. Seq.), the Department of Defense is collecting certain demographic and career information to be able to assess the success rates of women who are proposed for key roles in applications in STEM disciplines. To enable this assessment, each application must include the two following forms completed as instructed: the Research and Related Senior/Key Person Profile (Expanded) form and the Research and Related Personal Data form. Both forms are provided with the application package in Grants.gov.

i. Electronic Upload

DARPA encourages grant and cooperative agreement proposers to submit their proposals via electronic upload at http://www.grants.gov/web/grants/applicants/apply-for-grants.html. Proposers electing to use this method must complete a one-time registration process on Grants.gov before a proposal can be electronically submitted. *If proposers have not previously registered, this process can take up to four weeks so* registration should be done in sufficient time to ensure it does not impact a proposer's ability to meet required submission deadlines. Registration requirements and instructions are outlined at http://www.grants.gov/web/grants/register.html.

Carefully follow the DARPA submission instructions provided with the solicitation application package on Grants.gov. Only the required forms listed therein (e.g., SF-424 and Attachments form) should be included in the submission. *Note: Grants.gov does not accept zipped or encrypted proposals.*

Once Grants.gov has received an uploaded proposal submission, Grants.gov will send two email

messages to notify proposers that: (1) the proposal has been received by Grants.gov; and (2) the proposal has been either validated or rejected by the system. *It may take up to two business days to receive these emails.* If the proposal is validated, then the proposer has successfully submitted their proposal. If the proposal is rejected, the submission must be corrected, resubmitted and revalidated before DARPA can retrieve it. If the solicitation is no longer open, the rejected proposal cannot be resubmitted. Once the proposal is retrieved by DARPA, Grants.gov will send a third email to notify the proposer. DARPA will send a final confirmation email as described in Section IV.C.

To avoid missing deadlines, Grants.gov recommends that proposers submit their proposals to Grants.gov 24-48 hours in advance of the proposal due date to provide sufficient time to complete the registration and submission process, receive email notifications and correct errors, as applicable.

Technical support for Grants.gov submissions may be reached at 1-800-518-4726 or support@grants.gov.

ii. Direct Mail/Hand-carry

Proposers electing to submit grant or cooperative agreement proposals via direct mail or hand-carried must provide one paper copy and one electronic copy on CD or DVD of the full proposal package. Proposers must complete the SF 424 R&R form (Application for Federal Assistance, Research and Related) provided at Grants.gov as part of the opportunity application package for this BAA and include it in the proposal submission. All parts of the proposal package must be mailed or hand-carried to the address noted in Section VII below.

V. Application Review Information

A. Evaluation Criteria

Proposals will be evaluated using the following criteria listed in descending order of importance: Overall Scientific and Technical Merit; Potential Contribution and Relevance to the DARPA Mission; and Cost Realism.

- **Overall Scientific and Technical Merit**

The proposed technical approach is innovative, feasible, achievable, and complete.

The proposed technical team has the expertise and experience to accomplish the proposed tasks. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final outcome that achieves the goal can be expected as a result of award. The proposal identifies major technical risks and planned mitigation efforts are clearly defined and feasible. The proposed schedule aggressively pursues performance metrics in an efficient time frame that accurately accounts for the anticipated workload.

- **Potential Contribution and Relevance to the DARPA Mission**

The potential contributions of the proposed effort bolster the national security technology base, and support DARPA's mission to make pivotal early technology investments that create or

prevent technological surprise. The proposed intellectual property restrictions (if any) will not significantly impact the Government's ability to transition the technology.

- **Cost Realism**

The proposed costs are realistic for the technical and management approach and accurately reflect the technical goals and objectives of the solicitation. The proposed costs are consistent with the proposer's Statement of Work and reflect a sufficient understanding of the costs and level of effort needed to successfully accomplish the proposed technical approach. The costs for the prime proposer and proposed subawardees are substantiated by the details provided in the proposal (e.g., the type and number of labor hours proposed per task, the types and quantities of materials, equipment and fabrication costs, travel and any other applicable costs and the basis for the estimates).

B. Review and Selection Process

DARPA will conduct a scientific/technical review of each conforming proposal. Conforming proposals comply with all requirements detailed in this BAA; proposals that fail to do so may be deemed non-conforming and may be removed from consideration. Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

The review process identifies proposals that meet the evaluation criteria described above and are, therefore, selectable for negotiation of awards by the Government. DARPA policy is to ensure impartial, equitable, comprehensive proposal evaluations and to select proposals that meet DARPA technical, policy, and programmatic goals. Proposals that are determined selectable will not necessarily receive awards (see Section II). Selections may be made at any time during the period of solicitation. For evaluation purposes, a proposal is defined to be the document and supporting materials as described in Section IV.

1. Handling of Source Selection Information

DARPA policy is to treat all submissions as source selection information (FAR 2.101 and 3.104), and to only disclose their contents to authorized personnel. Restrictive notices notwithstanding, submissions may be handled by support contractors for administrative purposes and/or to assist with technical evaluation. All DARPA support contractors performing this role are expressly prohibited from performing DARPA-sponsored technical research and are bound by appropriate nondisclosure agreements. Subject to the restrictions set forth in FAR 37.203(d), DARPA may also request input on technical aspects of the proposals from other non-Government consultants/experts who are strictly bound by the appropriate non-disclosure requirements.

Submissions will not be returned. The original of each submission received will be retained at DARPA and all other non-required copies destroyed. A certification of destruction may be requested via email to the BAA mailbox, provided the formal request is received within 5 days after being notified of submission status.

C. Federal Awardee Performance and Integrity Information (FAPIIS)

Following the review and selection process described above, but prior to making an award above

the simplified acquisition threshold (FAR 2.101), DARPA is required[8] to review and consider any information available through the designated integrity and performance system (currently FAPIIS). Selectees have the opportunity to comment on any information about themselves entered in the database. DARPA will consider any comments and other information in FAPIIS or other systems prior to making an award.

VI. Award Administration Information

A. Selection Notices

After proposal evaluations are complete, proposers will be notified as to whether their proposal was selected for award negotiation as a result of the review process. Notification will be sent by email to the Technical and Administrative POCs identified on the proposal cover sheet. If a proposal has been selected for award negotiation, the Government will initiate those negotiations following the notification.

B. Administrative and National Policy Requirements

1. Solicitation Provisions and Award Clauses, Terms and Conditions

Solicitation provisions relevant to DARPA BAAs are listed on the Additional BAA Content page on DARPA's website at www.darpa.mil/work-with-us/additional-baa. This page also lists award clauses that, depending on their applicability, may be included in the terms and conditions of awards resultant from DARPA solicitations. This list is not exhaustive and the clauses, terms and conditions included in a resultant award will depend on the nature of the research effort, the specific award instrument, the type of awardee, and any applicable security or publication restrictions.

For terms and conditions specific to grants and/or cooperative agreements, see the DoD General Research Terms and Conditions (latest version) at www.onr.navy.mil/Contracts-Grants/submit-proposal/grants-proposal/grants-terms-conditions.aspx and the supplemental DARPA-specific terms and conditions at www.darpa.mil/work-with-us/contract-management#GrantsCooperativeAgreements.

The above information serves to put potential proposers and awardees on notice of proposal requirements and award terms and conditions to which they may have to adhere.

2. System for Award Management (SAM) and Universal Identifier Requirements

All proposers must be registered in SAM unless exempt per FAR 4.1102. FAR 52.204-7, "System for Award Management" and FAR 52.204-13, "System for Award Management Maintenance" are incorporated into this BAA. See http://www.darpa.mil/work-with-us/additional-baa for further information.

International entities can register in SAM by following the instructions in this link: https://www.fsd.gov/fsd-gov/answer.do?sysparm_kbid=dbf8053adb119344d71272131f961946&sysparm_search=KB0013221.

[8] Per 41 U.S.C. 2313, as implemented by FAR 9.103 and 2 CFR § 200.205.

NOTE: new registrations can take an average of 7-10 business days to process in SAM. SAM registration requires the following information:

- DUNS number
- TIN
- Commercial and Government Entity (CAGE) Code. If a proposer does not already have a CAGE code, one will be assigned during SAM registration.
- Electronic Funds Transfer information (e.g., proposer's bank account number, routing number, and bank phone or fax number).

3. Representations and Certifications

In accordance with FAR 4.1102 and 4.1201, proposers requesting a procurement contract must complete electronic annual representations and certifications at www.sam.gov/. In addition, resultant procurement contracts will require supplementary DARPA-specific representations and certifications. See www.darpa.mil/work-with-us/additional-baa for further information.

4. Intellectual Property

Proposers should note that the Government does not own the intellectual property or technical data/computer software developed under Government contracts. The Government acquires the right to use the technical data/computer software. Regardless of the scope of the Government's rights, awardees may freely use their same data/software for their own commercial purposes (unless restricted by U.S. export control laws or security classification). Therefore, technical data and computer software developed under this solicitation will remain the property of the awardees, though DARPA will have, at a minimum, Government Purpose Rights (GPR) to technical data and computer software developed through DARPA sponsorship.

If proposers desire to use proprietary computer software or technical data or both as the basis of their proposed approach, in whole or in part, they should: (1) clearly identify such software/data and its proposed particular use(s); (2) explain how the Government will be able to reach its program goals (including transition) within the proprietary model offered; and (3) provide possible nonproprietary alternatives in any area that might present transition difficulties or increased risk or cost to the Government under the proposed proprietary solution. Proposers expecting to use, but not to deliver, commercial open source tools or other materials in implementing their approach may be required to indemnify the Government against legal liability arising from such use.

All references to "Unlimited Rights" or "Government Purpose Rights" are intended to refer to the definitions of those terms as set forth in the Defense Federal Acquisition Regulation Supplement (DFARS) 227.

a. Intellectual Property Representations

All proposers must provide a good faith representation of either ownership or possession of appropriate licensing rights to all other intellectual property to be used for the proposed project. Proposers must 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.

b. Patents

All proposers must include documentation proving ownership or possession of appropriate licensing rights to all patented inventions to be used for the proposed project. If a patent application has been filed for an invention, but it includes proprietary information and is not publicly available, a proposer must provide documentation that includes: the patent number, inventor name(s), assignee names (if any), filing date, filing date of any related provisional application, and summary of the patent title, with either: (1) a representation of invention ownership; or (2) proof of possession of appropriate licensing rights in the invention (i.e., an agreement from the owner of the patent granting license to the proposer)..

c. Procurement Contracts

- **Noncommercial Items (Technical Data and Computer Software):** Proposers requesting a procurement contract must list all noncommercial technical data and computer software that it plans to generate, develop, and/or deliver, in which the Government will acquire less than unlimited rights and to assert specific restrictions on those deliverables. In the event a proposer does not submit the list, the Government will assume that it has unlimited rights to all noncommercial technical data and computer software generated, developed, and/or delivered, unless it is substantiated that development of the noncommercial technical data and computer software occurred with mixed funding. If mixed funding is anticipated in the development of noncommercial technical data and computer software generated, developed, and/or delivered, proposers should identify the data and software in question as subject to GPR. In accordance with DFARS 252.227-7013, "Rights in Technical Data - Noncommercial Items," and DFARS 252.227-7014, "Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation," the Government will automatically assume that any such GPR restriction is limited to a period of 5 years, at which time the Government will acquire unlimited rights unless the parties agree otherwise. The Government may use the list during the evaluation process to evaluate the impact of any identified restrictions and may request additional information from the proposer, as may be necessary, to evaluate the proposer's assertions. Failure to provide full information may result in a determination that the proposal is non-conforming. A template for complying with this request is provided in Section IV.B.2.

- **Commercial Items (Technical Data and Computer Software):** Proposers requesting a procurement contract must list all commercial technical data and commercial computer software that may be included in any noncommercial deliverables contemplated under the research project, and assert any applicable restrictions on the Government's use of such commercial technical data and/or computer software. In the event a proposer does not submit the list, the Government will assume there are no restrictions on the Government's use of such commercial items. The Government may use the list during the evaluation process to evaluate the impact of any identified restrictions and may request additional information from the proposer to evaluate the proposer's assertions. Failure to provide full information may result in a determination that the proposal is non-conforming. A template for complying with this request is provided in Section IV.B.2.

d. Other Types of Awards

Proposers requesting an award instrument other than a procurement contract must follow the applicable rules and regulations governing those award instruments, but in all cases should appropriately identify any potential restrictions on the Government's use of any intellectual property contemplated under those award instruments. This includes both noncommercial items and commercial items. The Government may use the list as part of the evaluation process to assess the impact of any identified restrictions, and may request additional information from the proposer, to evaluate the proposer's assertions. Failure to provide full information may result in a determination that the proposal is non-conforming. A template for complying with this request is provided in Section IV.B.2.c.

5. Program-generated Data

Data are increasingly the key product of research and engineering endeavors. To ensure the reproducibility of results and access to source data for future research, awardees will be required to maintain and deliver any data generated during award performance ("program-generated data") that is needed to accomplish these goals. Awardees will be expected to document both the proprietary and non-proprietary products of their research to ensure the retention and potential reusability of this information. This may include:

- Raw unprocessed data, software source code and executables, build scripts, process sequence, programmatic communication and other collaboration activities;
- Data sets: rarified, experimental, test and measurement data;
- Design of experiments and simulations;
- Models or simulations (computational or mathematical);
- Recordings of various physical phenomena (including images, videos, senor data, etc.);
- Access to and use of institutional, organizational or scientific community repositories and archives

All program-generated data will reside in DARPA's data repository. When possible, DARPA may share some or all of the program-generated data with the broader research community as open data (with permission to access, reuse, and redistribute under appropriate licensing terms where required) to the extent permitted by applicable law and regulations (e.g., privacy, security, rights in data, and export control). DARPA plans to enable reproducibility of results through data sharing and to establish (or contribute to) digital collections that can advance this and other scientific fields.

6. Human Subjects Research (HSR)/Animal Use

Proposers that anticipate involving human subjects or animals in the proposed research must comply with the approval procedures detailed at www.darpa.mil/work-with-us/additional-baa, to include providing the information specified therein as required for proposal submission.

7. Controlled Unclassified Information (CUI) and Controlled Technical Information (CTI) on Non-DoD Information Systems

Proposers and awardees may be subject to the DARPA requirements related to CUI or CTI on Non-DoD Information Systems as detailed at www.darpa.mil/work-with-us/additional-baa.

CUI and CTI guidance and/or a CUI/CTI guide may be required depending on system and/or the populations performers propose to study. DARPA will make a determination if a CUI/CTI guide is necessary during the selection process and selectees will be notified of CUI/CTI guidance during contract negotiations. Proposers should indicate if they believe their approach will include CUI or CTI in their proposal.

CUI is defined as unclassified information that requires safeguarding or dissemination controls, pursuant to and consistent with applicable law, regulations, and Government-wide policies.

Controlled Technical Information (CTI) is defined as technical information with military or space application that is subject to controls on its access, use, reproduction, modification, performance, display, release, disclosure, or dissemination. The term CTI does not include information that is lawfully publicly available without restrictions.

DOD considers “technical information” to be technical data or computer software, as those terms are defined in Defense Federal Acquisition Regulation Supplement clause 252.227-7013, "Rights in Technical Data - Noncommercial Items" (48 CFR 252.227-7013). Examples of technical information include research and engineering data, engineering drawings, and associated lists, specifications, standards, process sheets, manuals, technical reports, technical orders, catalog-item identifications, data sets, studies and analyses and related information, and computer software code. Note that such technical information may or may not be controlled (i.e., CTI), depending on whether it has military or space application.

CTI is to be marked “DISTRIBUTION C. Distribution authorized to U.S. Government agencies and their contractor; Critical Technology; Current date. Other requests for this document shall be referred to DARPA, DSO” in accordance with Department of Defense Instruction 5230.24, "Distribution Statements on Technical Documents."

8. Electronic Invoicing and Payments

Awardees will be required to submit invoices for payment electronically via Wide Area Work Flow (WAWF) at https://wawf.eb.mil, unless an exception applies. Registration in WAWF is required prior to any award under this BAA.

9. Electronic and Information Technology

All electronic and information technology acquired or created through this BAA must satisfy the accessibility requirements of Section 508 of the Rehabilitation Act (29 U.S.C. § 749d) and FAR 39.2.

10. Publication of Agreement Awards

Per Section 8123 of the Department of Defense Appropriations Act, 2015 (Pub. L. 113-235), all grant awards must be posted on a public website in a searchable format. To comply with this requirement, proposers requesting grant awards must submit a maximum one (1) page abstract that may be publicly posted and explains the program or project to the public. The proposer should sign the bottom of the abstract confirming the information in the abstract is approved for public release. Proposers are advised to provide both a signed PDF copy, as well as an editable (e.g., Microsoft word) copy. Abstracts contained in grant proposals that are not selected for award will not be publicly posted.

11. Disclosure of Information and Compliance with Safeguarding Covered Defense Information Controls

The following provisions and clause apply to all solicitations and contracts; however, the definition of "controlled technical information" clearly exempts work considered fundamental research and therefore, even though included in the contract, will not apply if the work is fundamental research.

DFARS 252.204-7000, "Disclosure of Information"
DFARS 252.204-7008, "Compliance with Safeguarding Covered Defense Information Controls"
DFARS 252.204-7012, "Safeguarding Covered Defense Information and Cyber Incident Reporting"

The full text of the above solicitation provision and contract clauses can be found at http://www.darpa.mil/work-with-us/additional-baa#NPRPAC.

Compliance with the above requirements includes the mandate for proposers to implement the security requirements specified by National Institute of Standards and Technology (NIST) Special Publication (SP) 800-171, "Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations" (see https://doi.org/10.6028/NIST.SP.800-171r1) that are in effect at the time the BAA is issued.

For awards where the work is considered fundamental research, the contractor will not have to implement the aforementioned requirements and safeguards. However, should the nature of the work change during performance of the award, work not considered fundamental research will be subject to these requirements.

C. Reporting

1. Technical and Financial Reports

The number and types of technical and financial reports required under the contracted project will be specified in the award document, and will include, as a minimum, monthly financial

status reports and a yearly status summary. A final report that summarizes the project and tasks will be required at the conclusion of the performance period for the award. The reports must be prepared and submitted in accordance with the procedures contained in the award document.

2. Patent Reports and Notifications

All resultant awards will contain a mandatory requirement for patent reports and notifications to be submitted electronically through i-Edison (https://public.era.nih.gov/iedison).

VII. Agency Contacts

DARPA will use email for all technical and administrative correspondence regarding this solicitation.

- **Technical POC**: Charlton "David" Lewis, II, Program Manager, DARPA/DSO
- **BAA Email:** AtmoSense@darpa.mil
- **BAA Mailing Address:**

  DARPA/DSO

  ATTN: HR001120S0036
  675 North Randolph Street
  Arlington, VA 22203-2114

- **DARPA/DSO Opportunities Website:** http://www.darpa.mil/work-with-us/opportunities

For information concerning agency level protests see http://www.darpa.mil/work-with-us/additional-baa#NPRPAC.

VIII. Other Information

A. Frequently Asked Questions (FAQs)

Administrative, technical, and contractual questions should be emailed to AtmoSense@darpa.mil. All questions must be in English and must include the name, email address, and the telephone number of a point of contact.

DARPA will attempt to answer questions in a timely manner; however, questions submitted within 10 days of the proposal due date may not be answered. DARPA will post an FAQ list at: http://www.darpa.mil/work-with-us/opportunities. The list will be updated on an ongoing basis until the BAA expiration date as stated in Part I.

B. Collaborative Efforts/Teaming

DARPA highly encourages teaming before proposal submission and, as such, will facilitate the formation of teams with the necessary expertise. Interested parties should submit a one-page profile including the following information:

- Contact information to include name, organization, email, telephone number, mailing

address, organization website (if applicable).
- A brief description of the proposer's technical competencies.
- Desired expertise from other teams, if applicable.

All profiles must be emailed to AtmoSense@darpa.mil no later than 4:00 p.m. February 18, 2020. Following the deadline, the consolidated teaming profiles will be sent via email to the proposers who submitted a valid profile. Specific content, communications, networking, and team formation are the sole responsibility of the participants. Neither DARPA nor the DoD endorses the information and organizations contained in the consolidated teaming profile document, nor does DARPA or the DoD exercise any responsibility for improper dissemination of the teaming profiles. Teams need not be finalized at the time of abstract submission.

C. Proposers Day

The AtmoSense Proposers Day was held on February 14, 2020 in Arlington, VA. Attendance at the AtmoSense Proposers Day or viewing of the webcast was voluntary and is not required to propose to this solicitation.

The Government's presentation is published under HR001120S0036 on the DARPA's Opportunity Page, https://www.darpa.mil/work-with-us/opportunities?tFilter=&oFilter=2&sort=date.