

**ARMY RESEARCH OFFICE**

**BROAD AGENCY ANNOUNCEMENT FOR**

**Department of Army Ultra-wide Bandgap RF Electronics Center  
Fiscal Year 2022**



**W911NF-21-S-0003-01**

**ISSUED BY:**

**U.S. Army Contracting Command  
Aberdeen Proving Ground  
Research Triangle Park Division  
P. O. Box 12211  
Research Triangle Park, NC 27709-2211**

Issued: November 2020

White Papers Due: 15 February 2021

Final Proposals by Invite Only Due: 1 June 2021

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## **I. OVERVIEW OF THE FUNDING OPPORTUNITY**

### **A. Required Overview Content**

#### **1. Agency Name**

Combat Capabilities Development Command/Army Research Laboratory/U.S. Army Research Office (ARO)

#### **Issuing Acquisition Office**

U.S. Army Contracting Command-Aberdeen Proving Ground, Research Triangle Park (ACC-APG-RTP) Division

#### **2. Research Opportunity Title**

Department of Army Ultra-wide Bandgap RF Electronics Center Fiscal Year 2022

#### **3. Announcement Type**

Initial Announcement

#### **4. Research Opportunity Number**

W911NF-21-S-0003

#### **5. Catalog of Federal Domestic Assistance (CFDA) Number and Title**

12.431 – Basic Scientific Research

#### **6. Response Dates**

##### **a. Proposers' Day: 15 December 2020 1100-1500 Eastern Time.**

Virtual venue. Registration required and limited. Information available at link below: <https://www.eventbrite.com/e/ultra-wide-bandgap-rf-electronics-center-proposers-day-2020-registration-127230577081?aff=ebdssbonlinesearch>

##### **b. Whitepapers Due – 15 February 2021 no later than 4:00 PM Eastern Time**

c. Selection of whitepapers for full proposal on 22 March 2021

##### **d. Proposals Due – 1 June 2021 no later than 4:00 PM Eastern Time**

e. Selection of Proposal – 2 August 2021

#### **7. POINTS OF CONTACT**

a. Contracting Officer: Kevin Bassler, [kevin.j.bassler.civ@mail.mil](mailto:kevin.j.bassler.civ@mail.mil)

b. Program Manager: Joe X Qiu, [joe.x.qiu.civ@mail.mil](mailto:joe.x.qiu.civ@mail.mil), (919) 549-4297

c. Technical Points of Contact (TPOCs)

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iii. S Purushothaman (Purush) Iyer, [s.p.iyer.civ@mail.mil](mailto:s.p.iyer.civ@mail.mil), (919) 549-4204

iv. Hamid Krim, [hamid.krim.civ@mail.mil](mailto:hamid.krim.civ@mail.mil), (919) 549-44375

v. Peter Reynolds, [peter.j.reynolds16.civ@mail.mil](mailto:peter.j.reynolds16.civ@mail.mil), (919) 549-4345

## **B. Additional Overview Information**

This BAA sets forth research areas of interest to the CCDC-ARL. This BAA is issued under FAR 6.102(d)(2), which provides for the competitive selection of basic research proposals, and 10 U.S.C. 2358, 10 U.S.C. 2371, and 10 U.S.C. 2371b, which provide the authorities for issuing awards under this announcement for basic research. The definitions of basic research may be found at 32 CFR 22.105.

Proposals submitted in response to this BAA and selected for award are considered to be the result of full and open competition and in full compliance with the provision of Public Law 98-369, "The Competition in Contracting Act of 1984" and subsequent amendments.

The DoD agencies involved in this program reserve the right to select for award all, some, or none of the proposals submitted in response to this announcement. Due to Government budget uncertainties, no specific dollars have been reserved for awards under this BAA. The participating DoD agencies will provide no funding for direct reimbursement of whitepaper or proposal development costs.

Whitepapers, technical, and cost proposals (or any other material) submitted in response to this BAA will not be returned to the applicant. It is the policy of participating DoD agencies to treat all proposals as sensitive, competitive information and to disclose their contents only for the purposes of evaluation.

An applicant may withdraw a proposal at any time before award by written notice or by email sent to the Program Manager identified in Section I.A.7 of this BAA.

### **Technical Scope**

The technical portion of this BAA consists of three main topics: Ultra-wide Bandgap (UWBG) Semiconductor Physics and Devices, UWBG Materials, and Physics-Driven Machine Learning for UWBG Materials and RF Device Development. A main topic may be further divided into sub-topics. Teams are encouraged to self-organize at any scale to create a proposal to address one, several, or all of these areas as they see fit. The TPOCs listed in this BAA will be able to assist potential proposers in this during the white paper stage, and this aspect will in particular be a focus at the Proposers' Day described in I.A.6.a.

The full Center will be selected from a set of these Teams (as separate Team awards) that will together cover the full scope of the BAA. Team awards can themselves include sub-awards to one or more institutions or organizations, because the necessary expertise in addressing the numerous facets of the topics may reside within different organizations. Teams will be appropriately scoped for the level of effort taken on. All Team awards will collaborate and cooperate among themselves and with the Army Science and Technology (S&T) enterprise in accomplishing the research objectives.

### **This will be a two-step application process.**

The application process under this BAA consists of a Whitepaper stage and a Proposal stage. The purpose of this two-step approach is to facilitate pre-screening by the U.S. Government such that

detailed proposals are only sought from applicants whose whitepapers demonstrate the most promise for award (this also helps to reduce unnecessary proposal preparation efforts). The government's decision to invite a Proposal will be based upon the evaluation results of a timely and compliant Whitepaper submission. Only the most highly rated Whitepapers will receive an invitation from the government to submit a Proposal. **An Applicant that does NOT submit a timely and compliant whitepaper, is NOT eligible to submit a Proposal for consideration for funding. An Applicant that does NOT receive an invitation from the Government to submit a Proposal is NOT eligible to submit a Proposal.** An Applicant invited to submit a Proposal will receive feedback on their Whitepaper.

(End of Section)

## II. DETAILED INFORMATION ABOUT THE FUNDING OPPORTUNITY

### A. PROGRAM DESCRIPTION

#### 1. Overview

The U.S. Army Research Office (ARO) is soliciting proposals for establishing a multi-disciplinary research center for extreme-radio-frequency electronics (x-RF electronics) based on ultra-wide bandgap (UWBG) semiconductors and related emerging materials. The UWBG RF Electronics Center to be created will facilitate collaboration between extramural academic researchers and the Army in pursuit of a mutual goal: generating the foundational knowledge in solid-state physics, device structures, integrated circuit design, materials discovery and development, and physics-based machine learning needed to enable the next generation of RF electronics with unprecedented power, bandwidth, frequency agility, and size-weight-and-power (SWaP) requirements. This necessitates novel research that moves beyond the frequency, power and noise constraints imposed by current approaches to modeling, materials, and established device structures. The Center will provide the Army with a new ability to create advanced RF technologies across its modernization priorities for robust multi-domain operations in highly contested electromagnetic (EM) environments.

This BAA consists of three main topics: Ultra-wide Bandgap (UWBG) Semiconductor Physics and Devices, UWBG Materials, and Physics-Driven Machine Learning for UWBG Materials and RF Device Development. Some topics are further divided into sub-topics. Teams are encouraged to self-organize at any scale to create a proposal to address one, several, or all of these areas as they see fit. The full Center will be selected from a set of these Teams (as separate Team awards) that together appropriately cover the full scope of the BAA. Team awards can themselves include sub-awards to one or more institutions or organizations, because the necessary expertise in addressing the numerous facets of the topics may reside within different organizations. All Team awards will collaborate and cooperate among themselves and with the Army S&T enterprise in accomplishing the research objectives.

An explicit goal of the UWBG RF Electronics Center is to enable an order-of-magnitude or greater increase in power density over current state-of-the-art (SoA) devices based on wide bandgap (WBG) materials like gallium nitride (GaN). We are interested in:

- a) Frequencies in the upper millimeter-wave and sub-millimeter-wave regions of the EM spectrum, at frequencies ranging from 90 – 1000 GHz. This part of the EM spectrum remains relatively unexplored, and is expected to be important for future Army-relevant applications such as beyond-5G wireless communications. Capabilities at these frequencies are critical for developing strategies to counter emerging threats and maintaining spectral dominance across the entire EM spectrum for the Army. Device structures at these frequencies are smaller because of size scaling and not limited by thermal limits. They therefore provide an ideal platform for understanding complex carrier

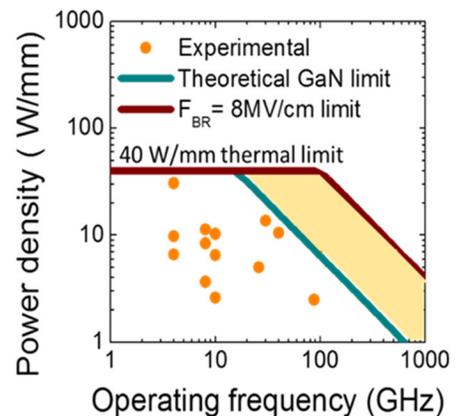


Figure 1. State-of-the-art GaN devices vs. theoretical limits.

dynamic under extremely high electric field and the associated breakdown mechanism in UWBG semiconductors without being overwhelmed by thermal issues. This knowledge is necessary for fully realizing the potential of UWBG semiconductors for future high power RF electronic applications, especially for frequencies at less than 90 GHz where thermal dissipation limits device performance before the electric field breakdown limit is reached.

- b) Frequencies at less than 90 GHz for supporting the current mission. To achieve these goals, the Center will explore innovative high-frequency device concepts based on UWBG semiconductor materials to enable new operating domains beyond those possible with conventional WBG materials.

A core component of the Center will be multidisciplinary basic research in electronics, semiconductor physics, and materials science exploring the underlying physics of RF devices and UWBG materials operating under extreme power, frequency, and thermal conditions. Significant fundamental advances in the materials science of UWBG semiconductors, with band gaps exceeding 4 eV, will be critical to realizing this goal.

The Center will develop methodologies to design, integrate, and fabricate UWBG semiconductors and related materials into RF electronic devices, and characterize these devices in terms of RF performance, carrier physics, thermal metrology, reliability, etc. ARO seeks approaches that integrate strong theory, modelling, and experimental efforts. ARO also anticipates that the scale of this effort, the amount of data generated, and the desire to search and optimize over wide design parameter spaces for novel materials and device concepts, will be impossible to manage without complementary basic research in artificial intelligence (AI) and, in particular, in physics-informed machine learning (ML) and uncertainty quantification (UQ).

## **2. Background**

At lower microwave frequencies, SoA GaN devices are subject to thermal limits, rather than intrinsic materials limits (Figure 1). At higher frequencies (30 – 100 GHz and up), GaN transistors are subject to size scaling effects dominated by material-dependent limits in transit time and electric breakdown strength. UWBG semiconductors with high breakdown strength are a potential platform for devices with dramatically enhanced power density and gain at high frequencies; the advantage over SoA GaN is the most obvious and potentially the most impactful at the upper millimeter-wave/submillimeter-wave frequencies of 90 – 1000 GHz. However, harnessing this benefit requires overcoming the following device and materials limits:

- 1) UWBG materials need improvements in terms of defect density, doping, size, and established processing steps, in order to serve as reliable electronic grade substrates.
- 2) Devices based on UWBG materials suffer from low channel conductivity due to poor control of *n*- and *p*-type carriers, low carrier mobility, and/or high contact resistance, all of which lead to parasitic delays;
- 3) UWBG-based devices that address the charge carrier density problem with innovative device designs still suffer from low effective carrier velocity in the channel; and
- 4) UWBG-based devices suffer from non-optimal electric field distribution and control, which leads to average electric fields well below the theoretical performance limits of UWBG

semiconductors.

This will require fundamental advances in:

*Semiconductor Physics and Device Design:* Electric fields oscillating at high frequency and intensity in a semiconductor present an extreme environment for charged carriers, and the physics of these carriers under such extreme conditions is poorly understood. For example, researchers lack a complete understanding about how holes and electrons interact with photons, phonons, polarons, other electrons/holes, and other quasiparticles, both in the bulk of the materials and at interfaces. Deeper insight into heat generation and transport within a device and across interfaces, and methods to characterize this at extreme power/frequency, is also needed. To date this has required scientists and engineers to rely on extrapolation and Edisonian approaches to develop new device concepts that are poorly optimized or faulty. The Center will establish principled understanding of governing physical phenomena from models capable of coupling nonlinear active dynamics with full-wave electromagnetic calculations, and capture interactions at frequencies where the size of active structures is comparable to the wavelength. The Center will also develop novel device topologies designed to fully exploit the properties of UWBG semiconductors.

*Materials Science:* The Center will also explore UWBG materials synthesis and characterization, both experimentally and theoretically, and the use of AI/ML techniques for discovering new UWBG materials, and for optimizing their properties for device structures. Example UWBG materials of interest include, but are not limited to, aluminum gallium nitride (AlGaN), aluminum nitride (AlN), cubic boron nitride (c-BN), and diamond. A complete set of synthesis and processing tools will be critical for the success of the Center. Critical materials-related issues include, but are not limited to, large area substrate and film growth, device homoepitaxy and heteroepitaxy, device contact and surface passivation, modeling and characterization of defect behavior, modeling and characterization of dopant incorporation and activation, and discovery of new compound UWBG materials. Complementary efforts examining novel approaches to RF materials are also expected to be useful; these may include examining unusual growth methods, examining new integration approaches that may allow existing materials (e.g., GaN, Ga<sub>2</sub>O<sub>3</sub>) to overcome shortcomings that would otherwise limit their utility for high-power RF electronics, or even considering exotic materials concepts, like 2D materials, twistronics, or topological materials, as potential platforms for next generation RF electronics.

*Physics-based machine learning:* The sheer breadth and depth of available parameter space in UWBG materials design and RF electronic device design necessitates the use of data-driven techniques, like AI and ML, to guide and inform efficient theory development, simulation, and experimentation. Because available data for UWBG materials and devices are limited, diverse, and expensive to generate, an alternative, physics-based machine learning (ML) approach is warranted. While ML techniques can and have been proven to help in finding patterns in large datasets, their use with smaller datasets with the incorporation of physical laws and constraints in lieu of large datasets is still in its nascent stage of development. A physics-aware ML approach, wherein ML learned and corrected for the discrepancy between the simulations and real-world observations, could potentially outperform a pure trial-and-error ML training strategy. Similarly, ML could enable us to derive more value from existing physics-based simulations. This type of approach will be one of the thrusts in the work carried out under this Center.

### **3. Technical Scope**

The technical portion of this BAA consists of three main topics: UWBG Semiconductor Physics and Devices, UWBG Materials, and Physics-Driven Machine Learning for UWBG Materials and RF Device Development. Each main topic is further divided into sub-topics. Teams are encouraged to self-organize at any scale to address one, several, or all of these areas as they see fit. The TPOCs listed in this BAA will be able to assist potential proposers in this during the white paper stage.

#### **Topic 1: UWBG Semiconductor Physics and Devices**

Though extensive materials exploration, study and development is still warranted (Topic 2), progress in UWBG materials synthesis over the past decade has now enabled fundamental research into new device structures and the underlying physics of device performance. The ultimate goal of this topic is to create RF electronic device structures that break the power density limit of GaN (Figure 1), maintain at least 10 dB of gain, and demonstrate at least an order of magnitude improvement in power density (W/mm) over current SoA WBG RF devices. These metrics should be pursued particularly in the upper millimeter-wave/submillimeter-wave regions of the EM spectrum: 90 - 1000 GHz. Areas of interest include, but are not limited to, the following.

##### **Topic 1.1: UWBG Semiconductor Physics**

The extremely high-power and -frequency electric fields in UWBG devices dramatically affect charge carrier dynamics, lattice dynamics, thermal and electronic transport, interfacial behavior, etc., in ways that are not yet fully understood. Under extreme environments, many of these properties may become strongly coupled in ways that current physical models are unable to address. Important UWBG semiconductor and device physics challenges include, but are not limited to:

- The extreme electronic environment influences the interactions of charge carriers with other particles and quasi-particles such as phonons, photons, and polarons. These interactions strongly influence carrier scattering and mobility, so understanding these carrier physics is critically important for the development of extreme RF electronics. In addition, surface and/or interface effects add further complexity. The situation becomes even more complicated when the applied fields approach the breakdown strength of the material, and when thermal effects are taken into account. Understanding these complex processes will require new carrier transport theory and modeling under numerous extreme conditions, along with experimental confirmation. Innovative techniques, such as use of isotopic engineering to control phonon scattering and increase carrier saturation velocity, will be critical for achieving the central objective and should be explored.
- Extreme operating conditions are also expected to create complex thermal environments with strongly-coupled thermal and electronic behavior. Theoretical and experimental investigations of thermal transport in UWBG materials are lacking. In addition to new carrier transport theories, a full understanding and treatment of UWBG-based RF electronics will require new phonon and vibrational-mode physics in the bulk and at interfaces.

- Doping of UWBG semiconductors remains a significant challenge to realizing device structures. UWBG materials tend to have large dopant activation energies, or only have one type (donor or acceptor) of shallow dopants. Understanding what makes a dopant hydrogenic, and identifying hydrogenic donors and acceptors, is a critical stepping stone to next-generation UWBG devices. For example, silicon was recently shown to be a shallow donor in AlN, but shallow acceptors remain elusive. Donors and acceptors have been identified in both c-BN and diamond, but all dopants identified thus far are deep and non-hydrogenic, presenting a fundamental challenge to overcome. Though hydrogen termination of diamond has been shown to create surface hole channels, these carriers suffer from poor mobility due to surface scattering. Under extreme electronic conditions, dopant activation may change significantly, and aliovalent dopants may be subject to drift and diffusion.
- Heterostructures of UWBG materials must be developed to create high performance devices such as high electron mobility transistors (HEMTs), where different regions of the transistors are composed of different materials. HEMTs allow the doped region to be spatially separated from the region occupied by free carriers, resulting in lower ionized impurity scattering and high mobility. UWBG heterostructures will be critical for development of UWBG RF devices.

### **Topic 1.2: UWBG Semiconductor Devices**

The higher critical fields in UWBG semiconductors could allow higher voltage bias in small device structures at very high frequencies. To leverage these larger voltage windows, basic research is needed in three critical areas: 1) Scaling of device and contact resistances; 2) Scaling of gate length to realize high effective velocity; 3) Field management to realize fields at or near the theoretical material breakdown limits. Critical challenges include, but are not limited to:

- To fully exploit the properties of UWBG semiconductors, new device topologies should be explored, including multi-channel FETs, FINFETs, vertical topologies etc.;
- To manage the high electric fields and RF-DC dispersion, the development of efficient field management strategies and dielectrics will be a very important issue to reach critical field limits;
- It is very important to address thermal issues and limits for UWBG materials in device structures. Devices made from Diamond, AlN and c-BN have high intrinsic thermal conductivities, and are expected to support efficient thermal transport solutions. Ga<sub>2</sub>O<sub>3</sub> and AlGa<sub>N</sub> have low thermal conductivities, resulting in thermal challenges at the device level. High power devices from Ga<sub>2</sub>O<sub>3</sub> and AlGa<sub>N</sub> will require innovative approaches to enhance heat dissipation;
- Modulation doped structures and similar field effect transistors allow the doped region to be spatially separated from the region occupied by free carriers, and reduce mobility degradation due to impurity scattering; these are very promising for overcoming fundamental material limits;
- As frequencies approach mm-wave and THz, device modeling for predicting device performance must include complex nonlinear coupling of physics-based carrier transport, thermal effects, and full-wave electromagnetics;

- Techniques for increasing device  $f_i$  (unity gain cutoff frequency) and  $f_{max}$  (power gain cutoff frequency) through engineering of material properties, device topologies, or a combination of both;
- Understanding of underlying physics affecting device linearity, efficiency, lifetime and reliability;
- Innovative circuit-level concepts for linearity and efficiency enhancement;
- Exploration of non-conventional devices such as distributed, ballistic and plasmonic structures could overcome the limits imposed by conventional devices;
- Electric field distribution, transport properties, and RF emission characteristics have intimate and complex relationships. Combined with the large number of possible parameters for UWBG RF materials and devices, this suggests that artificial intelligence and machine learning techniques will be required to guide both materials design and device design. Because data are scarce, but high-quality—computational approaches like density functional theory (DFT), full-wave EM simulations, and technology computer-aided design (TCAD) are highly accurate, but computationally expensive—new approaches that are driven by physics-based understanding, rather than data, will be needed. (See Topic 3).

### **Topic 1.3: Novel approaches to integration of WBG/UWBG semiconductors**

Proper integration (contacts, passivation, thermal management, gate insulators, etc.) is crucial to current RF electronics technology as well as next generation technology based on UWBG semiconductors. In fact, integration, rather than intrinsic material characteristics, can be the limiting factor in the performance of many or most RF devices. Integration breakthroughs may therefore not only be a critical enabler for next generation UWBG RF electronics, but may also enable unprecedented RF performance from existing WBG materials like GaN, or allow UWBG materials to overcome critical shortcomings (e.g., Ga<sub>2</sub>O<sub>3</sub> with poor thermal conductivity).

Example research efforts applicable to this sub-topic include, but are not limited to:

- Utilizing recent advances in remote epitaxy to realize arbitrary combinations of materials—semiconductors, metals, insulators—all with epitaxial quality, and to integrate devices with high thermal conductivity substrates;
- Utilizing remote epitaxy and other integration techniques to realize novel device architectures (e.g., vertical GaN FINFETS), control twist and tilt between layers to modulate interfacial properties and enable novel interfacial behaviors;
- Fundamental studies to understand and control contact resistance, surface/interface chemistry and passivation, and heteroepitaxial growth of dielectrics, semiconductors, and metals on UWBG materials;
- Thermal metrology development, including thermal mapping of devices operating at high frequency, measuring transient thermal responses, characterization of thermal boundary resistances, transport of heat in multilayers/heterostructures, and tools to profile the thermal conductivity of materials/devices/interfaces as a function of depth and radius under a top or above a bottom contact.

**Note:** while GaN and Ga<sub>2</sub>O<sub>3</sub> are generally not of interest for other topics/sub-topics, they may be

appropriate materials platforms for this particular sub-topic if novel integration schemes are proposed specifically to overcome the existing weaknesses of these materials.

**TPOC: Dr. Joe Qiu, joe.x.qiu.civ@mail.mil, (919) 549-4297**

### **Topic 2: UWBG Materials**

The overarching goal of this topic is to realize electronic-grade UWBG semiconductor materials, with material properties that surpass GaN, the current state-of-the-art semiconductor for RF electronics. Specific success metrics are:

- 1) An electronic band-gap of 4 eV or greater;
- 2) Large area growth of epitaxial films and/or single crystal substrates measuring 4-inches or greater;
- 3) Precise control over dopants and defects such that the material supports *n*- and *p*-type conductivity over a carrier concentration range of  $10^{10} - 10^{20} \text{ cm}^{-3}$  with mobility of  $100 - 1000 \text{ cm}^2/\text{V}\cdot\text{s}$ ;
- 4) Robustness against ionizing radiation (electron damage threshold of 500 keV or greater, atom displacement energy of 20 eV or greater), electric breakdown (breakdown strength of 10 MV/cm or greater), and thermal degradation (thermal conductivity of 300 W/m·K or greater).

A complementary topic goal is to develop novel materials solutions that can serve as a basis for high-power and -frequency RF electronics. Possible efforts may include, but are not limited to, searching the p-block phase space for new UWBG compound semiconductors with the aid of data-driven techniques like physics-informed machine learning or Bayesian optimization, and/or exploration of exotic materials platforms ranging from topological materials to twistrionics.

**Note:** because of extensive existing investment in the development of GaN, SiC, and Ga<sub>2</sub>O<sub>3</sub>, these specific materials are generally not of interest for research under Topic 2.

#### **Topic 2.1: Novel approaches to large area, uniform growth of UWBG semiconductors**

The goal of this sub-topic is to enable electronic-grade, 4-inch diameter (or greater), wafer-scale growth of diamond, c-BN, AlGaN, or related UWBG materials. Form factors of interest include single-crystal bulk substrates and homo-/heteroepitaxial single crystal films. These single crystals should exhibit uniform thickness, composition, and planarity, with low and controlled concentrations of extended defects like dislocations and twin boundaries. Note that doping and conductivity control are not the primary goals here (see Topic 2.2); the focus is crystal quality over large areas.

With the exception of Ga<sub>2</sub>O<sub>3</sub>, current methods to grow diamond, c-BN, and other UWBG substrates are laborious, time-consuming, and expensive, and fail to produce the large area substrates needed for next-generation RF semiconductor device development. We are soliciting novel approaches to the scalable growth of large area substrates and single-crystal films of diamond, c-BN, AlGaN, and other known III-V semiconductors of interest.

Example research efforts applicable to this sub-topic include, but are not limited to:

- Wafer-scale chemical conversion of multilayer graphene to diamond/diamane;
- Wafer-scale chemical conversion of multilayer hexagonal BN to c-BN;
- Exploration of metathesis reactions converting h-BN to c-BN;
- Lateral epitaxial overgrowth;
- Novel physical vapor deposition techniques (e.g., high-power impulse magnetron sputtering, cathodic arc deposition, metal-organic hybrid molecular beam epitaxy).

“Traditional” techniques, such as hydride vapor phase epitaxy, molecular beam epitaxy, chemical vapor deposition, and high-pressure/high-temperature crystal growth, are not of particular interest for this subtopic, unless related approaches of significant novelty are proposed.

### **Topic 2.2: Fundamental studies of growth processes, defects, and doping in UWBG semiconductors**

The goal of this sub-topic is to establish growth and processing methods to create UWBG materials (e.g., c-BN, AlGa<sub>N</sub>, diamond, and related materials) with controllable conductivity and high carrier mobility. Specifically sought are materials with controllable room-temperature hole and electron concentrations ranging from  $10^{10} - 10^{20} \text{ cm}^{-3}$ , with concurrent room-temperature hole and electron mobility ranging from  $100 - 1000 \text{ cm}^2/\text{V}\cdot\text{s}$  over this carrier density range, and extended defect densities of  $10^4 \text{ cm}^{-2}$  or less. Note that “traditional” growth techniques are appropriate for this sub-topic.

In addition to developing novel growth approaches, fundamental research into the details of both novel and established growth processes (e.g., MOCVD, high-pressure solid state synthesis) is warranted to improve our understanding and control over UWBG semiconductor materials. This requires integrated theory and experimental approaches to model, characterize, and control the thermodynamic and kinetic factors that influence UWBG crystallization and epitaxy from the plasma, vapor, melt, or solid phases. This will enable better understanding and the ability to directly control growth processes and resulting materials quality.

Related to building new models of growth thermodynamics and kinetics, significant effort is needed to better control dopant and defect behavior in UWBG materials. This requires *ab initio* modeling and prediction of dopant and defect physics with explicit integration into the growth models to better understand the interplay between processing and electronic properties. These models will also be integrated with experimental growth and characterization results. Ultimately, these models should satisfy the urgent need to identify and deterministically incorporate hydrogenic donor *and* acceptor defects to control the conductivity and mobility of UWBG materials. Alternatively, models may identify new interfacial or remote doping schemes that would also enable deterministic control over *n* and *p*-type properties. Characterization efforts should also reveal materials parameters that predict RF performance (e.g., saturation velocity, breakdown strength).

Example research efforts applicable to this sub-topic include, but are not limited to:

- Identification and characterization of hydrogenic donors and acceptors in AlGaN, AlN, c-BN, and diamond, with incorporation during crystal growth and/or through post-growth ion implantation;
- Novel approaches to local control of hole/electron concentrations, mobility, and drift velocity, using heterostructures, heteroepitaxial strain, delta doping, modulation doping, remote doping, interfacial or surface transfer doping, polarization-induced doping, or quantum wells;
- Fundamental studies of diamond or III-V heteroepitaxy, chemical and phase purity and homogeneity, and growth rates;
- Accurate measurements of carrier saturation velocities in c-BN and AlGaN;
- First-principles theory for understanding doping and defect physics in UWBG semiconductors—including compensation mechanisms, defect equilibria of point defects, dislocations, twin/grain boundaries, and strain—and to prescribe non-equilibrium growth conditions to control dopants and mitigate or manage defects;
- Theory and model development to understand, at atomistic detail, how thermodynamic and kinetic conditions influence growth and interfacial morphology of UWBG materials during bulk crystal growth and/or epitaxial growth, and how these conditions influence dopant incorporation and defect generation;
- Data-mining and AI based techniques to synergistically exploit and manage hypotheses, multi-fidelity models, simulations, and experimental data—including available models and data from the extant literature where appropriate—to rationally explore the large parameter space for growing and doping UWBG materials controllably;
- Predictive, data-driven, and/or physics-aware thermodynamic and kinetic models to understand and control UWBG growth, homo-/heteroepitaxy, composition, doping, strain, and surface chemistry/morphology. As applicable, new AI algorithms or ML models that are driven by our fundamental understanding of materials physics and materials chemistry, rather than copious amounts of data, are sought to enhance the search for optimal growth conditions for controlled doping, defects, morphology, etc. (See Topic 3).

**Note** that “traditional” growth techniques are appropriate for this sub-topic.

### **Topic 2.3: Discovery of new UWBG semiconductors and alternative materials for RF electronics**

There is no specified goal for this sub-topic. Rather, we seek alternative and innovative approaches that may yield either a new UWBG semiconductor that can achieve all of the goals for Topic 1, or exotic materials approaches that uncover an alternate, unexpected route suitable for high frequency electronic devices.

Example research efforts applicable to this sub-topic include, but are not limited to:

- Deeper exploration of known but poorly understood alternative UWBG materials, such as MgZnO, MgNiO, ZnSiN<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, MgGa<sub>2</sub>O<sub>4</sub>, etc.;
- 2D materials such as h-BN, transition metal dichalcogenides (TMDCs), multi-layer twistrionics;

- Topological materials such as amorphous and crystalline topological insulators;
- Ferroelectric materials and heterostructures for RF electronics, such as BaTiO<sub>3</sub>-semiconductor heterostructures, ferroelectric AlN and ScAlN, etc.;
- Exploration and screening of the B-C-N-O-Al-Ga-etc. high-dimensional phase space to identify and synthesize candidate UWBG compounds with attractive properties, guided by ML approaches like active learning, using DFT or other first-principles approaches;
- Data-mining and AI-based techniques to synergistically exploit and manage hypotheses, multi-fidelity models, simulations, and experimental data—including available models and data from the extant literature where appropriate—to rationally identify new or existing UWBG materials with respect to desired RF device-level properties.

**TPOC: Dr. Evan Runnerstrom, [evan.l.runnerstrom.civ@mail.mil](mailto:evan.l.runnerstrom.civ@mail.mil), (919) 549-4259**

### **Topic 3: Physics-Driven AI/ML for UWBG Materials and Device Discovery**

Contemporary research challenges in materials science and electrical engineering—especially with regards to UWBG materials and extremely high power and high frequency RF electronic devices—are often poorly suited for current machine learning (ML) and other AI approaches because data are in short supply and expensive to obtain. State-of-the-art ML approaches (data-rich, physics-poor), though potentially useful in certain scenarios, will fall short on fully guiding the complex simulations and experiments described in Topics 1 and 2. As a result, the x-RF Center, with research challenges that are inherently data-poor but physics rich, opens a research avenue where advances in AI/ML are sorely needed. This shortfall warrants fundamentally new approaches that are physics-driven, as opposed to data-driven. Successful approaches will likely fuse machine learning, materials physics, and device/RF physics in novel ways to create models that guide researchers more efficiently towards discovering what is not known or easily intuited, but physically sound. Such a framework will leverage the relative strengths of humans (fundamental physical understanding of “ground truths”) and machines (the ability to make non-intuitive inferences in high-dimensional space).

The relevant computational and simulation tools from materials science and electrical engineering are well developed (e.g., DFT, TCAD, full-wave EM simulations), and can serve as a “ground truth” for validating AI and ML models. However, they are too computationally expensive to generate sufficient data to train “vanilla” ML models; this limitation presents a fundamental challenge to data-driven techniques for UWBG materials and devices. The challenge is not merely to collect data faster and cheaper: data generation would have to improve by orders of magnitude, which is especially unrealistic for immature fields like UWBG semiconductors. Physics offers a way around this problem, as it allows one to build models with various fidelities ranging from simple to complex, generally allowing humans to extract maximum meaning from a given data point. For example, one can utilize few high-fidelity data points supplemented with plentiful low-fidelity data to build predictive, high-fidelity models of complex physical systems. Because physics is the baseline for these models, they potentially have reliable predictive power (a major shortcoming for current ML approaches). This approach is in its infancy with regards to ML (i.e., “multi-fidelity machine learning”), but has the potential to dramatically reduce the amount of data that is needed to build a useful ML model.

The goal of Topic 3 is to answer the following questions. How can physics be implicitly or

explicitly incorporated into ML models to enhance their modeling and predictive power while reducing their reliance on excessive amounts of data? Can known semiconductor materials and device physics drive the development of new AI algorithms and ML models that learn from very small amounts of very high quality data? Can these algorithms and models, as necessary, prescribe the targeted collection of new data (either small amounts of high-fidelity data or large amounts or low-fidelity data) to maximize new knowledge and mitigate uncertainty? Specifically to UWBG materials and devices, can these algorithms and models infer relationships between materials processing, physical properties, and device performance? Can they be used to efficiently and rationally optimize device design, and generally guide and inform simulation and experiment in UWBG materials and RF devices? Uncertainty quantification (UQ) is expected to be a critical aspect in the development cycle of new UWBG materials and devices that behave as one expects. Given the projected paucity of data as described above, new UQ methods will likely be needed for experiment, simulation, and physics-driven AI/ML models.

The goal of this research theme is to develop AI and ML methodologies that allow for a more efficient sampling of materials phase space, thermodynamic energy landscapes, and RF electronic device design, with quantified uncertainty, in order to reduce the Center's reliance on empirical and Edisonian approaches to discovery and design. For example, innovative approaches to mapping electronic energy landscapes as a function of dopant/defect type and concentration with DFT may require generative techniques that recognize and adapt to DFT's ability to generate very high-quality data at low rates. Other important examples include the exploration of possible RF device structures, many of which may not be intuitive, and optimizing for electric field distribution and transport properties. Here, full-wave EM simulations are so accurate as to be considered a ground-truth, but are too computationally expensive for brute-force data generation approaches. Rather, new AI and ML approaches that efficiently leverage this high quality albeit in low quantity data are needed to simplify the exploration of a vast parameter space and innovate materials to yield a systematic and efficient selection and understanding of the relevant parameters.

**TPOC: Dr. Purush Iyer, [s.p.iyer.civ@mail.mil](mailto:s.p.iyer.civ@mail.mil), (919) 549-4204, & Dr. Hamid Krim, [hamid.krim.civ@mail.mil](mailto:hamid.krim.civ@mail.mil), (919) 549-44375**

#### **4. Department of Defense High Performance Computing Modernization Program**

The DoD High Performance Computing Modernization Program (HPCMP) furnishes the DoD Science & Technology (DoD S&T) and Development Test and Evaluation (DT&E) communities with use-access to very powerful high-performance computing systems. Recipients of DoD contracts, grants, and assistance instruments may be eligible to use HPCMP assets in support of their funded activities if program manager approval is obtained and if security/screening requirements are favorably completed. Additional information and an application may be found at <https://www.hpc.mil/>.

(end of section)

## **B. FEDERAL AWARD INFORMATION**

It is anticipated the awards will be made in the form of contracts, grants, and cooperative agreements. While other vehicles such as grants and contracts will be considered, the strong preference is for a cooperative agreement as the award type that allows for maximum interaction, cooperation, and collaboration between the government and the awardees. The awards will be made at funding levels commensurate with the proposed research, scope, investigator/team type, as well as availability of funding. We realize the preparation of a research proposal often represents a substantial investment of time and effort by the applicant. Therefore, in an attempt to minimize this burden, we are requiring applicants interested in funding under this BAA to submit whitepapers not exceeding eight pages (technical content). Whitepapers received will be reviewed and ranked by a government panel. A detailed description of the whitepaper submissions can be found in Section D.

Highest ranked applicants will be invited to submit full proposals. The determination that a proposal should be invited will be made by the Government and communicated to the applicants. An Applicant that does NOT receive an invitation from the Government to submit a Proposal is NOT eligible to submit a Proposal. Only those applicants invited by a TPOC and/or the Program Manager will be eligible to submit a proposal.

The award for a full proposal will contain a base period for thirty-six months, followed by an additional option period of twenty-four months to be determined by the results of the three-year program review. The base and option period may be incrementally or otherwise funded for shorter durations.

It is anticipated that approximately \$4.5M in total of annual funding will be available for award for all the teams/components of the Center. Depending on the scope of a proposal, whether addressing only a single sub-topic at one extreme, to potentially covering the full scope of the Center at the other extreme, it can request funds in the range from ~\$150K all the way to the full \$4.5M. Each increment or option will be subject to the availability of out-year appropriations.

Multiple whitepapers and proposals from a single institute may be submitted addressing separate topic areas.

The ACC-APG RTP Division has the authority to award a variety of instruments on behalf of ARO. Anticipated awards will be made in the form of contracts, grants, or cooperative agreements. The ACC-APG RTP Division reserves the right to select the type of instrument most appropriate for the effort proposed. While other vehicles such as grants and contracts will be considered, the strong preference is for a cooperative agreement as that award type allows for maximum interaction, cooperation, and collaboration between and among the government and the awardees. Applicants should familiarize themselves with these instrument types and the applicable regulations before submitting a proposal. Following are brief descriptions of the possible award instruments:

1. Procurement Contract. A legal instrument, consistent with 31 U.S.C. 6303, which reflects a relationship between the Federal Government and a state government, a local government, or other entity/contractor when the principal purpose of the instrument is to acquire property or

services for the direct benefit or use of the Federal Government.

Contracts are primarily governed by the following regulations:

- a. Federal Acquisition Regulation (FAR)
- b. Defense Federal Acquisition Regulation Supplement (DFARS)
- c. Army Federal Acquisition Regulation Supplement (AFARS)

2. Grant. A legal instrument that, consistent with 31 U.S.C. 6304, is used to enter into a relationship:

- a. The principal purpose of which is to transfer a thing of value to the recipient to carry out a public purpose of support or stimulation authorized by a law or the United States, rather than to acquire property or services for the Federal Government's direct benefit or use.
- b. In which substantial involvement is not expected between the Federal Government and the recipient when carrying out the activity contemplated by the grant.
- c. No fee or profit is allowed.

3. Cooperative Agreement. A legal instrument which, consistent with 31 U.S.C. 6305, is used to enter into the same kind of relationship as a grant (see definition "grant"), except that substantial involvement is expected between the Federal Government and the recipient when carrying out the activity contemplated by the cooperative agreement. The term does not include "cooperative research and development agreements" as defined in 15 U.S.C. 3710a. No fee or profit is allowed.

4. Grants and cooperative agreements for institutions of higher education, nonprofit organizations, foreign organizations, and foreign public entities are primarily governed by the following:

- a. Federal statutes
- b. Federal regulations
- c. 2 CFR Part 200, as modified and supplemented by DoD's interim implementation found at 2 CFR Part 1103
- d. 32 CFR Parts 21, 22, 26, and 28
- e. DoD Research and Development General Terms and Conditions
- f. Agency-specific Research Terms and Conditions

5. Grants and cooperative agreements for both for-profit and nonprofit organizations exempted from Subpart E—Cost Principles of 2 CFR Part 200, are primarily governed by the following:

- a. Federal statutes
- b. Federal regulations
- c. 32 CFR Part 34 - Administrative Requirements for Grants and Agreements with For-Profit Organizations
- d. 32 CFR Parts 21, 22, 26, and 28
- e. DoD Research and Development General Terms and Conditions
- f. Agency-specific Research Terms and Conditions

6. The following websites may be accessed to obtain an electronic copy of the governing

regulations and terms and conditions:

- a. FAR, DFARS, and AFARS: <http://farsite.hill.af.mil/>
- b. Code of Federal Regulations (CFR): <https://www.ecfr.gov/cgi-bin/ECFR?page=browse>
- c. DoD Research and Development General Terms and Conditions:  
<https://www.onr.navy.mil/work-with-us/manage-your-award/manage-grant-award/grants-terms-conditions>
- d. Agency-specific Research Terms and Conditions:  
<http://www.arl.army.mil/www/default.cfm?page=8>

(end of section)

## **C. ELIGIBILITY INFORMATION**

### **1. Eligible Applicants**

Eligible applicants under this BAA include institutions of higher education, nonprofit organizations, state and local governments, and for-profit organizations (i.e. large and small businesses) in the United States or its territories. Whitepapers and proposals will be evaluated only if they are for fundamental scientific study and experimentation directed toward advancing the scientific state of the art or increasing basic knowledge and understanding. Whitepapers and proposals focused on specific devices or components are beyond the scope of this BAA. More than one whitepaper and/or proposal is allowable from any single institution or organization.

### **2. Cost Sharing or Matching**

Generally, there is no requirement for cost sharing, matching, or cost participation to be eligible for award under this BAA. Cost sharing and matching is not an evaluation factor used under this BAA.

In addition, if cost sharing is proposed on a grant or cooperative agreement proposal submitted by a nonprofit or institution of higher education, the award will be subject to the restrictions at 2 CFR 200.306. If cost sharing is proposed on a contract proposal, the award will be subject to the restrictions at FAR 35.003.

### **3. Other**

Pursuant to the policy of FAR 35.017 and supplements, selected Federally Funded Research and Development Centers (FFRDC) may propose under this BAA as allowed by their sponsoring agency and in accordance with their sponsoring agency policy.

(end of section)

## **D. WHITEPAPER SUBMISSION INFORMATION**

### **1. Overview**

Whitepapers should focus on describing details of the proposed research, including how it is innovative, how it could substantially increase the scientific state-of-the-art, Army/DoD relevance, and potential impact.

Whitepapers are limited to ten (10) total pages; eight (8) pages for whitepaper technical content, one (1) cover page and a one (1) page addendum as discussed below. Evaluators will only review the whitepaper cover page, up to eight whitepaper technical content pages, and the one-page addendum.

Whitepapers must be in the following format but do not require any special forms:

- Page Size: 8 ½ x 11 inches
- Margins – 1 inch
- Spacing – single
- Font – Times New Roman, 12 point

Combine all files and forms into a single PDF before submitting.

### **2. Format and Content of Whitepapers:**

#### **a. COVER PAGE (not to exceed one page):**

The whitepaper cover page shall include at a minimum: Title of the whitepaper, name and contact information of the individual and organization submitting the whitepaper, the topic(s)/sub-topic(s) addressed, the BAA number of this announcement, and the TPOC name, if known. The Cover page shall indicate which of the Technical topics(s)/sub-topic(s) the proposal will address.

#### **b. TECHNICAL CONTENT (not to exceed eight pages):**

i. Scientific (max. 6 pages) - What is your basic idea? Why is it innovative? What are the technical challenges to this idea you will be focused on with your research? What are the scientific and technical approaches to overcome the challenges?

ii. Impact (max 1 page) - If successful, how will this work improve the capabilities of future RF Electronics?

iii. Programmatic (max 1 page) – To the extent known at this point, provide details on the research team, timeline, deliverables, and estimated cost of the research. The teaming approach for multiple topics and/or subtopics will be described. Brief per year descriptions are an acceptable level of granularity.

#### **c. ADDENDUM not to exceed 1 page:**

Include biographical sketches of the key personnel who will perform the research, highlighting

their qualifications and experience.

### **3. Restrictive Markings on whitepapers:**

- a. Any proprietary data that the applicant intends to be used only by the Government for evaluation purposes must be clearly marked. The applicant must also identify any technical data or computer software contained in the whitepaper that is to be treated by the Government as limited rights in technical data and restricted rights in computer software. In the absence of such identification, the Government will conclude there are no limitations or restrictions on technical data or computer software included in the whitepaper. Records or data bearing a restrictive legend may be included in the whitepaper. It is the intent of the Army to treat all whitepapers as procurement sensitive before award and to disclose their contents only for the purpose of evaluation.

Care must be exercised to ensure that classified, sensitive, and critical technologies are not included in a whitepaper. If such information is required, appropriate restrictive markings and procedures should be applied prior to submission of the whitepaper.

- b. Applicants are cautioned, however, that portions of the whitepapers may be subject to release under terms of the Freedom of Information Act, 5 U.S.C. 552, as amended.

### **4. Evaluation and Disposition of whitepapers**

(1) Evaluation Process: Applicants are advised that invitations for proposals will be made based on the whitepaper submission and the availability of funding. The whitepaper will be evaluated for the concept's scientific merit, technical and resource plausibility, collaboration and teaming plan, and potential contributions of the effort to the Army and DoD mission. Applicants whose whitepapers are evaluated as having significant scientific merit may be invited to submit a full proposal. An applicant **may not** submit a proposal without submitting a whitepaper and receiving a proposal invite from the Government.

(2) Disposition Process: The applicant will be notified in writing (email) after completion of the evaluation. Whitepapers will not be returned to applicants.

### **5. Whitepaper Submission**

All whitepapers must be emailed directly to the following email address: [usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil](mailto:usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil). In the email subject line, include the phrase "Whitepaper Submission UWBG RF Electronics," the BAA number W911NF-21-S-0003, and the research topic area(s) addressed from Section II.A.3 of this BAA. Whitepapers submitted via email must be in a single PDF formatted file as an email attachment.

(end of section)

## E. PROPOSAL PREPARATION INFORMATION

### 1. Proposal Information

- a. **Eligibility.** An Applicant that does NOT submit a timely and compliant Whitepaper is NOT eligible to submit a Proposal for consideration for funding. Only the most highly rated Whitepapers will receive an invitation from the government to submit a Proposal. An Applicant that does NOT receive an invitation from the government to submit a Proposal is NOT eligible to submit a Proposal.
- b. **Research Sought and Duration.** Proposals in any amount up to \$4.5M per year (depending on the number of topics and sub-topics addressed and the overall scope of the work). The topics for the research are identified in Section II.A.3 in the research topics area section of this BAA and/or by the TPOC/Program Manager. The awards are expected to be for a base period of thirty-six months and an option period of twenty-four months.

### 2. Proposal Preparation.

- i. Eligible applicants should submit proposals with technical sections that are no more than **twenty-five (25) pages** in length. Proposals that address only a single topic or sub-topic should be appropriately shorter. Proposals shall clearly state in the forefront material the Technical Topics(s)/sub-topic(s) addressed by the proposal. No brochures or explanatory material should be submitted with the proposal.
- ii. Proposed research efforts must be "stand alone" and not predicated on the use of any facilities other than those under the direct control of the applicant(s).
- iii. The research proposal should follow the format set forth in Section II.F (Proposal Application and Submission Information) of this BAA. Limited rights in technical data and restricted rights in computer software should be identified as an attachment to the proposal. Otherwise, it will be concluded that the proposal does not contain any such limitations or restrictions
- iv. The principal investigator(s) (PI) should disclose and explain the relevance of the proposal to the research interests identified earlier in the research topic areas of this BAA.

(end of section)

## **F. PROPOSAL APPLICATION AND SUBMISSION INFORMATION**

### **1. Address to View Broad Agency Announcement**

This BAA may be accessed via the following websites:

- a. Grants.gov ([www.grants.gov](http://www.grants.gov))
- b. Federal Business Opportunities (beta.SAM.gov) - FBO.gov has been moved to beta.SAM.gov and is now known as Contract Opportunities.
- c. ARL website ([https://www.arl.army.mil/business/broad-agency-announcements/.](https://www.arl.army.mil/business/broad-agency-announcements/))

Amendments to this BAA, if any, will be posted to these websites when they occur. Interested parties are encouraged to periodically check these websites for updates and amendments.

The following information is for those invited to respond to this BAA:

### **2. Content and Form of Application Submission**

#### **a. General Information**

i. Preliminary Inquiries: Potential applicants may make preliminary inquiries to the TPOCs and/or Program Manager as to the appropriateness of the type of research effort contemplated, before expending extensive effort in preparing a whitepaper and/or detailed proposal or submitting proprietary information.

\*NOTE: The Government will not be obligated by any discussion that arises out of preliminary inquiries.

ii. Classified Submissions: Classified proposals are not accepted under this BAA.

iii. Use of Color in Proposals: All proposals received will be stored as electronic images. Electronic color images require a significantly larger amount of storage space than black-and-white images. As a result, applicants' use of color in proposals should be minimal and used only when necessary for details. Do not use color if it is not necessary.

iv. Post-Employment Conflict of Interest: There are certain post-employment restrictions on former federal employees, including special government employees (18 U.S.C. 207). If a prospective applicant believes a conflict of interest may exist, the situation should be discussed with the TPOC listed in the BAA for their area of scientific research who will then coordinate with appropriate ARO legal counsel prior to the applicant expending time and effort in preparing a proposal.

v. Statement of Disclosure Preference: In accordance with Section II.F.2.c.iii of this BAA, ARO Form 52 or 52A shall be completed stating your preference for release of information contained in your proposal. Copies of these forms may be downloaded from the ARO web site at [https://www.arl.army.mil/business/broad-agency-announcements/baa-forms/.](https://www.arl.army.mil/business/broad-agency-announcements/baa-forms/)

NOTE: Proposals may be handled for administrative purposes by support contractors. These

support contractors are prohibited from submitting proposals under this BAA and are bound by non-disclosure and/or conflict of interest requirements as deemed appropriate.

vi. Equipment: Normally, title to equipment or other tangible property purchased with Government funds vests with nonprofit institutions of higher education or with nonprofit organizations whose primary purpose is conducting scientific research if vesting will facilitate scientific research performed for the Government. For-profit organizations are expected to possess the necessary plant and equipment to conduct the proposed research. Deviations may be made on a case-by-case basis to allow for-profit organizations to purchase equipment but regulatory disposition instructions must be followed.

## **b. The Application Process**

The application process is in three stages as follows:

i. Stage 1 - Verify the accuracy of your Unique Entity Identifier (formerly DUNS) at the Dun and Bradstreet (D&B) website <http://fedgov.dnb.com/webform> before registering with the System for Award Management System (SAM) at <https://www.sam.gov/SAM/>. Prospective applicants must be registered in SAM prior to submitting an application or plan. The SAM obtains Legal Business Name, Doing Business Name (DBA), Physical Address, and Postal Code/ Zip+4 data fields from D&B. If corrections are required, registrants will not be able to enter/modify these fields in SAM; they will be pre-populated using D&B Unique Entity Identifier record data. When D&B confirms the correction has been made, the registrant must then re-visit sam.gov and click a “yes” to D&B's changes. Only at this point will the D&B data be accepted into the SAM record. Allow a minimum of two (2) business days for D&B to send the modified data to SAM.

ii. Stage 2 - Prospective proposers are required to submit whitepapers prior to the submission of a complete, more detailed proposal as described in the sections above.

iii. Stage 3 – The most highly rated and approved whitepaper applicants will be invited by the Government and are required to submit proposals in order to be considered for funding. Only applicants requested by the TPOCs and/or the Program Manager are eligible to submit proposals. All proposals submitted under the terms and conditions cited in this BAA will be reviewed.

All proposals for Assistance Instruments must be submitted electronically through Grants.gov using Workspace. Proposals for Contracts may be submitted via either Grants.gov or email to: [usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil](mailto:usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil). See Section II.F.2.d of this BAA for information on the proposal submission process.

Requests for waiver of electronic submission requirements may be submitted via email to: or regular mail (USPS):

Army Research Office  
ATTN: RDRL-RO (Proposal Processing)  
P.O. Box 12211  
RTP, NC 27709-2211

All required forms for proposals may be downloaded from the ARO web site at:  
<https://www.arl.army.mil/business/broad-agency-announcements/baa-forms/>

### **c. Preparation of Proposals**

#### **i. COVER PAGE:**

- (1) A Cover Page is required. For contract proposals submitted by email, use ARO Form 51. For all Assistance instruments and contract proposals submitted via Grants.gov, use the SF 424 (R&R) Form. Proposals will not be processed without either: (1) a signed Cover Page, ARO Form 51, or (2) a SF 424 (R&R) Form.
- (2) Should the project be carried out at a branch campus or other component of the applicant, that branch campus or component should be identified in the space provided (Block 11 on the ARO Form 51 and Block 12 on the SF 424 (R&R) Form).
- (3) The title of the proposed project should be brief, scientifically representative, intelligible to a scientifically-literate reader, and suitable for use in the public domain.
- (4) The proposed duration for which support is requested should be consistent with the nature and complexity of the proposed activity.
- (5) Specification of a desired starting date for the project is important and helpful; however, requested effective dates cannot be guaranteed.
- (6) Pursuant to 31 U.S.C. 7701, as amended by the Debt Collection Improvement Act of 1996 [Section 31001(I)(1), Public Law 104-134] and implemented by 32 CFR 22.420(d), federal agencies shall obtain each awardees' Taxpayer Identification Number (TIN). The TIN is being obtained for purposes of collecting and reporting on any delinquent amounts that may arise out of an awardees' relationship with the Government.
- (7) Applicants shall provide their organization's Unique Entity Identifier (formerly DUNS). This number is a nine-digit number assigned by D&B Information Services. See Section II.D.3 of this BAA for requirements pertaining to the Unique Entity Identifier.
- (8) Applicants shall provide their assigned Commercial and Government Entity (CAGE) Code. The CAGE Code is a 5-character code assigned and maintained by the Defense Logistics Service Center (DLSC) to identify a commercial plant or establishment.

#### **ii. TABLE OF CONTENTS:**

Use the following format for the Table of Contents. Forms are available at <https://www.arl.army.mil/business/broad-agency-announcements/baa-forms/> under "BAA Forms" (Forms, ARO BAA Forms).

SECTION	PAGE NUMBER
Table of Contents	A-1
Statement of Disclosure Preference (Form 52 or 52A)	B-1
Research and Related Other Project Information	B-2
Project Abstract	C-1
Project Description (Technical Proposal)	D-1
Biographical Sketch	E-1
Bibliography	F-1
Current and Pending Support	G-1
Facilities, Equipment, and Other Resources	H-1
Proposal Budget	I-1
Contract Facilities Capital Cost of Money (DD Form 1861)	J-1
Appendices	K-1
List Appendix Items: _____	

This format applies to all proposals submitted via email and via Grants.gov. Applicants' should show the location of each section of the proposal, as well as major subdivisions of the project description.

iii. STATEMENT OF DISCLOSURE PREFERENCE (FORM 52 OR 52A): Complete and sign ARO Form 52 (Industrial Contractors) or ARO Form 52A (Educational and Nonprofit Organizations).

iv. RESEARCH AND RELATED OTHER PROJECT INFORMATION: Must be completed and signed by all applicants.

v. PROJECT ABSTRACT:

(1) The project abstract shall be completed on the form entitled “Publicly Releasable Project Abstract” found at the following website:

<http://www.arl.army.mil/www/default.cfm?page=218>.

(2) Unless otherwise instructed in this BAA, the project abstract shall include a concise statement of work and basic approaches to be used in the proposed effort. The abstract should include a statement of scientific objectives, methods to be employed, and the significance of the

proposed effort to the advancement of scientific knowledge.

(3) The abstract should be no longer than one (1) page (maximum 4,000 characters).

(4) The project abstract shall be marked by the applicant as publicly releasable. By submission of the project abstract, the applicant confirms that the abstract is releasable to the public. For a proposal that results in a grant award, the project abstract will be posted to a searchable website available to the general public to meet the requirements of Section 8123 of the DoD Appropriations Act, 2015. The website address is <https://dodgrantawards.dtic.mil/grants/#/home>

(5) The Abstract shall clearly indicate which Topic Area(s) the Proposal addresses.

vi. PROJECT DESCRIPTION (TECHNICAL PROPOSAL): The technical portion of the proposal is limited to 25 pages (less if only a single topic or sub-topic is addressed) and shall contain the following:

(1) A complete discussion stating the background and objectives of the proposed work, the challenges to achieving the objectives, scientific approaches to be considered, the relationship to competing or related research, and the level of effort to be employed. Include also the nature and extent of the anticipated results and how they will significantly advance the scientific state-of-the-art. Also, include the manner in which the work will contribute to the accomplishment of the Army and DoD's mission. Ensure the proposal identifies any scientific uncertainties and describes specific approaches for the resolution or mitigation of the uncertainties. More specifically, the proposal shall include:

- (a) A list intellectual property owners, if any
- (b) A brief description of the overall goal for the effort
- (c) Impact, if successful, both to the Army and DoD
- (d) For background include how is it done today, what is new in your approach and why you think it will be successful
- (e) List any assumptions and preliminary constraints for this effort
- (f) Describe possible follow-on research and development needed if the proposed research is successful
- (g) A project plan outline, projected start date and overall schedule for the effort
- (h) Describe mid-term and final criteria to check for success (should be at least on a yearly basis)
- (i) Describe how many phases necessary for this effort and the cost and timeline of each phase (should be at least on a yearly basis)
- (j) Identify the individuals/organizations to be involved in the proposed effort along with their roles (researcher/students/senior technical personnel/ junior employees)
- (k) Provide any additional relevant details not incorporated in the above sections (potential vendors to team with, researchers or institutions capable of providing the needed work or solutions, historical attempts, past performances)

(2) A brief description of your organization. If the applicant has extensive government contracting experience and has previously provided the information to the ARO, the information need not be provided again. A statement setting forth this condition should be

made.

(3) The names of other federal, state, local agencies, or other parties receiving the proposal and/or funding the proposed effort. If none, state so. Concurrent or later submission of the proposal to other organizations will not prejudice its review by the ARO if we are kept informed of the situation.

(4) A statement regarding possible impact, if any, of the proposed effort on the environment, considering as a minimum its effect upon water, atmosphere, natural resources, human resources, and any other values.

(5) A statement regarding the use of Class I and Class II ozone- depleting substances. Ozone-depleting substances are any substance designated as Class I by EPA, including but not limited to chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform, and any substance designated as Class II by EPA, including but not limited to hydrochlorofluorocarbons. See 40 CFR Part 82 for detailed information. If Class I or II substances are to be utilized, a list shall be provided as part of the applicant's proposal. If none, state so.

(6) The type of support, if any, requested by the applicant (e.g., facilities, equipment, and materials).

(7) Proposals shall also include a teaming and collaboration plan. This plan shall include a detailed plan for collaboration, cooperation, and communication among the proposing team members as well as with notional or specific researchers within the Army S&T enterprise. It shall also include a plan for interaction, collaboration, cooperation, and communication among all Center awardees. It is anticipated that all awardees supported by the Center will jointly meet at least monthly. A formal meeting may be called by the Program Manager up to biannually. In addition, proposals must describe a plan for data sharing that includes creation and maintenance of a website accessible by all Center awardees as well as with participating researchers across the Army S&T enterprise. During the award selection stage, a single awardee may be designated to execute the data sharing website, in which case such website will be available within three months post award and be maintained for the duration of the award. Do not include anticipated costs associated with such a website as part of the proposal. That will be separately addressed for the awardee that is selected for this. In your proposal only discuss how you would address such data sharing.

vii. BIOGRAPHICAL SKETCH:

(1) This section shall contain the biographical sketches for key personnel only.

(a) Primary PI: The Primary PI provides a single or initial point of communication between the ARO and the awardee organization(s) about scientific matters. If not otherwise designated, the first PI listed will serve as the Primary PI. This individual can be changed with notification to ARO. ARO does not infer any additional scientific stature to this role among collaborating investigators.

(b) Co-PIs: The individual(s) a research organization designates as having an appropriate

level of authority and responsibility for the proper conduct of the research and submission of required reports to ARO. When an organization designates more than one PI, it identifies them as individuals who share the authority and responsibility for leading and directing the research, intellectually and logistically. ARO does not infer any distinction among multiple PIs.

(2) The following information is required:

(a) Relevant experience and employment history including a description of any prior Federal employment within one year preceding the date of proposal submission.

(b) List of up to five publications most closely related to the proposed project and up to five other significant publications, including those being printed. Patents, copyrights, or software systems developed may be substituted for publications.

(c) List of persons, other than those cited in the publications list, who have collaborated on a project or a book, article, report or paper within the last four years. Include pending publications and submissions. Otherwise, state "None."

(d) Names of each investigator's own graduate or post-graduate advisors and advisees.

NOTE: The information provided in (c) and (d) is used to help identify potential conflicts or bias in the selection of reviewers.

(3) For the personnel categories of postdoctoral associates, other professionals, and students (research assistants), the proposal may include information on exceptional qualifications of these individuals that merit consideration in the evaluation of the proposal.

(4) The biographical sketches are limited to three (3) pages per investigator and other individuals that merit consideration.

viii. BIBLIOGRAPHY: A bibliography of pertinent literature is required. Citations must be complete (including full name of author(s), title, and location in the literature).

ix. CURRENT AND PENDING SUPPORT:

(1) All project support from whatever source must be listed. The list must include all projects requiring a portion of the PI's and other key personnel's time, even if they receive no salary support from the project(s).

(2) The information should include, as a minimum: (i) the project/proposal title and brief description, (ii) the name and location of the organization or agency presently funding the work or requested to fund such work, (iii) the award amount or annual dollar volume of the effort, (iv) the period of performance, and (v) a breakdown of the time required of the PI and/or other key personnel.

x. FACILITIES, EQUIPMENT, AND OTHER RESOURCES: The applicant should include

in the proposal a listing of facilities, equipment, and other resources already available to perform the research proposed.

xi. PROPOSAL BUDGET (including DD Form 1861):

(1) Each proposal must contain a budget for each year of support requested and a cumulative budget for the full term of requested support. Each budget year and the cumulative budget for the full term must be documented on ARO Form 99. ARO Form 99 may be reproduced, but you may not make substitutions in prescribed budget categories nor alter or rearrange the cost categories as they appear on the form. The proposal may request funds under any of the categories listed so long as the item is considered necessary to perform the proposed work and is not precluded by applicable cost principles. In addition to the forms, the budget proposal should include budget justification for each year.

(2) A signed summary budget page must be included. The documentation pages should be titled "Budget Explanation Page" and numbered chronologically starting with the budget form. The need for each item should be explained clearly.

(3) All cost data must be current and complete. Costs proposed must conform to the following principles and procedures:

Institutions of Higher Education: 2 CFR Part 200

Nonprofit Organizations: 2 CFR Part 200

For-Profit/Commercial Organizations: FAR Part 31, DFARS Part 231, FAR Subsection 15.403-5, and DFARS Subsection 215.403-5.

\* For those nonprofit organizations specifically exempt from the provisions of Subpart E of 2 CFR Part 200 (see 2 CFR 200.401(c)), FAR Part 31 and DFARS Part 231 shall apply.

(4) Sample itemized budgets and the information they must include for a contract and for grants and cooperative agreements can be found at Section II.J of this BAA (Other Information). Before award of a cost-type contract or assistance instrument it must be established that an approved accounting system and financial management system exist.

xii. APPENDICES: Some situations require that special information and supporting documents be included in the proposal before funding can be approved. Such information and documentation should be included by appendix to the proposal.

(1) To evaluate compliance with Title IX of the Education Amendments of 1972 (20 U.S.C. A Section 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 following forms completed as indicated.

(A) Research and Related Senior/Key Person Profile (Expanded) form:

The Degree Type and Degree Year fields on the Research and Related Senior/Key Person

Profile (Expanded) form will be used by DoD as the source for career information. In addition to the required fields on the form, applicants must complete these two fields for all individuals that are identified as having the project role of PD/PI or Co-PD/PI on the form. Additional senior/key persons can be added by selecting the “Next Person” button.

(B) Research and Related Personal Data form:

This form will be used by DoD as the source of demographic information, such as gender, race, ethnicity, and disability information for the Project Director/Principal Investigator and all other persons identified as Co-Project Director(s)/Co-Principal Investigator(s). Each application must include this form with the name fields of the Project Director/Principal Investigator or any Co-Project Director(s)/Co-Principal Investigator(s) completed; however, provision of the demographic information in the form is voluntary. If completing the form for multiple individuals, each Co-Project Director/Co-Principal Investigator can be added by selecting the “Next Person” button. The demographic information, if provided, will be used for statistical purposes only and will not be made available to merit reviewers. Applicants who do not wish to provide some or all of the information should check or select the “Do not wish to provide” option.

**d. Submission of Proposals**

Proposals must be submitted by email (only when a contract is requested) or through Grants.gov. Proposals must be submitted through the applicant’s organizational office having responsibility for Government business relations. All signatures must be that of an official authorized to commit the organization in business and financial affairs.

Proposal content requirements remain the same for both email and Grants.gov submission.

i. EMAIL SUBMISSION (only when a **Contract is the requested form of agreement**):

(1) Proposals requesting a Contract may be emailed directly to [usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil](mailto:usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil). Do not email full proposals to the TPOC. All emailed proposals must adhere to the format requirements and contain the information outlined in Section II.F.2.c of this BAA.

(2) The applicant must include with its proposal submission the representations required by Section II.H.2.c of this BAA. The representations must include applicant POC information and be signed by an authorized representative. Note: If the applicant’s SAM Representations and Certifications include its response to the representations a hard copy representation is not required with proposal submission.

(3) All forms requiring signature must be completed, printed, signed, and scanned into a PDF document. All documents must be combined into a single PDF formatted file to be attached to the email.

(4) Proposal documents (excluding required forms) must use the following format:

- Page Size – 8 ½ x 11 inches

- Margins – 1 inch
- Spacing – single
- Font – Times New Roman, 12 point, single-sided pages

ii. GRANTS.GOV SUBMISSION Use grants.gov for **all proposals requesting Assistance agreements (grants and cooperative agreements)**. (Proposals requesting a Contract may be submitted either via Grants.gov or email: [usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil](mailto:usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil) )

(1) Grants.gov Registration (See Section II.F.2.f below) must be accomplished prior to application submission in Grants.gov.

NOTE: All web links referenced in this section are subject to change by Grants.gov and may not be updated here.

(2) Specific forms are required for submission of a proposal. The forms are contained in the Application Package available through the Grants.gov application process. To access these materials, go to <http://www.grants.gov>, select "Apply for Grants," and then select "Get Application Package." A Grant Application Package and Application Instructions are available through the Grants.Gov Apply portal under CFDA Number 12.431/Funding Opportunity Number W911NF-21-S-0003. Select "Apply" and then "Apply Now Using Workspace."

\*NOTE: Effective 31 December 2017, the legacy PDF application package on Grants.gov will be retired and applicants must apply online at Grants.gov using the application Workspace. For access to complete instructions on how to apply for opportunities using Workspace refer to <https://www.grants.gov/web/grants/applicants/workspace-overview.html>.

The following documents are mandatory: (1) Application for Federal Assistance (R&R) (SF 424 (R&R)), and (4) Attachments form.

(3) The SF 424 (R&R) form is to be used as the cover page for all proposals submitted via Grants.gov. The SF 424 (R&R) must be fully completed. Authorized Organization Representative (AOR) usernames and passwords serve as "electronic signatures" when your organization submits applications through Grants.gov. By using the SF 424 (R&R), proposers are providing the certification required by 32 CFR Part 28 regarding lobbying (see Section II.H.2.a.ii of this BAA). Block 11, "Descriptive Title of Applicant's Project," must reference the research topic area being addressed in the effort by identifying the specific paragraph from Section II.A of this BAA.

(4) The Attachments form must contain the documents outlined in Section II.F.2.c.ii entitled "Table of Contents". All documents must be combined into separate and single PDF formatted files using the Table of Contents names. Include "W911NF-21-S-0003" in the title so the proposal will be distinguished from other BAA submissions and upload each document to the mandatory Attachments form.

(5) The applicant must include with its proposal submission the representations required by Section II.H.2.b of this BAA. The representations must include applicant POC information and be signed by an authorized representative. Attach the representations document to an available

field within the Attachments form. Note: If the applicant's SAM Representations and Certifications include its response to the representations a hard copy representation is not required with proposal submission.

(6) The Grants.gov User Guide at:

<https://www.grants.gov/help/html/help/index.htm#t=Applicants%2FGrantApplications.htm> will assist AORs in the application process. Remember that you must open and complete the Application for Federal Assistance (R&R) (SF 424 (R&R)) first, as this form will automatically populate data fields in other forms. If you encounter any problems, contact customer support at 1-800-518-4726 or at [support@grants.gov](mailto:support@grants.gov). If you forget your user name or password, follow the instructions provided in the Credential Provider tutorial. Tutorials may be printed by right-clicking on the tutorial and selecting "Print".

(7) As it is possible for Grants.gov to reject the proposal during this process, it is strongly recommended that proposals be uploaded at least two days before any established deadline in the BAA so that they will not be received late and be ineligible for award consideration. It is also recommended to start uploading proposals at least two days before the deadline to plan ahead for any potential technical and/or input problems involving the applicant's own equipment.

#### **f. Grants.gov Registration**

i. Each organization that desires to submit applications via Grants.Gov must complete a one-time registration. There are several one-time actions your organization must complete in order to submit applications through Grants.gov (e.g., obtain a Unique Entity Identifier, register with the SAM, register with the credential provider, register with Grants.gov and obtain approval for an AOR to submit applications on behalf of the organization). To register please see <https://www.grants.gov/help/html/help/index.htm#t=Register%2FRegister.htm>

ii. Please note the registration process for an Organization or an Individual can take between three to five business days or as long as four weeks if all steps are not completed in a timely manner.

iii. Questions relating to the registration process, system requirements, how an application form works, or the submittal process should be directed to Grants.gov at 1-800-518-4726 or [support@grants.gov](mailto:support@grants.gov).

### **3. Unique Entity Identifier and System for Award Management (SAM)**

a. Each applicant (unless the applicant is an individual or Federal awarding agency that is exempt from those requirements under 2 CFR 25.110(b) or (c), or has an exemption approved by the Federal awarding agency under 2 CFR 25.110(d)) is required to:

- i. Be registered in SAM prior to submitting its application;
- ii. Provide a valid unique entity identifier (formerly DUNS) in its application; and
- iii. Maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency.

b. The Federal awarding agency may not make a Federal award to an applicant until the applicant has complied with all applicable unique entity identifier and SAM requirements. If an applicant has not fully complied with the requirements by the time the Federal awarding agency is ready to make a Federal award, the Federal awarding agency may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

#### **4. Submission Dates and Times**

##### **a. Proposals**

Proposals will be considered until and including the closing date of this announcement. Proposals submitted after the closing date will not be considered by the Government.

##### **b. Proposal Receipt Notices**

i. Grants.gov: After a proposal is submitted to Grants.gov, the AOR will receive a series of three emails from Grants.gov. The first two emails will be received within 24 to 48 hours after submission. The first email will confirm time of receipt of the proposal by the Grants.gov system and the second will indicate that the proposal has either been successfully validated by the system prior to transmission to the grantor agency or has been rejected due to errors. A third email will be received once the grantor agency has confirmed receipt of the proposal. Reference the Grants.gov User Guide at <https://www.grants.gov/help/html/help/index.htm?callingApp=custom#t=Applicants%2FCheckApplicationStatus%2FCheckApplicationStatus.htm> for information on how to track your application package.

For the purposes of this BAA, an applicant's proposal is not considered received by ARO until the ARO receives email #3.

ii. Email Submission: After a proposal is submitted to [usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil](mailto:usarmy.rtp.rdecom-aro.mbx.baa3@mail.mil), the AOR will receive an email confirming time of receipt of the proposal by the grantor agency. For the purposes of this BAA, an applicant's proposal is not considered received by the grantor agency until the AOR receives the email confirming receipt of the proposal.

#### **5. Intergovernmental Review**

Not Applicable

#### **6. Funding Restrictions**

There are no specific funding restrictions associated with this BAA (e.g. direct costs, indirect costs, etc.).

#### **7. Other Submission Requirements**

a. Information to Be Requested from Successful Applicants: Applicants whose proposals are accepted for funding will be contacted before award to provide additional information required for award. The required information may include requests to clarifying budget explanations, representations, certifications, and some technical aspects.

b. For Contracts Only: Performance Work Statements (PWS). Prior to award the Contracting Officer may request that the contractor submit a PWS for the effort to be performed, which will be incorporated into the contract at the time of award.

(End of Section)

## **G. Proposal Review Information**

### **1. Criteria**

- a. Proposals submitted in response to this BAA will be evaluated using the criteria listed below (in descending order of importance):
  - i. Scientific merit, soundness, and programmatic strategy of the proposed.
  - ii. Relevance and potential contributions of the proposed research to one or more of the topic areas.
  - iii. Qualifications and availability of the Principal Investigators and key co-investigators
  - iv. Rigor and completeness of the teaming plan. This will be considered as of equal importance as criteria iii. (Qualifications) above.
  - v. Applicants record of past performance.
  - vi. Realism and reasonableness of cost

**\*\*NOTE:** Cost sharing will not be a consideration in proposal evaluation.

### **2. Review and Selection Process**

- a. Upon receipt of a proposal, the ARO staff will perform an initial review of its scientific merit and potential contribution to the Army and DoD mission. Proposals not considered having sufficient scientific merit or relevance to the Army's needs may not receive further review.
- b. All proposals are treated as procurement sensitive and are disclosed only for the purpose of evaluation. Proposals not declined as a result of an initial review will be subject to a peer review by highly qualified government scientists. The applicant must indicate on the appropriate proposal form (Form 52 or 52A) any limitation to be placed on disclosure of information contained in the proposal.
- c. Each proposal will be evaluated based on the evaluation criteria in Section II.G.1 of this BAA rather than against other proposals for research in the same general area.
- d. Upon completion of an evaluation against the criteria in Section II.G.1, a proposal selected for possible award will be analyzed for the realism and reasonableness of costs. Proposal costs must be determined reasonable and realistic before the Government can make an award.

### **3. Recipient Qualification**

- a. Grant and Cooperative Agreement Proposals:
  - i. The Grants Officer is responsible for determining a recipient's qualification prior to award. In general, a Grants Officer will award grants or cooperative agreements only to qualified recipients that meet the standards at 32 CFR 22.415. To be qualified, a potential recipient must:
    - (1) Have the management capability and adequate financial and technical resources, given those that would be made available through the grant or cooperative agreement, to

execute the program of activities envisioned under the grant or cooperative agreement;

(2) Have a satisfactory record of executing such programs or activities (if a prior recipient of an award);

(3) Have a satisfactory record of integrity and business ethics; and

(4) Be otherwise qualified and eligible to receive a grant or cooperative agreement under applicable laws and regulations.

Applicants are requested to provide information with proposal submissions to assist the Grants Officer's evaluation of recipient qualification.

ii. In accordance with Office of Management and Budget (OMB) guidance in parts 180 and 200 of Title 2, CFR, it is DoD policy that DoD Components must report and use integrity and performance information in the Federal Awardee Performance and Integrity Information System (FAPIIS), or any successor system designated by OMB, concerning grants, cooperative agreements, and TIAs as follows:

If the total Federal share will be greater than the simplified acquisition threshold on any Federal award under a notice of funding opportunity (see 2 CFR 200.88 Simplified Acquisition Threshold):

(1) The Federal awarding agency, prior to making a Federal award with a total amount of Federal share greater than the simplified acquisition threshold, will review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (currently FAPIIS) (see 41 U.S.C. 2313);

(2) An applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a Federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM;

(3) The Federal awarding agency will consider any comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under Federal awards when completing the review of risk posed by applicants as described in 2 CFR 200.205 Federal awarding agency review of risk posed by applicants.

b. Contract Proposals:

i. Contracts shall be awarded to responsible prospective contractors only. See FAR 9.104-1 for a listing of the general standards against which an applicant will be assessed to determine responsibility.

Applicants are requested to provide information with proposal submission to assist the Contracting Officer's evaluation of responsibility.

ii. FAPIIS will be checked prior to making an award. The web address is: <https://www.fapiis.gov/fapiis/index.action>. The applicant representing the entity may comment in this system on any information about the entity that a federal government official entered. The information in FAPIIS will be used in making a judgment about the entity's integrity, business ethics, and record of performance under Federal awards that may affect the official's determination that the applicant is qualified to receive an award.

(End of Section)

## **H. Award Administration Information**

### **1. Award Notices**

Applicants whose proposals are recommended for award may be contacted by a Contract/Grant Specialist to discuss additional information required for award. This may include representations and certifications, revised budgets or budget explanations, certificate of current cost or pricing data, subcontracting plan for small businesses, and/or other information as applicable to the proposed award. The anticipated start date will be determined at that time.

The notification email must not be regarded as an authorization to commit or expend funds. The Government is not obligated to provide any funding until a Government Contracting/Grants Officer signs the award document.

The award document signed by the Government Contracting/Grants Officer is the official and authorizing award instrument. The authorizing award instrument, signed by the Contracting/Grants Officer, will be emailed to the PI and AOR.

### **2. Administrative and National Policy Requirements**

#### **a. Required Representations and Certifications:**

##### **i. Contract Proposals:**

(1) Representations and certifications shall be completed by successful applicants prior to award. FAR Online Representations and Certifications are to be completed through SAM at <https://www.sam.gov/SAM/>. As appropriate, DFARS and contract-specific certification packages will be provided to the contractor for completion prior to award.

(2) FAR 52.203-18, PROHIBITION ON CONTRACTING WITH ENTITIES THAT REQUIRE CERTAIN CONFIDENTIALITY AGREEMENTS OR STATEMENTS—REPRESENTATION (JAN 2017)

(a) Definition. As used in this provision--

“Internal confidentiality agreement or statement”, “subcontract”, and “subcontractor”, are defined in the clause at 52.203-19, Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements.

(b) In accordance with section 743 of Division E, Title VII, of the Consolidated and Further Continuing Appropriations Act, 2015 (Pub. L. 113-235) and its successor provisions in subsequent appropriations acts (and as extended in continuing resolutions), Government agencies are not permitted to use funds appropriated (or otherwise made available) for contracts with an entity that requires employees or subcontractors of such entity seeking to report waste, fraud, or abuse to sign internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or subcontractors from lawfully reporting such waste, fraud, or abuse to a designated investigative or law enforcement

representative of a Federal department or agency authorized to receive such information.

(c) The prohibition in paragraph (b) of this provision does not contravene requirements applicable to SF 312, (Classified Information Nondisclosure Agreement), Form 4414 (Sensitive Compartmented Information Nondisclosure Agreement), or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(d) Representation. By submission of its offer, the applicant represents that it will not require its employees or subcontractors to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or subcontractors from lawfully reporting waste, fraud, or abuse related to the performance of a Government contract to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information (e.g., agency Office of the Inspector General).

**(3) FAR 52.209-11, REPRESENTATION BY CORPORATIONS REGARDING DELINQUENT TAX LIABILITY OR A FELONY CONVICTION UNDER FEDERAL LAW (FEB 2016)**

As required by sections 744 and 745 of Division E of the Consolidated and Further Continuing Appropriations Act, 2015 (Pub. L 113-235), and similar provisions, if contained in subsequent appropriations acts, the Government will not enter into a contract with any corporation that--

Has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, where the awarding agency is aware of the unpaid tax liability, unless an agency has considered suspension or debarment of the corporation and made a determination that suspension or debarment is not necessary to protect the interests of the Government; or

Was convicted of a felony criminal violation under any Federal law within the preceding 24 months, where the awarding agency is aware of the conviction, unless an agency has considered suspension or debarment of the corporation and made a determination that this action is not necessary to protect the interests of the Government.

The applicant represents that—

It is  is not  a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability; and

It is  is not  a corporation that was convicted of a felony criminal violation

under a Federal law within the preceding 24 months.

ii. Grant and Cooperative Agreement Proposals:

(1) Grant awards greater than \$100,000 require a certification of compliance with a national policy mandate concerning lobbying. Statutes and Government-wide regulations require the certification to be submitted prior to award. When submitting your grant through Grants.gov, by completing blocks 18 and 19 of the SF 424 (R&R) Form, the grant applicant is providing the certification on lobbying required by 32 CFR Part 28; otherwise a copy signed by the AOR must be provided. Below is the required certification:

CERTIFICATION AT APPENDIX A TO 32 CFR PART 28 REGARDING LOBBYING: Certification for Contracts, Grants, Loans, and Cooperative Agreements the undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit SF-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

(2) In accordance with Continuing Appropriations Act, 2017 (Pub. L. 114-223), or any other Act that extends to fiscal year (FY) 2017 funds the same prohibitions as contained in section 743, division E, title VII, of the Consolidated Appropriations Act, 2016 (Pub. L. 114-113), none of the funds appropriated or otherwise made available by that or any other Act may be made available for a grant or cooperative agreement with an entity that requires its employees or contractors

seeking to report fraud, waste, or abuse to sign internal confidentiality agreements or statements prohibiting or otherwise restricting those employees or contractors from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive the information.

#### PROHIBITION ON CONTRACTING WITH ENTITIES THAT REQUIRED CERTAIN INTERNAL CONFIDENTIALITY AGREEMENTS – REPRESENTATION

Agreement with the representation below will be affirmed by checking the “I agree” box in block 17 of the SF424 (R&R) as part of the electronic proposal submitted via Grants.gov. The representation reads as follows:

By submission of its proposal or application, the applicant represents that it does not require any of its employees, contractors, or subrecipients seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting those employees, contractors, subrecipients from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

\*Note that: Section 743 states that it does not contravene requirements applicable to SF 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(3) Recipients are required to submit the following representation with the application package IAW the instructions at Section II.D.2.f.ii of this BAA:

#### REPRESENTATIONS UNDER DOD ASSISTANCE AGREEMENTS: APPROPRIATIONS PROVISIONS ON TAX DELINQUENCY AND FELONY CONVICTIONS

The applicant is ( ) is not ( ) a “Corporation” meaning any entity, including any institution of higher education, other nonprofit organization, or for-profit entity that has filed articles of incorporation.

If the applicant is a “Corporation” please complete the following representations:

(a) The applicant represents that it is ( ) is not ( ) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

(b) The applicant represents that it is ( ) is not ( ) is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

NOTE: If an applicant responds in the affirmative to either of the above representations, the applicant is ineligible to receive an award unless the agency suspension and debarment official (SDO) has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore should provide information about its tax liability or conviction to the agency's SDO as soon as it can do so, to facilitate completion of the required considerations before award decisions are made.

b. Policy Requirements:

The following list provides notable national policy requirements that may be applicable to an award. NOTE: The following is not an all-inclusive list of policy requirements. For assistance awards, refer to the DoD Research and Development General Terms and Conditions at <https://www.onr.navy.mil/work-with-us/manage-your-award/manage-grant-award/grants-terms-conditions> for additional national policy requirements that may apply. For contract awards, appropriate clauses will be added to award documents.

i. PROTECTION OF HUMAN SUBJECTS:

(1) Assistance Instruments:

(a) The recipient must protect the rights and welfare of individuals who participate as human subjects in research under this award and comply with the requirements at 32 CFR part 219, Department of Defense Instruction (DoDI) 3216.02, 10 U.S.C. 980, and when applicable, Food and Drug Administration (FDA) regulations.

(b) The recipient must not begin performance of research involving human subjects, also known as human subjects research (HSR), that is covered under 32 CFR part 219, or that meets exemption criteria under 32 CFR 219.101(b), until you receive a formal notification of approval from a DoD Human Research Protection Official (HRPO). Approval to perform HSR under this award is received after the HRPO has performed a review of the recipient's documentation of planned HSR activities and has officially furnished a concurrence with the recipient's determination as presented in the documentation.

(c) In order for the HRPO to accomplish this concurrence review, the recipient must provide sufficient documentation to enable his or her assessment as follows:

(i) If the HSR meets an exemption criteria under 32 CFR 219.101(b), the documentation must include a citation of the exemption category under 32 CFR 219.101(b) and a rationale statement.

(ii) If the recipient's activity is determined as "non-exempt research involving human subjects", the documentation must include:

- Assurance of Compliance (i.e., Department of Health and Human Services Office for Human Research Protections (OHRP) Federal Wide Assurance (FWA)) appropriate for the scope of work or program plan; and

- Institutional Review Board (IRB) approval, as well as all documentation reviewed by the IRB to make their determination.

(d) The HRPO retains final judgment on what activities constitute HSR, whether an exempt category applies, whether the risk determination is appropriate, and whether the planned HSR activities comply with the requirements in paragraph (a) of this section.

(e) The recipient must notify the HRPO immediately of any suspensions or terminations of the Assurance of Compliance.

(f) DoD staff, consultants, and advisory groups may independently review and inspect the recipient's research and research procedures involving human subjects and, based on such findings, DoD may prohibit research that presents unacceptable hazards or otherwise fails to comply with DoD requirements.

(g) Definitions for terms used in this article are found in DoDI 3216.02.

(2) Contracts: The appropriate clauses shall be added to the award.

ii. ANIMAL USE:

(1) Assistance Instruments:

(a) Prior to initiating any animal work under the award, the recipient must:

(i) Register the recipient's research, development, test, and evaluation or training facility with the Secretary of Agriculture in accordance with 7 U.S.C. 2136 and 9 CFR section 2.30, unless otherwise exempt from this requirement by meeting the conditions in 7 U.S.C. 2136 and 9 CFR parts 1-4 for the duration of the activity.

(ii) Have the recipient's proposed animal use approved in accordance with DoDI 3216.01, Use of Animals in DoD Programs by a DoD Component Headquarters Oversight Office.

(iii) Furnish evidence of such registration and approval to the grants officer.

(b) The recipient must make the animals on which the research is being conducted, and all premises, facilities, vehicles, equipment, and records that support animal care and use available during business hours and at other times mutually agreeable to the recipient, the United States Department of Agriculture Office of Animal and Plant Health Inspection Service (USDA/APHIS) representative, personnel representing the DoD component oversight offices, as well as the grants officer, to ascertain that the recipient is compliant with 7 U.S.C. 2131 et seq., 9 CFR parts 1-4, and DoDI 3216.01.

(c) The recipient's care and use of animals must conform with the pertinent laws of the United States, regulations of the Department of Agriculture, and regulations, policies, and procedures of the DoD (see 7 U.S.C. 2131 et seq., 9 CFR parts 1-4, and DoDI 3216.01).

(d) The recipient must acquire animals in accordance with DoDI 3216.01.

(2) Contracts: The appropriate clauses shall be added to the award.

iii. BIOLOGICAL SAFETY PROGRAM REQUIREMENTS:

(1) Assistance Instruments and Contracts: Awards may be subject to biological safety program requirements IAW:

(a) Army Regulation (AR) 385-10, Chapter 20

[https://armypubs.army.mil/epubs/DR\\_pubs/DR\\_a/pdf/web/p385\\_10.pdf](https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/p385_10.pdf)

(b) Department of Army (DA) Pamphlet (PAM) 385-69

[http://armypubs.army.mil/epubs/DR\\_pubs/DR\\_a/pdf/web/p385\\_69.pdf](http://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/p385_69.pdf)

(c) DoD Manual 6055.18-M, Enclosure 4, Section 13

<https://www.hsdl.org/?abstract&did=24365>

(d) DoD Executive Agent List (see item 3)

[https://armypubs.army.mil/epubs/DR\\_pubs/DR\\_a/pdf/web/ARN3387\\_AR10-90\\_Web\\_FINAL.pdf](https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN3387_AR10-90_Web_FINAL.pdf)

iv. MILITARY RECRUITING:

(1) Assistance Instruments: This is to notify potential applicants that each grant or cooperative agreement awarded under this announcement to an institution of higher education must include the following term and condition:

(a) As a condition for receiving funds available to the DoD under this award, you agree that you are not an institution of higher education (as defined in 32 CFR part 216) that has a policy or practice that either prohibits, or in effect prevents:

(i) The Secretary of a Military Department from maintaining, establishing, or operating a unit of the Senior Reserve Officers Training Corps (ROTC)—in accordance with 10 U.S.C. 654 and other applicable Federal laws—at that institution (or any sub-element of that institution);

(ii) Any student at that institution (or any sub-element of that institution) from enrolling in a unit of the Senior ROTC at another institution of higher education.

(iii) The Secretary of a Military Department or Secretary of Homeland Security from gaining access to campuses, or access to students (who are 17 years of age or older) on campuses, for purposes of military recruiting in a manner that is at least equal in quality and scope to the access to campuses and to students that is provided to any other employer; or

(iv) Access by military recruiters for purposes of military recruiting to the names of students (who are 17 years of age or older and enrolled at that institution or any sub-element of that institution); their addresses, telephone listings, dates and places of birth, levels of education,

academic majors, and degrees received; and the most recent educational institutions in which they were enrolled.

(b) If you are determined, using the procedures in 32 CFR part 216, to be such an institution of higher education during the period of performance of this award, we:

(i) Will cease all payments to you of DoD funds under this award and all other DoD grants and cooperative agreements; and

(ii) May suspend or terminate those awards unilaterally for material failure to comply with the award terms and conditions.

(2) Contracts: Each contract awarded under this announcement to an institution of higher education shall include the following clause: DFARS 252.209-7005, Military Recruiting on Campus.

v. SUBCONTRACTING:

(1) Assistance Instruments: N/A

(2) Contracts: Pursuant to Section 8(d) of the Small Business Act (15 U.S.C. § 637(d)), it is the policy of the Government to enable small business and small disadvantaged business (SDB) concerns to be considered fairly as subcontractors. All other than U.S. small businesses proposing contracts expected to exceed \$700,000 and that have subcontracting possibilities are required to submit a subcontracting plan IAW FAR 19.702(a), and shall do so with their proposal.

Subcontracting plans are determined to be acceptable or unacceptable based on the criteria established at FAR 19.705-4, DFARS 219.705-4, and AFARS 5119.705-4. Goals are established on an individual contract basis and should result in realistic, challenging and attainable goals that, to the greatest extent possible, maximize small business participation in subcontracting for Small Business, SDB, Woman-Owned Small Business (WOSB), Economically-Disadvantaged Women-Owned Small Business (EDWOSB), Service-Disabled Veteran-Owned Small Business (SDVOSB), Veteran-Owned Small Business (VOSB), and Historically Underutilized Business Zone (HUBZone) Small Business consistent with applicants' make-or-buy policy, the pool of and availability of qualified and capable small business subcontractors, their performance on subcontracts, and existing relationships with suppliers.

Subcontracting goals should result in efficient contract performance in terms of cost, schedule, and performance and should not result in increased costs to the Government or undue administrative burden to the prime contractor. For reference, DoD Small Business Subcontracting Goals may be found at:

<https://business.defense.gov/About/Goals-and-Performance/>

vi. EXPORT CONTROL LAWS:

(1) Assistance Instruments: N/A

(2) Contracts: Applicants should be aware of current export control laws and are responsible for ensuring compliance with all International Traffic in Arms Regulation (ITAR) (22 CFR 120 et. Seq.) requirements, as applicable. In some cases, developmental items funded by the Department of Defense are now included on the United States Munition List (USML) and are therefore subject to ITAR jurisdiction. Applicants should address in their proposals whether ITAR restrictions apply or do not apply, such as in the case when research products would have both civil and military application, to the work they are proposing to perform for the Department of Defense. The USML is available online at <https://www.ecfr.gov/cgi-bin/text-idx?node=pt22.1.121>. Additional information regarding the President's Export Control Reform Initiative can be found at <https://2016.export.gov/ecr/index.asp>

vii. DRUG-FREE WORKPLACE:

(1) Assistance Instruments: The recipient must comply with drug-free workplace requirements in Subpart B of 2 CFR part 26, which is the DoD implementation of 41 U.S.C. chapter 81, "Drug-Free Workplace."

(2) Contracts: The appropriate clause(s) shall be added to the award.

viii. DEBARMENT AND SUSPENSION:

(1) Assistance Instruments: The recipient must comply with requirements regarding debarment and suspension in Subpart C of 2 CFR part 180, as adopted by DoD at 2 CFR part 1125. This includes requirements concerning the recipient's principals under an award, as well as requirements concerning the recipient's procurement transactions and subawards that are implemented in DoD Research and Development General Terms and Conditions PROC Articles I through III and SUB Article II.

(2) Contracts: The appropriate clause(s) shall be added to the award.

ix. REPORTING SUBAWARDS AND EXECUTIVE COMPENSATION:

(1) Assistance Instruments: The recipient must report information about subawards and executive compensation as specified in the award term in Appendix A to 2 CFR part 170, "Reporting subaward and executive compensation information," modified as follows:

(a) To accommodate any future designation of a different Government wide Web site for reporting subaward information, the Web site "http://www.fsrs.gov" cited in paragraphs a.2.i. and a.3 of the award provision is replaced by the phrase "http://www.fsrs.gov or successor OMB-designated Web site for reporting subaward information";

(b) To accommodate any future designation of a different Government wide Web site for reporting executive compensation information, the Web site "http://www.sam.gov" cited in paragraph b.2.i. of the award provision is replaced by the phrase "https://www.sam.gov or successor OMB-designated Web site for reporting information on total compensation"; and

(c) The reference to “Sec. \_\_\_\_ .210 of the attachment to OMB Circular A-133, “Audits of States, Local Governments, and Non-Profit Organizations” in paragraph e.3.ii of the award term is replaced by “2 CFR 200.330, as implemented in DoD Research and Development General Terms and Conditions SUB Article I of this award.”

(2) Contracts: The appropriate clause(s) shall be added to the award.

#### x. PROHIBITION ON CONTRACTING WITH ENTITIES USING CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

Section 889 of the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2019 (Public Law 115-232) prohibits the head of an executive agency from obligating or expending loan or grant funds to procure or obtain, extend, or renew a contract to procure or obtain, or enter into a contract (or extend or renew a contract) to procure or obtain the equipment, services, or systems prohibited systems as identified in section 889 of the NDAA for FY 2019. For more information on how this applies to all grant recipients and sub-recipients after August 13, 2020, please see DoD Research General Terms and Conditions (SEP 2020) NP Article IV. Other national policy requirements, paragraph 18.

### 3. Reporting

a. Additional reports including number and types will be specified in the award document, but will include as a minimum monthly financial status reports. The reports shall be prepared and submitted in accordance with the procedures contained in the award document and mutually agreed upon before award. Reports and briefing material will also be required as appropriate to document progress in accomplishing program metrics. A final report that summarizes the project and tasks will be required at the conclusion of the performance period for the award.

Proposals that receive an award will require annual progress reports as well as a final report. Please note that your award document will reference Form 18, "Reporting Instructions," as found at <http://www.arl.army.mil/www/default.cfm?page=29>. You shall use these reporting instructions for format instructions only; the due date for receipt of a final technical report is thirty (30) days from completion of the award.

b. **ARMY MANPOWER CONTRACTOR REPORTING: For Contracts Only**. The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains a secure Army data collection site where the contractor will report ALL contractor manpower (including subcontractor manpower) required for performance of this contract. The contractor is required to completely fill in all the information in the format using the following web address: <https://www.sam.gov/SAM/>. The required information includes:

- (1) Contracting Office, Contracting Officer, Contracting Officer’s Technical Representative;
- (2) Contract number, including task and delivery order number;
- (3) Beginning and ending dates covered by reporting period;
- (4) Contractor name, address, phone number, email address, identity of contractor employee entering data;

- (5) Estimated direct labor hours (including sub-contractors);
- (6) Estimated direct labor dollars paid this reporting period (including sub-contractors);
- (7) Total payments (including sub-contractors);
- (8) Predominate Federal Service Code (FSC) reflecting services provided by contractor (and separate predominant FSC for each sub-contractor if different);
- (9) Estimated data collection cost;
- (10) Organizational title associated with the Unit Identification Code (UIC) for the Army Requiring Activity (the Army Requiring Activity is responsible for providing the contractor with its UIC for the purposes of reporting this information);
- (11) Locations where contractor and sub-contractors perform the work (specified by zip code in the United States and nearest city, country, when in an overseas location, using standardized nomenclature provided on website);
- (12) Presence of deployment or contingency contract language; and
- (13) Number of contractor and sub-contractor employees deployed in theater this reporting period (by country).

As part of its submission, the contractor will also provide the estimated total cost (if any) incurred to comply with this reporting requirement. Reporting period will be the period of performance not to exceed 12 months ending 30 September of each Government FY and must be reported by 31 October of each calendar year. Contractors may use a direct XML data transfer to the database server or fill in the fields on the website. The XML direct transfer is a format for transferring files from a contractor's systems to the secure web site without the need for separate data entries for each required data element at the web site. The specific formats for the XML direct transfer may be downloaded from the web site.

c. If the total Federal share exceeds \$500,000 on any Federal award under a notice of funding opportunity, the post-award reporting requirements reflected in Appendix XII to 2 CFR 200 will be included in the award document. This requirement also applies to modifications of awards that: 1) increase the scope of the award, 2) are issued on or after January 1, 2016, and 3) increase the federal share of the award's total value to an amount that exceeds \$500,000.

(End of Section)

## **I. Agency Contacts**

1. Questions of a technical or programmatic nature shall be directed to the Program Manager or one of the TPOCs.
  - a. Program Manager: Joe X Qiu, [joe.x.qiu.civ@mail.mil](mailto:joe.x.qiu.civ@mail.mil), (919) 549-4297
  - b. Technical Points of Contact (TPOCs)
    - i. Joe X Qiu, [joe.x.qiu.civ@mail.mil](mailto:joe.x.qiu.civ@mail.mil), (919) 549-4297
    - ii. Evan Runnerstrom, [evan.l.runnerstrom.civ@mail.mil](mailto:evan.l.runnerstrom.civ@mail.mil), (919) 549-4259
    - iii. S Purushothaman (Purush) Iyer, [s.p.iyer.civ@mail.mil](mailto:s.p.iyer.civ@mail.mil), (919) 549-4204
    - iv. Hamid Krim, [hamid.krim.civ@mail.mil](mailto:hamid.krim.civ@mail.mil), (919) 549-44375
    - v. Peter Reynolds, [peter.j.reynolds16.civ@mail.mil](mailto:peter.j.reynolds16.civ@mail.mil), (919) 549-4345

2. Questions of a business or administrative nature are to be directed to the following email:  
[kevin.j.bassler.civ@mail.mil](mailto:kevin.j.bassler.civ@mail.mil)

3. Comments or questions submitted should be concise and to the point, eliminating any unnecessary verbiage. In addition, the relevant part and paragraph of the announcement should be referenced.

4. Requests to withdraw a proposal shall be directed to [joe.x.qiu.civ@mail.mil](mailto:joe.x.qiu.civ@mail.mil)

(End of Section)

## J. Other Information

Below are two separate outlines of the informational requirements for a sample cost proposal. Section J.1 is for a procurement contract and Section J.2 is for grants and cooperative agreements.

### 1. CONTRACT Proposals

Cost Proposal – {No Page Limit}

Cover sheet to include:

1	BAA number
2	Technical area
3	Lead organization submitting proposal
4	Type of business, selected among the following categories: “LARGE BUSINESS”, “SDB”, “OTHER SMALL BUSINESS”, “HBCU”, “MI”, “OTHER EDUCATIONAL”, OR “OTHER NONPROFIT”
5	Contractor’s reference number (if any)
6	Other team members (if applicable) and type of business for each
7	Proposal title
8	TPOC to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available)
9	Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), and electronic mail (if available)
10	Award instrument requested: cost plus fixed fee (CPFF), cost-contract—no fee, cost sharing contract – no fee, or other type of procurement contract (specify)
11	Place(s) and period(s) of performance
12	Total proposed cost separated by basic award and option(s) (if any)
13	Name, address, and telephone number of the proposer’s cognizant Defense Contract Management Agency (DCMA) administration office (if known)
14	Name, address, and telephone number of the proposer’s cognizant Defense Contract Audit Agency (DCAA) audit office (if known)
15	Date proposal was prepared
16	DUNS number
17	TIN number
18	CAGE code
19	Subcontractor information
20	Proposal validity period
21	Any Forward Pricing Rate Agreement, other such approved rate information, or such other documentation that may assist in expediting negotiations (if available)

#### a. Reasoning for Submitting a Strong Cost Proposal

The ultimate responsibility of the Contracting Officer is to ensure that all prices offered in a proposal are fair and reasonable before contract award. To establish the reasonableness of the offered prices, the Contracting Officer may ask the applicant to provide supporting documentation that assists in this determination. The applicant's ability to be responsive to the Contracting Officer's requests can expedite contract award. As specified in Section 808 of Public Law 105-261, an applicant who does not comply with a requirement to submit information for a contract or subcontract in accordance with paragraph (a)(1) of FAR 15.403-3 may be ineligible for award.

b. DCAA-Accepted Accounting System

i. Before a cost-type contract can be awarded, the Contracting Officer must confirm that the applicant has a DCAA-accepted accounting system in place for accumulating and billing costs under Government contracts [FAR 53.209-1(f)]. If the applicant has DCAA correspondence, which documents the acceptance of its accounting system, this should be provided to the Contracting Officer (i.e. attached or referenced in the proposal). Otherwise, the Contracting Officer will submit an inquiry directly to the appropriate DCAA office and request a review of the applicant's accounting system.

ii. If an applicant does not have a DCAA-accepted accounting system in place, the DCAA review process can take several months depending upon the availability of the DCAA auditors and the applicant's internal processes. This will delay contract award.

iii. For more information about cost proposals and accounting standards, view the link titled "Information for Contractors" on the main menu of the DCAA website.

c. Field Pricing Assistance

During the pre-award cost audit process, the Contracting Officer may solicit support from DCAA to determine commerciality and price reasonableness of the proposal [FAR 15.404-2]. Any proprietary information or reports obtained from DCAA field audits will be appropriately identified and protected within the Government.

d. Sample Cost Proposal – "Piece by Piece"

To help guide applicants through the pre-award cost audit process, a sample cost proposal is detailed below. This sample allows the applicant to see exactly what the Government is looking for so that all cost and pricing back-up data can be provided to the Government in the first cost proposal submission. Review each cost element within the proposal, and take note of the types of documentation that the Contracting Officer will require from the applicant.

i. Direct Labor: The first cost element included in the cost proposal is Direct Labor. Each proposed employee must be listed by name and labor category.

Below is the Direct Labor as proposed by our sample applicant:

<b>DIRECT LABOR</b>		<b>YEAR 1</b>			<b>YEAR 2</b>		
<b>Employee Name</b>	<b>Labor Category</b>	<b>Direct Hourly Rate</b>	<b>Hours</b>	<b>Total Direct Labor</b>	<b>Direct Hourly Rate</b>	<b>Hours</b>	<b>Total Direct Labor</b>
Andy Smith	Program Manager	\$55.00	720.00	\$39,600.00	\$56.65	720.00	\$40,788.00
Bryan Andrews	Senior Engineer	\$40.00	672.00	\$26,880.00	\$41.20	672.00	\$27,686.40
Cindy Thomas	Principal Engineer	\$50.00	512.00	\$25,600.00	\$51.50	512.00	\$26,368.00
David Porter	Entry Level Engineer	\$10.00	400.00	\$4,000.00	\$10.30	400.00	\$4,120.00
Edward Bean	Project Administrator	\$25.00	48.00	\$1,200.00	\$25.75	48.00	\$1,236.00
Subtotal Direct Labor (DL)				\$97,280.00			\$100,198.40

(1) For this cost element, the Contracting Officer requires the applicant to provide adequate documentation in order to determine that the labor rate for each employee/labor category is fair and reasonable. The documentation must explain how these labor rates were derived. For example, if the rates are DCAA-approved labor rates, provide the Contracting Officer with copies of the DCAA documents stating the approval. This is the most acceptable means of documentation to determine the rates fair and reasonable. Other types of supporting documentation may include General Service Administration (GSA) contract price lists, actual payroll journals, or Salary.com research. If an employee listed in a cost proposal is not a current employee (maybe a new employee, or one contingent upon the award of this contract), a copy of the offer letter stating the hourly rate, signed and accepted by the employee, may be provided as adequate documentation.

Sometimes the hourly rates listed in a proposal are derived through subjective processes, i.e., blending of multiple employees in one labor category, or averaged over the course of the year to include scheduled payroll increases, etc. These situations should be clearly documented for the Contracting Officer.

(2) Another cost element in Direct Labor is labor escalation, or the increase in labor rates from year to year. In the example above, the proposed labor escalation is 3% (ex., Andy Smith’s direct labor rate increased by 3% from \$55.00/hour in Year 1 to \$56.65/hour in Year 2). Often times, an applicant may not propose escalation on labor rates during a 24-month period. Whatever the proposed escalation rate is, please be prepared to explain why it is fair and reasonable. For example, a sufficient explanation for our sample escalation rate would be “The Government’s General Schedule Increase and Locality Pay for the same time period (name FY) in the same location (name location) was published as 3.5%; therefore a 3% increase is fair and reasonable”.

ii. *Other Direct Costs (ODCs)*: This section of the cost proposal includes all other directly-related costs required in support of the effort (i.e., materials, subcontractors, consultants, travel, etc.). Any cost element that includes various items must be detailed in a cost breakdown.

(1) Direct Material Costs: This subsection of the cost proposal will include any special tooling, test equipment, and material costs necessary to perform the project. Items included in this section must be carefully reviewed relative to need and appropriateness for the work proposed, and must, in the opinion of the Contracting Officer, be advantageous to the Government and directly related to the specific topic.

The Contracting Officer will require adequate documentation from the applicant to determine the cost reasonableness for each material cost proposed. The following methods are ways in which the Contracting Officer can determine this [FAR 15.403-1]:

(a) Adequate Price Competition. A price is based on adequate price competition when the applicant solicits and receives quotes from two or more responsible vendors for the same or similar items or services. Based on these quotes, the applicant selects the vendor who represents the best value to the Government. The applicant will be required to provide to the Contracting Officer copies of all vendor quotes received.

\*NOTE: Price competition is not required for items at or below the micropurchase threshold (\$10,000) [FAR 15.403-1]. If an item’s unit cost is less than or equal to \$10,000, price competition is not necessary. However, if an item’s total cost over the period of performance (unit cost x quantity) is higher than \$10,000, two or more quotes must be obtained by the applicant.

(b) Commercial Prices. Commercial prices are those published on current price lists, catalogs, or market prices. This includes vendors who have prices published on a GSA-schedule contract. The applicant will be required to provide copies of such price lists to the Contracting Officer.

(c) Prices set by law or regulation. If a price is mandated by the Government (i.e. pronouncements in the form of periodic rulings, reviews, or similar actions of a governmental body, or embodied in the laws) that is sufficient to set a price.

Below is the list of Direct Material costs included in our sample proposal:

<b>DIRECT MATERIAL COSTS</b>	<b>YEAR 1</b>	<b>YEAR 2</b>
Raw Materials	\$35,000.00	\$12,000.00
Computer for experiments	\$4,215.00	\$0.00
Cable (item #12-3657, 300 ft)	\$1,275.00	\$0.00
Software	\$1,825.00	\$1,825.00
Subtotal Direct Materials Costs	\$42,315.00	\$13,825.00

“Raw Materials”: This is a generic label used to group many material items into one cost item within the proposal. The Contracting Officer will require a detailed breakout of all the items that

make up this cost. For each separate item over \$10,000 (total for Year 1 + Year 2), the applicant must be able to provide either competitive quotes received, or show that published pricing was used.

“Computer for experiments”: This item is most likely a grouping of several components that make up one system. The Contracting Officer will require a detailed breakout of all the items that make up this cost. For each separate item over \$10,000 (total for Year 1 + Year 2), the applicant must be able to provide either competitive quotes received, or show that published pricing was used.

“Cable”: Since this item is under the simplified acquisition threshold of \$10,000, competitive quotes or published pricing are not required. Simply provide documentation to show the Contracting Officer where this price came from.

“Software”: This cost item could include either one software product, or multiple products. If this includes a price for multiple items, please provide the detailed cost breakdown. Note: The price for Year 1 (\$1,825) is below the simplified acquisition threshold; however, in total (Year 1 + Year 2) the price is over \$10,000, so competitive quotes or published pricing documentation must be provided.

Due to the specialized types of products and services necessary to perform these projects, it may not always be possible to obtain competitive quotes from more than one reliable source. Each cost element over the simplified acquisition threshold (\$10,000) must be substantiated. There is always an explanation for how the cost of an item was derived; document how you came up with that price.

When it is not possible for an applicant to obtain a vendor price through competitive quotes or published price lists, the Contracting Officer may accept other methods to determine cost reasonableness. Below are some examples of other documentation, which the Contracting Officer may accept to substantiate costs:

(a) Evidence that a vendor/supplier charged another applicant a similar price for similar services. Has the vendor charged someone else for the same product? Two (2) to three (3) invoices from that vendor to different customers may be used as evidence.

(b) Previous contract prices. Has the applicant charged the Government a similar price under another Government contract for similar services? If the Government has already paid a certain price for services, then that price may already be considered fair and reasonable. Provide the contract number, and billing rates for reference.

(c) DCAA approved. Has DCAA already accepted or verified specific cost items included in your proposal? Provide a copy of DCAA correspondence that addressed these costs.

(2) ODCs: Below is the remaining ODC portion of our proposal including equipment, subcontractors, consultants, and travel. Assume in this scenario that competitive quotes or catalog prices were not available for these items:

<b>ODCs</b>	<b>YEAR 1</b>	<b>YEAR 2</b>
Equipment Rental for Analysis	\$5,500.00	\$5,600.00
Subcontractor – Widget, Inc.	\$25,000.00	\$0.00
Consultant: John Bowers	\$0.00	\$12,000.00
Travel	\$1,250.00	\$1,250.00
Subtotal: ODCs	\$31,750.00	\$18,850.00

“Equipment Rental for Analysis”: The applicant explains that the Year 1 cost of \$5,500 is based upon 250 hours of equipment rental at an hourly rate of \$22.00/hr. One (1) invoice from the vendor charging another vendor the same price for the same service is provided to the Contracting Officer as evidence. Since this cost is over the simplified acquisition threshold, further documentation to determine cost reasonableness is required. The applicant is able to furnish another invoice charging a second vendor the same price for the same service.

“Subcontractor – Widget, Inc.”: The applicant provides a copy of the subcontractor quote to the Contracting Officer in support of the \$25,000 cost. This subcontractor quote must include sufficient detailed information (equivalent to the data included in the prime’s proposal to the Government), so that the Contracting Officer can make a determination of cost reasonableness.

(a) As stated in Section 3.5(c)(6) of the DoD Cost Proposal guidance, “All subcontractor costs and consultant costs must be detailed at the same level as prime contractor costs in regards to labor, travel, equipment, etc. Provide detailed substantiation of subcontractor costs in your cost proposal.”

(b) In accordance with FAR 15.404-3, “the Contracting Officer is responsible for the determination of price reasonableness for the prime contract, including subcontracting costs”. This means that the subcontractor’s quote/proposal may be subject to the same scrutiny by the Contracting Officer as the cost proposal submitted by the prime. The Contracting Officer will need to determine whether the subcontractor has an accepted purchasing system in place and/or conduct appropriate cost or price analyses to establish the reasonableness of proposed subcontract prices. Due to the proprietary nature of cost data, the subcontractor may choose to submit their pricing information directly to the Contracting Officer and not through the prime. This is understood and encouraged.

(c) When a subcontractor is selected to provide support under the prime contract due to its specialized experience, the Contracting Officer may request sole source justification from the applicant.

“Consultant – John Bowers”: The applicant shall provide a copy of the consultant’s quote to the Contracting Officer as evidence. In this example, the consultant will be charging an hourly rate of \$125 an hour for 96 hours of support. The applicant indicates to the Contracting Officer that this particular consultant was used on a previous contract with the Government (provide contract number), and will be charging the same rate. A copy of the consultant’s invoice to the applicant under the prior contract is available as supporting evidence. Since the Government has paid this price for the same services in the past, determination has already been made that the price is fair.

“Travel”: The Contracting Officer will require a detailed cost breakdown for travel expenses to determine whether the total cost is reasonable based on Government per diem and mileage rates. This breakdown shall include the number of trips, the destinations, and the number of travelers. It will also need to include the estimated airfare per round trip, estimated car rental, lodging rate per trip, tax on lodging, and per diem rate per trip. The lodging and per diem rates must comply with the Joint Travel Regulations. Please see the following website to determine the appropriate lodging and per diem rates: <http://www.defensetravel.dod.mil>. Additionally, the applicant must provide why the airfare is fair and reasonable as well. Sufficient back up for both airfare and car rental would include print outs of online research at the various travel search engines (Expedia, Travelocity, etc.), documenting the prices for airfare and car rentals are fair and reasonable.

Below is a sample of the travel portion:

<b>TRAVEL</b>	<b>Unit</b>	<b>Trips</b>	<b>Travelers</b>	<b>Nights</b>	<b>Days</b>	<b>Unit Cost</b>	<b>Total Travel</b>
Airfare	roundtrip	1	1			\$996.00	\$996.00
Lodging	day	1	1	1		\$75.00	\$75.00
Tax on Lodging (12%)	day	1	1	1		\$9.00	\$9.00
Per Diem	day	1	1		2	\$44.00	\$88.00
Automobile Rental	day	1	1		2	\$41.00	\$82.00
Subtotal Travel							\$1,250.00

iii. *Indirect Costs*: Indirect costs include elements such as fringe benefits, general and administrative (G&A), overhead, and material handling costs. The applicant shall indicate in the cost proposal both the indirect rates (as a percentage) as well as how those rates are allocated to the costs in the proposal.

Below is the indirect portion of our sample proposal:

<b>INDIRECTS</b>	<b>YEAR 1</b>	<b>YEAR 2</b>
Subtotal Direct Labor (DL):	\$97,280.00	\$100,198.40
Fringe Benefits, if not included in Overhead, rate (15.0000 %) X DL =	\$14,592.00	\$15,029.76
Labor Overhead (rate 45.0000 %) X (DL + Fringe) =	\$50,342.40	\$51,852.67
Total Direct Labor (TDL):	\$162,214.40	\$167,080.83

In this example, the applicant includes a fringe benefit rate of 15.00% that it allocated to the direct labor costs. The applicant also proposes a labor overhead rate of 45.00% that is allocated to the direct labor costs plus the fringe benefits.

All indirect rates and the allocation methods of those rates must be verified by the Contracting Officer. In most cases, DCAA documentation supporting the indirect rates and allocation methods can be obtained through a DCAA field audit or proposal review. Many applicants have already completed such reviews and have this documentation readily available. If an applicant is unable to participate in a DCAA review to substantiate indirect rates, the Contracting Officer may request other accounting data from the applicant to make a determination.

iv. *Facilities Capital Cost of Money (FCCM)*: Cost of money is an imputed cost that is not a form of interest on borrowings (see FAR 31.205-20). FCCM is an “incurred cost” for cost-reimbursement purposes under applicable cost-reimbursement contracts and for progress payment purposes under fixed-price contracts. It refers to (1) FCCM (48 CFR 9904.414) and (2) cost of money as an element of the cost of capital assets under construction (48 CFR 9904.417). If cost of money is proposed in accordance with FAR 31.205-10, a DD Form 1861 is required to be completed and submitted with the applicant’s proposal.

v. *Fee/Profit*: The proposed fee percentage will be analyzed in accordance with DFARS 215.404, the Weighted Guidelines Method.

vi. *Subcontracting Plan*: If the total amount of the proposal exceeds \$700,000 and the applicant is a large business or an institute of higher education (other than HBCU/MI) and the resultant award is a contract, the applicant shall be prepared to submit a subcontracting plan for small business and SDB concerns. A mutually agreeable plan will be included in and made a part of the contract (see Section II.F.2.b.v).

## **2. GRANT and COOPERATIVE AGREEMENT Proposals**

Before award it must be established that an approved accounting system and financial management system exist.

a. *Direct Labor*: Show the current and projected salary amounts in terms of man-hours, man-months, or annual salary to be charged by the PI(s), faculty, research associates, postdoctoral associates, graduate and undergraduate students, secretarial, clerical, and other technical personnel either by personnel or position. State the number of man-hours used to calculate a man-month or man-year. For proposals from universities, research during the academic term is deemed part of regular academic duties, not an extra function for which additional compensation or compensation at a higher rate is warranted. Consequently, academic term salaries shall not be augmented either in rate or in total amount for research performed during the academic term. Rates of compensation for research conducted during non-academic (summer) terms shall not exceed the rate for the academic terms. When part or all of a person's services are to be charged as project costs, it is expected that the person will be relieved of an equal part or all of his or her

regular teaching or other obligations. For each person or position, provide the following information:

- i. The basis for the direct labor hours or percentage of effort (e.g., historical hours or estimates);
- ii. The basis for the direct labor rates or salaries. Labor costs should be predicted upon current labor rates or salaries. These rates may be adjusted upward for forecast salary or wage cost-of-living increases that will occur during the agreement period. The cost proposal should separately identify the rationale applied to base salary/wage for cost-of-living adjustments and merit increases. Each must be fully explained;
- iii. The portion of time to be devoted to the proposed research, divided between academic and non-academic (summer) terms, when applicable;
- iv. The total annual salary charged to the research project; and
- v. Any details that may affect the salary during the project, such as plans for leave and/or remuneration while on leave.

Note: There is no page limitation for budget proposals or budget justifications.

b. Fringe Benefits and Indirect Costs (Overhead, G&A, and Other): The most recent rates, dates of negotiation, the base(s) and periods to which the rates apply must be disclosed and a statement included identifying whether the proposed rates are provisional or fixed. If the rates have been negotiated by a Government agency, state when and by which agency. A copy of the negotiation memorandum should be provided. If negotiated forecast rates do not exist, applicants must provide sufficient detail to enable a determination to be made that the costs included in the forecast rate are allocable according to applicable cost provisions. Applicants' disclosure should be sufficient to permit a full understanding of the content of the rate(s) and how it was established. As a minimum, the submission should identify:

- i. All individual cost elements included in the forecast rate(s);
- ii. Basis used to prorate indirect expenses to cost pools, if any;
- iii. How the rate(s) was calculated;
- iv. Distribution basis of the developed rate(s);
- v. Basis on which the overhead rate is calculated, such as "salaries and wages" or "total costs;" and
- vi. The period of the applicant's FY.

c. Permanent Equipment: If facilities or equipment are required, a justification why this property should be furnished by the Government must be submitted. State the organization's inability or

unwillingness to furnish the facilities or equipment. Applicants must provide an itemized list of permanent equipment showing the cost for each item. Permanent equipment is any article or tangible nonexpendable property having a useful life of more than one year and an acquisition cost of \$5,000 or more per unit. The basis for the cost of each item of permanent equipment included in the budget must be disclosed, such as:

- i. Vendor Quote: Show name of vendor, number of quotes received and justification, if intended award is to other than lowest bidder.
- ii. Historical Cost: Identify vendor, date of purchase, and whether or not cost represents lowest bid. Include reason(s) for not soliciting current quotes.
- iii. Engineering Estimate: Include rationale for quote and reason for not soliciting current quotes.

If applicable, the following additional information shall be disclosed in the applicant's cost proposal:

- iv. Special test equipment to be fabricated by the awardee for specific research purposes and its cost.
  - v. Standard equipment to be acquired and modified to meet specific requirements, including acquisition and modification costs, listed separately.
  - vi. Existing equipment to be modified to meet specific research requirements, including modification costs. Do not include equipment the organization will purchase with its funds if the equipment will be capitalized for Federal income tax purposes. Proposed permanent equipment purchases during the final year of an award shall be limited and fully justified.
  - vii. Grants and cooperative agreements may convey title to an institution for equipment purchased with project funds. At the discretion of the Contracting/Grants Officer, the agreement may provide for retention of the title by the Government or may impose conditions governing the equipment conveyed to the organization per the governing laws and regulations.
- d. Travel: Forecasts of travel expenditures (domestic and foreign) that identify the destination and the various cost elements (airfare, mileage, per diem rates, etc.) must be submitted. The costs should be in sufficient detail to determine the reasonableness of such costs. Allowance for air travel normally will not exceed the cost of round-trip, economy air accommodations. Specify the type of travel and its relationship to the research project. Requests for domestic travel must not exceed \$3,000 per year per PI. Separate, prior approval by the ARL is required for all foreign travel (i.e., travel outside the continental U.S., its possessions and Canada). Foreign travel requests must not exceed \$1,800 each per year per PI. Special justification will be required for travel requests in excess of the amounts stated above and for travel by individuals other than the PI(s). Individuals other than the PI(s) are considered postdoctoral associates, research associates, graduate and undergraduate students, secretarial, clerical, and other technical personnel. Additional travel may be requested for travel to Army laboratories and facilities to enhance

agreement objectives and to achieve technology transfer.

(1) Participant Support Costs: This budget category refers to costs of transportation, per diem, stipends, and other related costs for participants or trainees (but not employees) in connection with ARO-sponsored conferences, meetings, symposia, training activities, apprenticeships and workshops (see the “Other Programs” section as described earlier in this BAA). Generally, indirect costs are not allowed on participant support costs. The number of participants to be supported should be entered in the parentheses on the budget form. These costs should also be justified in the budget justification page(s) attached to the cost proposal.

(2) Materials, Supplies, and Consumables: A general description and total estimated cost of expendable equipment and supplies are required. The basis for developing the cost estimate (vendor quotes, invoice prices, engineering estimate, purchase order history, etc.) must be included. If possible, provide a material list.

(3) Publication, Documentation, and Dissemination: The budget may request funds for the costs of preparing, publishing, or otherwise making available to others the findings and products of the work conducted under an agreement, including costs of reports, reprints, page charges, or other journal costs (except costs for prior or early publication); necessary illustrations, cleanup, documentation, storage, and indexing of data and databases; and development, documentation, and debugging of software.

(4) Consultant Costs: Applicants normally are expected to utilize the services of their own staff to the maximum extent possible in managing and performing the project's effort. If the need for consultant services is anticipated, the nature of proposed consultant services should be justified and included in the technical proposal narrative. The cost proposal should include the names of consultant(s), primary organizational affiliation, each individual's expertise, daily compensation rate, number of days of expected service, and estimated travel and per diem costs.

(5) Computer Services: The cost of computer services, including computer-based retrieval of scientific, technical, and educational information, may be requested. A justification/explanation based on the established computer service rates at the proposing organization should be included. The budget also may request costs, which must be shown to be reasonable, for leasing automatic data processing equipment. The purchase of computers or associated hardware and software should be requested as items of equipment.

(6) Subawards (Subcontracts or Subgrants): A precise description of services or materials that are to be awarded by a subaward must be provided. For subawards totaling \$10,000 or more, provide the following specific information:

- A clear description of the work to be performed;
- If known, the identification of the proposed subawardee and an explanation of why and how the subawardee was selected or will be selected;

- iii. The identification of the type of award to be used (cost reimbursement, fixed price, etc.);
  - iv. Whether or not the award will be competitive and, if noncompetitive, rationale to justify the absence of competition; and
  - v. A detailed cost summary.
- k. ODCs: Itemize and provide the basis for proposed costs for other anticipated direct costs such as communications, transportation, insurance, and rental of equipment other than computer related items. Unusual or expensive items must be fully explained and justified.
- l. Profit/Fee: Profit/fee is not allowed for the recipient of or subaward to an assistance instrument, where the principal purpose of the activity to be carried out is to stimulate or support a public purpose (i.e., to provide assistance), rather than acquisition (i.e., to acquire goods and services for the direct benefit of the Government). A subaward is an award of financial assistance in the form of money, or property in lieu of money, made under a DoD grant or cooperative agreement by a recipient to an eligible subrecipient. The term includes financial assistance for substantive program performance by the subrecipient of a portion of the program for which the DoD grant or cooperative agreement was made. It does not include the recipient's procurement of goods and services needed to carry out the program.
- m. Subcontracting Plan: Subcontracting plans do not apply to assistance instruments.
- n. FCCM: If cost of money is proposed, a completed FCCM (DD Form 1861) is required.

(End of Section)