



Broad Agency Announcement  
Automating Scientific Knowledge Extraction and Modeling  
(ASKEM)

INFORMATION INNOVATION OFFICE

HR001122S0005

12/2/2021

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## PART I: OVERVIEW INFORMATION

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Information Innovation Office (I2O)
- **Funding Opportunity Title** – Automating Scientific Knowledge Extraction and Modeling (ASKEM)
- **Announcement Type** – Initial announcement
- **Funding Opportunity Number** – HR001122S0005
- **Catalog of Federal Domestic Assistance Numbers (CFDA)** – 12.910 Research and Technology Development
- **Dates**
  - o Posting Date: December 2, 2021
  - o Proposers Day: December 8, 2021
  - o Abstract Due Date: December 13, 2021, 12:00 noon, Eastern Time
  - o Questions Due: January 5, 2022, 12:00 noon, Eastern Time
  - o Proposal Due Date: February 7, 2022, 12:00 noon, Eastern Time
  - o Solicitation Closing Date: May 30, 2022, 5:00 pm, Eastern Time
- **Program Overview** – The objective of the ASKEM program is to develop the Artificial Intelligence (AI) approaches and tools needed for agile creation, sustainment, and enhancement of the complex models and simulators necessary to support expert knowledge- and data-informed decision making in diverse missions and scientific domains.
- Anticipated individual awards – Multiple awards are anticipated.
- Types of instruments that may be awarded – Procurement contracts, cooperative agreements, grants, or Other Transactions for prototype
- Agency contact
  - o Points of Contact
    - The BAA Coordinator for this effort can be reached at:  
Email: ASKEM@darpa.mil  
DARPA/I2O  
ATTN: HR001122S0005  
675 North Randolph Street  
Arlington, VA 22203-2114

## PART II: FULL TEXT OF ANNOUNCEMENT

### I. Funding Opportunity Description

This publication constitutes a Broad Agency Announcement (BAA) as contemplated in Federal Acquisition Regulation (FAR) 6.102(d)(2) and 35.016 and 2 C.F.R. § 200.203. Any resultant award negotiations will follow all pertinent laws and regulations. Any negotiations and/or awards for procurement contracts will use procedures under FAR 15.4, Contract Pricing, as specified in the BAA.

The Defense Advanced Research Projects Agency (DARPA) is soliciting innovative proposals in the following technical areas: machine-assisted knowledge discovery and curation, machine-assisted modeling, machine-assisted simulators, and workbench for Human-Machine Interface (HMI) and integration. Proposed research should investigate innovative approaches that enable revolutionary advances in science or systems. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.

#### A. Program Overview

##### Introduction

Computational models have become key artifacts through which expert knowledge gets encoded, propagated, and applied to real-world problems. Simulators (procedures or workflows that use models to perform some prognostic or diagnostic inference) are key tools at all levels of the United States (U.S.) Government and Department of Defense (DoD) decision-making. ASKEM will enable a new paradigm for scientific modeling analogous to the transition in software development from a waterfall model to continuous development (Dev) and IT Operations (Ops) (DevOps).

The objective of the ASKEM program is to create a knowledge-modeling-simulation ecosystem, empowered with the Artificial Intelligence (AI) approaches and tools needed for the agile creation, sustainment, and enhancement of the complex models and simulators necessary to support expert knowledge- and data-informed decision making in diverse missions and scientific domains. The effectiveness of the tools will be demonstrated in applications relevant to viral epidemics such as COVID-19 and to the causes and impacts of space weather. ASKEM tools will enable experts to maintain, reuse, and adapt large collections of heterogeneous data, knowledge, and models – with traceability across knowledge sources, model assumptions, and model fitness.

ASKEM will accelerate scientific advancement, improve collaboration, and lead to timelier and more reliable expert guidance to support threat detection, interventions, and decision-making, especially in rapidly evolving environments. ASKEM tools will enable expert modeling to adapt at the pace of the modern world, allowing decision-makers to get in front of disasters, global changes, and our adversaries in order to avoid damages and improve the timeliness and effectiveness of our responses. Models and simulators built and sustained with ASKEM tools will eliminate current barriers to expert model usefulness caused by a lack of transparency (and

thus explainability), questionable validity (fitness-for-purpose), and long manual iteration cycles for model extension and customization. The government expects both civil and military applications of this research.

## **Background**

Much of existing scientific knowledge is encoded most explicitly in scientific model codes. In the physical and biological sciences, these models often take the form of sets of coupled differential equations that are derived from some first principles (e.g., fluid dynamics) and/or from empirical observation of aggregate phenomena (e.g., radiation use efficiency in plants). These equations include parameters calibrated to observational or experimental data, which are often manually updated over the model's lifetime as research produces more data. The structure of the equations must sometimes be updated as well, to correct errors or to include new phenomena that have recently been discovered to be significant. This process is highly manual and prone to error. Further, as the pace of discovery accelerates in a given field, it quickly becomes impossible for a single scientist or team to keep track of new developments in their domain, let alone discover valuable information or connections across domains.

The use of scientific and expert modeling of all sorts fails frequently, and the failures can have real consequences. The current process of knowledge discovery, model creation, and simulation is highly human-intensive. Notionally, subject matter experts (SMEs) comb through existing knowledge, typically in the form of scientific publications or partial model implementations in code, to discover useful artifacts for their work. These artifacts are studied and the knowledge is manually extracted to inform the SME's modeling process. Once a computational model is developed, SMEs conduct simulation experiments with the model for validation or prediction. The results inform a SME's understanding of the system and drive them to seek out new sources of knowledge to fill gaps and update their models. This highly idealized iterative process is rarely how things proceed in the real world, where the process is recursive and has complex dependencies and biases at every step (e.g., limitations in a SME's domain knowledge, modeling, or software engineering experience can constrain or bias their actions in other steps). Errors, omissions, or inherent human biases often go undetected and can be compounded by the process of iteration. This expert knowledge pipeline is slow or broken at every stage, from the black-box simulators used to support analysis, through the semantically-opaque models from which they are built, to the rapidly changing knowledge used to develop and maintain these models. Models go out of date, become hard to maintain, are poorly understood, and are difficult or impossible to evaluate for fitness-for-purpose. The implications of these failures are felt throughout our scientific and technological development and decision-making.

The early stages of the COVID-19 pandemic presented a clear example of these failings and their impact. When the pandemic started, dozens of black-box simulators emerged to provide predictions. But the design of these simulators was completely opaque, and their fitness for the purpose of prediction was barely considered and never communicated. More importantly, the semantic connection between simulators and models did not exist. With no traceability to model assumptions or structure, these simulators could not provide any of the context or explanations that provide the real insights required to support decisions. The tools we use for modeling also failed. Once the challenge was recognized, decision-makers reached out to experts with what

appeared to be simple questions: ‘*What’s going to happen?*’ and ‘*What should we do?*’ The experts looked to their models but updating in code is a slow and difficult process even in the best of times. A big reason why modeling tools fail is because they are disconnected from the source knowledge where the assumptions come from in the first place, preventing traceable explanations and transparent model updating. The tools we use for knowledge synthesis also failed. The pace of new information and the difficulty of extracting it from Portable Document Formats (PDFs) and putting it in the context of the existing body of knowledge made it impossible for modelers to adapt in a timely fashion.

Iteration within and between all steps is critical for the scientific process. But iteration today is slow and/or very difficult. In the early pandemic, our understanding of key aspects of the virus, such as transmission modes, was changing rapidly, but even in the best cases it can take weeks to modify model codes, test and debug, validate, and iterate. This is a time-consuming and error-prone process that was incompatible with the pace of new knowledge and the frequency of updates needed to support decision-making.

These same issues and others pervade all domains of expert modeling because they are inherent to the current tooling that we use to create, sustain, use, and share models. There are currently major efforts underway to create “digital twins” (i.e., models with near-real-time data assimilation procedures to enable closed form model-system coupling and, in principle, control) of just about anything in the world (e.g., a human tumor, the U.S. Gulf Coast, the global supply chain, and even the fully coupled natural earth system). Whether researchers try to adapt existing codes or build de novo model codes for this twinning, it is almost certain that this new wave of modeling will suffer from the same unsustainable flaws as the last generation.

While knowledge tools such as Google Scholar or Allen Institute for AI’s Semantic Scholar, state-of-the-art (SOTA) modeling/simulator tools such as Modelica-based tools, and related tools from other DARPA programs exist today, there are still significant barriers to the rapid development, evaluation, fielding, adaptation, and sustainment of scientific models. Current pipelines do not maintain the relevant inputs, assumptions, and modeling choices made during development. Rapidly changing knowledge, semantically-opaque models, and black-box simulators make it almost impossible to maintain a consistent and current pipeline, resulting in poor quality decision-support. Google Scholar and Semantic Scholar help experts find relevant papers, but extracting information for use in modeling is still highly manual and difficult to sustain as literature accumulates. Without tooling to support machine-assisted modeling with traceability through the full pipeline and life-cycle, expert models quickly become hard to sustain, share, understand, or validate. The implications are felt throughout our scientific and technological development and decision making.

Previous research and development has led to improvements in individual pieces of the modeling pipeline for creating and using new models, including in programming languages (e.g., Julia, MATLAB, Modelica) and simulators (e.g., Simulink, OpenModelica). These improvements focus on making the human modeler more productive but do little to automate parts of the process so people can work efficiently by focusing effort where they provide unique contributions. None of these tools embrace existing model codes implemented in different languages, which may encode the best current understanding of a problem, nor do they support

rapid adaptation and evolution of models to respond to time-critical needs. ASKEM will lay the foundation for a new ecosystem in which accurate and appropriate models stay current with rapidly changing data, theories, and challenges. At the end of the program, there will be new tools interacting in an open ecosystem that embodies the ASKEM objective.

## **B. Program Structure**

ASKEM is a 42-month program divided into two phases of 21 months each. Phase 1 will focus on the program goals of improving the accuracy, timeliness, and maintainability of models. Phase 2 will add increased attention to the objectives of generalizability and scalability. Metrics for each phase are described below (see Metrics for Technology and Program Assessment). Proposals should address how the proposed research plan will meet associated technology metrics as well as the overall program metrics and milestones.

ASKEM will develop and demonstrate technologies in the following four technical areas (TAs):

- TA1: Machine-assisted knowledge discovery and curation
- TA2: Machine-assisted modeling
- TA3: Machine-assisted simulators
- TA4: Workbench for HMI and Integration

ASKEM will employ a collaborative and iterative approach to development and integration. Two-week hackathons/integration events will be held throughout the program. However, performers in all TAs will be expected to work closely with other performers during all phases of development to ensure their research products are compatible and synergistic with other efforts. All tools and methods produced in TAs 1-3 must be capable of being integrated tightly into the ASKEM Workbench developed in TA4. While TA4 will ultimately be responsible for integration, all proposals should speak to (and budget for) the approaches to integration; proposals should describe how they intend to work with other teams performing in the same and different technical areas to promote integration and collaboration.

To facilitate the open exchange of information, performers will have Associate Contractor Agreement (ACA) language included in their award, which is described further in Section VIII, Other Information. The TA4 performer will be responsible for executing the ASKEM ACA.

One of ASKEM's objectives is to seed the creation of an open ecosystem that supports the full modeling lifecycle. DARPA strongly encourages proposers to pursue open-source software approaches. Approaches that inhibit this objective are not desired and would adversely affect the program goals and objectives.

For the initial hackathon at Month 6, the primary objectives will be to gather baseline measures of timeliness and accuracy for the components. TA4 will work with the other performers to create an initial integrated prototype of a subset of TAs 1-3 capabilities, but baseline measurements are expected to be conducted using engineering interfaces (for example, Jupyter notebooks) developed by each team. Data, models, tools, and prototypes will be built around the viral epidemiology use case.

The second hackathon at Month 12 will add and baseline a use-case from the domain of space weather, update measurements of timeliness and accuracy for the epidemiology use case, introduce baseline measurements of maintainability, and demonstrate initial integration of TAs1-3 components into the TA4 workbench. In addition to measuring progress and improvements in TAs1-3, the timeliness of the integrated, end-to-end process for the epidemiology use case will be measured using the TA4 workbench.

The program-level assessment will begin at Month 18 and expected to extend over 2-3 months. It will employ multiple challenge problems drawn from the two use case domains to measure the impact of the integrated ASKEM system, compared to current manual techniques, on timeliness, accuracy, maintainability, and explainability of the modeling process. See Table 1 for additional details on the Phase 1 Hackathons and Assessment.

For Phase 2, the 6-month hackathon cadence will be replaced by assessments starting at Month 31 and Month 40. These will be end-to-end program-level assessments with all TAs working together in the integrated workbench. Challenge problems will be designed to test the scalability and generalizability of the solutions. Possible challenges in Phase 2 include: 1) multiscale modeling – e.g., space weather scales from stratospheric to interplanetary and epidemic scales from biological to behavioral; 2) coupled subdomains – e.g., magnetosphere/ionosphere or virus/information/behavior; and 3) new domains – e.g., tropospheric climate, cancer dynamics, or wildfire prevention.

## **Technical Areas**

Process challenges similar to those experienced in scientific modeling existed in the software development community until tool chains were developed, enabling cross-platform builds, automated testing and result visualization, and infrastructure as code. ASKEM will produce modeling automation tools that: 1) extract model components from documents and code while abstracting away from implementation details like math framework, language, and platform; 2) decompose and compose distinct model and simulator components; and 3) integrate all elements and processes in the modeling pipeline to enable full traceability and reach back to knowledge during modeling and simulator design. Tools will be integrated into an extensible workbench that addresses the entire modeling lifecycle.

DARPA seeks innovative proposals in the following TAs, as shown in Figure 1 and described in detail as follows<sup>1</sup>:

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<sup>1</sup> Outputs from the ASKE AI Exploration can be found at: <https://github.com/DARPA-ASKE/info-and-links>



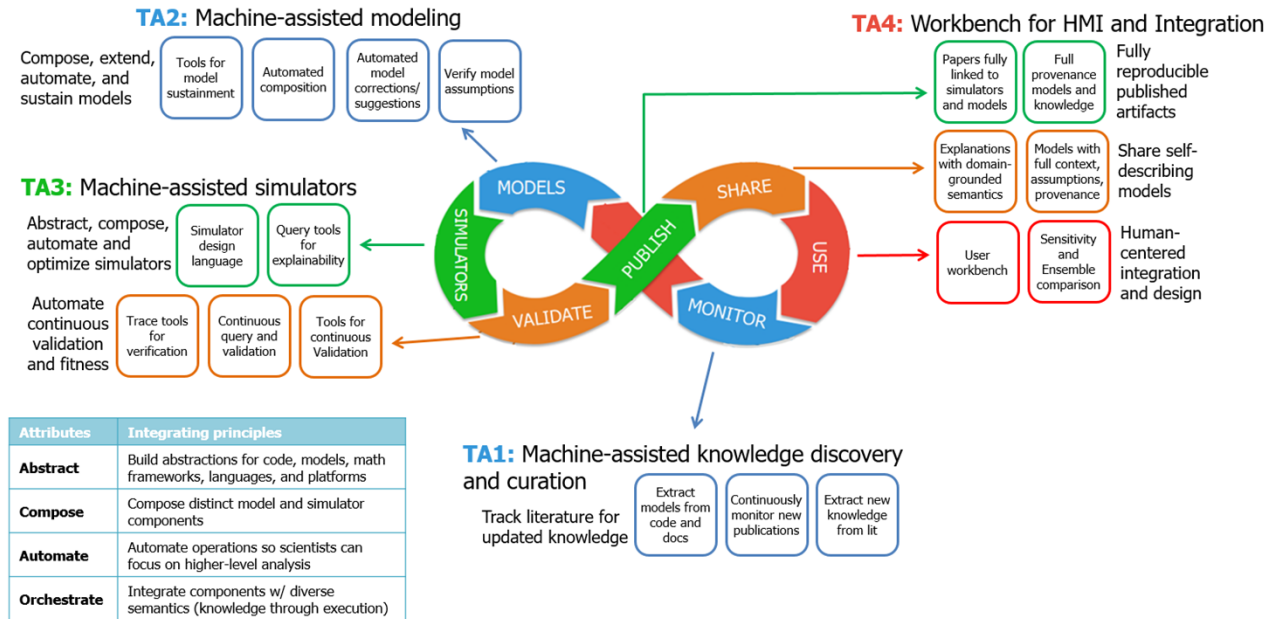


Figure 1 ASKEM TAs

Two classes of application use cases, viral pandemics, and space weather will be used throughout the program to exercise and evaluate the technologies being developed as well as to ensure generalizable tools are developed. Initial development will focus on epidemiological models of viral pandemics like COVID-19. Space weather will be introduced after the initial integration and assessment event at six (6) months. Closely related domains/subdomains will be introduced as challenge problems for test and evaluation.

While subject matter expertise will be valuable, it is important to keep in mind that the focus of ASKEM is models and modeling, not the use case domains.

DARPA anticipates funding multiple technical approaches and performers for TAs 1-3 and making a single TA4 award. Phase 2 will be considered an option, which may or may not be exercised at the Government’s sole discretion, and should be separately priced in the cost proposal. Exercising Phase 2 options will be based on demonstrated technical progress towards the goals of the ASKEM program and on the availability of funds.

Each proposal may address any single TA, a combination of TA1 and TA2, or a combination of TA2 and TA3. Other combinations of TAs will not be accepted.

Proposers may submit multiple proposals. The Government reserves the right to decide which, if any, are selected for award. TA4 will integrate and demonstrate the technologies developed in TAs 1-3 for the two use cases. If a performer is selected for TA4 award, the performer cannot be selected for the other TA(s) either as a prime or subcontractor.

The individual TAs are elaborated below.

**TA1: Machine-assisted knowledge discovery and curation**

TA1 performers will develop powerful and generalizable approaches for machine-assisted discovery and curation of modeling-relevant knowledge. They will automatically capture provenance and context in arbitrary domains and will develop generalizable techniques for domain-agnostic discovery, extraction, and linking over sources such as text, equations, tables, figures, and code.

Significant challenges for TA1 include extraction of multi-modal (text, tables, figures, equations, etc.) knowledge fragments from documents, extracting meta-data rich representations of models from code and documents, synthesizing the knowledge extracted from documents and code for incorporation into a continuously curated model store (created and maintained by TA4), and supporting reach-back from models or simulators (i.e., TA2/3) to identify and provide new information that is contextually relevant. Approaches could include knowledge base construction from richly formatted data, extraction of models from software, and extraction and linking of domain and mathematical semantics at multiple levels of abstraction.

Typical model descriptions include an explicit model implementation in code and a model description document distributed in PDF or similar format. A critical component of ASKEM is model extraction from code and grounding extracted models with domain and mathematical semantics (extracted from the documentation or other sources). This grounding process starts at the level of variables and equations and expands to higher-level semantics like model assumptions and computational implementation choices. Grounding should enable automated consistency checks through comparisons of models in code with their descriptions in documentation or publications. TA1 proposals may address extraction from documents, code, or both. Proposals that address extraction from only one source type must clearly describe how they will interact and interface with other TA1 performers to leverage capabilities provided by others.

Proposals in this area should clearly describe the key innovations that can meet the goals of this technical area and present arguments and evidence for the potential to meet metrics and milestones (see Table 2). Proposers are encouraged to use an example from the epidemiology use case to explain their approach and how they will interact with other technical areas (TA2, TA3, and TA4), particularly with respect to traceability, interacting with a model store, reach-back to knowledge, and integration. It is expected that TA1 knowledge tools should be capable of informing all parts of the modeling and simulation process (e.g., discovering publications/tables with alternative values for model parameters or useful equations, similar models that might help inform modeling decisions, or alternative simulator designs/methods).

Proposals responding to both TA1 and TA2 should address the expectations of each TA and describe the expected synergies offered by the combination. These proposals should also explicitly address how the proposed approach will impact integration and collaboration with other efforts addressing only a single TA. While early technology assessments will rely on engineering interfaces developed by the individual performers to demonstrate and exercise their components, integration into the TA4 workbench, and with a TA4-controlled HMI, is expected to take place within the first year of the program.

For processing human-readable sources such as journal articles, preprints, and software design documentation, a strong proposal should present approaches that:

- Are easily adapted to new scientific domains;
- Can extract text, equations, tables, and figures from a variety of sources and can accurately link data within those documents, such as associating variable descriptions or parameter values presented in text with variables from equations identified and extracted from other portions of the document; and
- Address the challenges of progressive/iterative knowledge evolution (updating knowledge and model representations as new knowledge becomes available).

For processing computer codes, a strong proposal should present approaches that:

- Automate the analysis of legacy codes to isolate and extract models and solvers;
- Support models implemented in multiple programming languages; and
- Link model elements (variables, functions, assumptions, definitions) and provide traceability for those elements back to where they are defined or parameterized in human-readable source materials.

A strong proposal will develop and support rich meta-data representations that

- Enable traceability within and between documents and code; and
- Facilitate associating extracted models and knowledge fragments with the abstract model representations employed by TA2.

## **TA2: Machine-assisted modeling**

The goal of TA2 is to develop formal representations and techniques for machine-assisted modeling that support automated composition and decomposition of models for creation, sustainment, and customization. These techniques should address challenges including establishing and maintaining traceability of model components to sources, automatic structural and semantic comparison of model candidates, verifying model structures and assumptions (e.g., between the model expressed in the code and described in the documentation), exploring knowledge-constrained model spaces, and applying domain-constrained machine learning to identify structural gaps or missing components in models and recommend candidates to fill such gaps.

TA2 proposals should address how models will be extracted from the meta-data rich artifacts produced by TA1, how to represent these models, and how to enable human and automated transformations such as model extension, decomposition (e.g., decomposing a multi-region epidemiological model into a representation of the viral transmission dynamics and a representation of the spatial network), composition, and multi-model comparisons (at the level of structures and meta-data). Proposals should also address the scalability of approaches, how to handle models with complex spatial representations, and how to support effective interaction with (potentially high dimensional) model parameter spaces. To the greatest extent possible, proposed solutions should not depend on or be limited by the mathematical framework used to implement the models computationally; that is, the same model should be instantiable in multiple ways (e.g., an agent-based model, ordinary differential equations, etc.).

Proposals in this area should clearly describe the key innovations that can meet the goals of this technical area and present arguments and evidence for the potential to meet metrics and

milestones (see Table 2). Proposers are encouraged to use an example from the epidemiology use case to explain their approach and how they will interact with other technical areas (TA1, TA3, and TA4), particularly with respect to traceability; interacting with a model store; informing, enabling, and constraining TA3 workflows; and integration into the overall system. While early technology assessments will rely on engineering interfaces developed by the individual performers to demonstrate and exercise their components, integration into the TA4 workbench, and with a TA4-controlled HMI, is expected to take place within the first year of the program.

Proposals responding to both TAs 1 and 2, or TAs 2 and 3, should address the expectations of each TA and describe the expected synergies offered by the combination. These proposals should also explicitly address how the proposed approach will impact integration and collaboration with other efforts addressing only a single TA.

A strong proposal will present an approach that:

- Is generalizable to support multiple scientific domains (beyond the two use cases prescribed in this solicitation) with any limits on the representational power of the proposed approach clearly identified;
- Represents any physical/theoretical constraints innate to a domain and validates that models are consistent with them;
- Constructs and represents models in a way that can be instantiated within a variety of computational frameworks;
- Supports de novo model construction, ingestion of existing models such as legacy software addressing the same or related problems, and composition of complex models from simpler component models;
- Uses TA1 tools effectively to establish and maintain traceability from knowledge sources to models, parameters, and data, and address the challenges of progressive/iterative knowledge evolution (updating knowledge and model representations as new knowledge becomes available);
- Enables and supports comparisons of models in terms of domain semantics (e.g., do these models incorporate the same or similar phenomena) and structurally (e.g., is the mathematics of these phenomena implemented in the same or similar ways in the model);
- Helps expert modelers detect relevant processes and mechanisms that should be incorporated into the models; and
- Considers how their representations and tools will be represented and interacted with visually in the TA4 workbench.

Proposers should use examples (use of the epidemiology use case is encouraged) to show how key modeling operations (e.g., decomposition, composition, comparison, parameter exploration, visualization, etc.) will be supported.

### **TA 3: Machine-assisted simulators**

TA3 will support machine-assisted and automated construction of simulators; that is, procedures and workflows that use models from TA2 to perform prognostic or diagnostic inference. The potential tasks here are very broad and could include model calibration, iterative assessment of validity, fitness-for-purpose or model skill, construction of fast statistical emulators or reduced

form proxies of complex models, model-based data assimilation, etc. These procedures will be expected to address individual models as well as complex multi-model workflows.

A major challenge facing TA3 is the abstraction and composition of simulator designs given the diversity of potential components. These components include not just the models from TA2, but also the different mathematical frameworks, solvers, and various design operators (e.g., simple operators like samplers, measure extraction, or equivalence relationships, or complex operators for model initialization or calibration) needed to use those models appropriately and productively — all while abstracting away implementation details related to the compute platform.

Simulator designs must be instantiated and executed through automated, efficient code generation that accounts for differences in platforms and optimal resource usage. A critical part of TA3 is machine-assisted diagnosis to enable rapid detection of model issues for iteration. In ASKEM, validation will be a continuous process that will require workflows customized to specific applications to demonstrate actual fitness for purpose and/or model skill.

Proposals in this area should clearly describe the key innovations that can meet the goals of this technical area and present arguments and evidence for the potential to meet metrics and milestones (see Table 2). Proposers are encouraged to use an example from the epidemiology use case to explain their approach and how they will interact with other technical areas (TA1, TA2, and TA4), particularly with respect to maintaining traceability for calibration, constraining the workflows based on any limitations carried by TA2 models, and integration and HMI affordances required of TA4. While early technology assessments will rely on engineering interfaces developed by the individual performers to demonstrate and exercise their components, integration into the TA4 workbench, and with a TA4-controlled HMI, is expected to take place within the first year of the program.

Proposals responding to both TA2 and TA3 should address the expectations of each TA and describe the expected synergies offered by the combination. These proposals should also explicitly address how the proposed approach will impact integration and collaboration with other efforts addressing only a single TA.

A strong proposal will present an approach that:

- Creates reusable and adaptable workflows for a variety of simulator tasks, including operations such as model calibration, back-casting, skill assessment, fitness-for-purpose, prediction, etc.;
- Develops and employs a simulator workflow representation that is compatible with the model representation developed for TA2;
- Is broadly applicable across domains, including the epidemiology and space weather domains, with limited required customizations;
- Automates the generation of executable simulations from models
  - Addressing constraints associated with the model
  - Employing mathematical frameworks appropriate to the intended use of the model
  - Selecting solvers appropriate to the targeted computing environment; and
- Incorporates simulator choices into the model/simulator provenance to enhance the traceability of results.

Proposers should use examples (use of the epidemiology use case is encouraged) to show how key simulator tasks (e.g., model calibration and forecasting, choice of appropriate mathematical framework and solver, capture of simulator decisions) will be supported.

#### **TA4: Workbench for HMI and Integration**

TA4 will develop a workbench that brings together all the tools from TAs 1-3 in a visual meta-modeling platform for domain experts (technical and subject matter). This workbench will allow for end-to-end traceability, rich explanations, reach-back to knowledge to discover new information, the design and management of single and multi-model reusable simulator workflows, and publication and sharing of fully reproducible artifacts.

The goal of ASKEM is to automate operations when possible, but ultimately the scientific modeling process requires humans in the loop at every stage; hence the integration of all the tooling into a workbench that leverages smart human-centered design is critical. Users of the ASKEM workbench are expected to be domain experts or trainees (e.g., graduate students or postdocs in a particular domain or experts in a DoD modeling group).

The TA4 performer must address two significant challenges: 1) coordinating/driving the integration of products from multiple TA1/2/3 performers into a single workbench; and 2) developing a workbench HMI that enables subject matter experts to employ the full capabilities of the ASKEM system. Program-level assessments, which measure the impact ASKEM tools have on the complete modeling pipeline, will heavily depend on the capability and usability of the integrated workbench.

ASKEM will emphasize and prioritize the development of open-source solutions and application programming interfaces (APIs) in order to seed a sustainable open-source ecosystem. TA4, as the overall integrator, will be expected to develop and publish APIs and example implementations to promote this goal.

To the greatest degree possible, the end-of-program goal should be to have a single integrated workbench and HMI that embraces and supports multiple modeling tasks in multiple scientific domains. Proposals in this area should clearly describe the key innovations that can meet the goals of this technical area and present arguments and evidence for the potential to meet program-level metrics and milestones.

As the overall system integrator, the TA4 performer will organize and plan the program hackathons and assessment activities (see Figure 2 and Table 1), in coordination with the government and Federally Funded Research and Development Center's (FFRDC) Test and Evaluation (T&E) team.

A strong proposal in this area will present an approach that:

- Promotes early integration between components by
  - developing and publishing APIs that support inter-TA connections

- designing and implementing the ASKEM model store, in close collaboration with TA1/2;
- Accommodates multiple approaches, particularly by TA2 and 3, in a flexible architecture;
- Clearly describes how an integrated workbench will be created that supports and maintains traceability throughout the modeling process and exposes the functionality needed by users to fully exercise and exploit the capabilities developed by TAs1-3;
- Enables the synergy between components needed to show that the integrated ASKEM pipeline is more efficient and effective than the individual steps required at program outset for scientific modeling;
- Collaboratively develops a consistent ASKEM HMI for all components and with high utility to the expert modelers it is intended to support; and
- Supports the FFRDC T&E team's measurements and assessments.

Proposers should use examples (use of the epidemiology use case is encouraged) to show how the proposed approach will enable the contributions from the other TAs to work together to achieve an end-to-end improvement in modeling flexibility, timeliness, and accuracy.

### **Independent Test and Evaluation**

An FFRDC team will be engaged to provide independent testing and evaluations (T&E) throughout the program. This team will be responsible for designing processes (see Table 1 for sample evaluation procedures for Phase 1 to measure and assess the individual TA components against the program metrics (see Metrics Section and Table 2 below) and for conducting program-level assessments comparing performance on end-to-end modeling tasks, with and without the ASKEM system. They will be responsible for providing the state-of-the-art modeling baseline used to measure the overall ASKEM impact on the modeling pipeline.

TAs 1-3 performers will be expected to work with the T&E team to ensure engineering interfaces used early in the program or other acceptable mechanisms are available by the time of the first hackathon. TA4 will be expected to work closely with this team to ensure assessment objectives can be addressed in conjunction with hackathons and program assessments.

Use Case	Potential Sources of Data and Real-world Problems	Hackathon-1 (6 mos) - TA Level Evaluation	Hackathon-2 (12 mos) - TA Level Evaluation	Program Level Assessment (18-20 mos)
<p><b>Viral Epidemics, current and future (COVID-19)</b></p>	<p><b>NIH ( NIAID, NCI, NIDA), Interagency Modeling and Analysis Group (IMAG), CDC <sup>2</sup>, FDA --</b> CDC data (all relevant daily/weekly data including cases, hospitalizations, deaths, vaccines administered, etc., at national and state level); non-pharmaceutical interventions (NPIs) enacted by date/region; scientific publications of COVID-19 topics from molecular to population scale covering topics like molecular pathways, drug/vaccine efficacy, NPI effectiveness and population compliance, infection propagation modes, seasonality, and age heterogeneity of outcomes.</p>	<p><b>TA1:</b> Measure and baseline timeliness for prototype tools</p> <ol style="list-style-type: none"> <li>1. T&amp;E team produce t1 baseline through manual extraction of equations from code and publications</li> <li>2. Performers do same task using ASKEM tools and engineering interfaces</li> </ol>	<p><b>TA1:</b> Measure timeliness and maintainability</p> <ol style="list-style-type: none"> <li>1. Baseline t1 for Space Weather (SW) use-case</li> <li>2. Measure updated t1 from hackathon 1 and for new (more complex) challenge</li> <li>3. Demonstrate initial integration in TA4 workbench</li> </ol>	<p>Conduct fully integrated experiment.</p> <ol style="list-style-type: none"> <li>1. T&amp;E team uses multiple challenge problems w/in use-cases to compare with/without ASKEM workbench.</li> <li>- E.g., epi-model (COVID-19) experiment based on CDC ensemble model forecast, demonstrate improved prediction skill (1-4 weeks out) - Better than SOTA (CDC) every week; and improves over time. Improve resolution from country to state/county.</li> <li>Automated extraction of key meta-data.</li> <li>2. Conduct new integrated modeling challenges to inform expanded CDC use-cases, measure all metrics.</li> <li>3. Demonstrate explainability through static (meta-data/provenance) and dynamic (explanation of results) methods with variety of causal factors e.g., intervention efficacy; sensitivity to assumptions and parameters; relationships.</li> <li>4. Demonstrate model updates with new information, going from papers to predictions.</li> <li>5. Conduct initial integrated assessment for SW use-case (full evaluation at first assessment in Phase 2).</li> </ol>
		<p><b>TA2:</b> Measure timeliness and baseline accuracy</p> <ol style="list-style-type: none"> <li>1. T&amp;E produces t2 baseline through manual equation transforms and (re)coding and the a1 baseline using naïve models tested against historical CDC data</li> <li>2. Performers do the same task using ASKEM tools and engineering interfaces</li> </ol>	<p><b>TA2:</b> Measure timeliness, maintainability and accuracy</p> <ol style="list-style-type: none"> <li>1. T&amp;E produces t2 and a1 baselines for SW use-case from hackathon 1, new challenge</li> <li>2. Measure updated t2 from hackathon 1, new challenge</li> <li>3. Measure a1 improvement through machine-assisted model composition</li> <li>4. Demonstrate initial integration in workbench</li> </ol>	
<p><b>Space Weather (starts at mo. 6, first eval at mo. 12)</b></p>	<p><b>USSF, USAF, NASA, NOAA, NGA <sup>3</sup> --</b> Models such as Global Ionosphere-Thermosphere Model (GITM) and the Thermosphere-Ionosphere-Electrodynamics General Circulation Model (TIEGCM). Data from, for example, NOAA, NASA, NGA and the Madrigal Database including satellite tracking and accelerometer data from CHAMP (CHALLENGING Minisatellite Payload), GRACE (Gravity Recovery and Climate Experiment), GOCE (Gravity field and steady-state Ocean Circulation Explorer) and SWARM missions.</p>	<p><b>TA3:</b> Measure and baseline timeliness and accuracy</p> <ol style="list-style-type: none"> <li>1. T&amp;E produces t3 baseline through manual simulator design (validation/prediction); a2 baseline with CDC ensemble to update targets</li> <li>2. Performers do the same task using ASKEM tools and engineering interfaces (demonstrate multi-model skill-weighted ensemble forecast prototype)</li> </ol>	<p><b>TA3:</b> Measure timeliness, maintainability, and accuracy</p> <ol style="list-style-type: none"> <li>1. T&amp;E produces t3 and a2 baselines for SW use-case</li> <li>2. Measure updated t3 from hackathon 1, new challenge</li> <li>3. Measure a2 improvement through machine-assisted simulator design</li> <li>4. Demonstrate continuous validation test harness</li> <li>5. Demonstrate initial integration</li> </ol>	
		<p><b>TA4:</b> Initial prototyping</p> <ol style="list-style-type: none"> <li>1. Prototype integration of TAs1-3</li> </ol>	<p><b>TA4: Preliminary integration testing (benchmarks)</b></p> <ol style="list-style-type: none"> <li>1. Prototype integrated timeliness measures for end-to-end modeling challenges (de novo/extension, sharing, simulator design, etc.)</li> </ol>	

Table 1 Phase 1 Evaluations and Assessments (see Table 2 for definitions of t1-t3 & a1-a2)

## Metrics for Technology and Program Assessment

In Phase 1, the program will measure progress by conducting evaluations every 6 months, with the first two focused on constituent capabilities and the third assessing the entire system. In Phase 2, these assessments will happen at a 9-month cadence and focus on overall system behavior and performance against increasingly complex and diverse challenges. The first two Phase 1 technical evaluations will be organized as 2-week hackathon-style events (for more details see Metrics Section), at months 6 and 12, to test the tools against the selected use-cases

<sup>2</sup> E.g., CDC ensemble forecast -- <https://www.cdc.gov/coronavirus/2019-ncov/science/forecasting/forecasting-us.html> and COVID-19 Scenario modeling -- <https://github.com/midas-network/covid19-scenario-modeling-hub>

<sup>3</sup> E.g., Community Coordinated Modeling Center for space science and space weather -- <https://ccmc.gsfc.nasa.gov/> and NOAA Space Weather Prediction Center -- <https://www.swpc.noaa.gov/models>



(viral pandemics and space weather). The third, end-of-phase assessment, will begin at month 18 and extend over a longer period (1-2 months) to enable evaluation and measurement of the impact of ASKEM’s tools and workbench on the complete modeling process – from new challenge to calibrated executable model.

The FFRDC T&E team will design assessments appropriate to the domains, ensure relevant materials (models, documents, data) are available to the performers, and conduct and evaluate the tests. The Month 6 evaluation will focus on viral epidemic models at population scales. In the Month 12 evaluation we expect to add cellular/genetic scale models of COVID-19 as well as the first evaluation of models for the space weather use case.

	TA1	TA2	TA3
Goals	Metrics Targets (AIE, Phase 1, Phase 2)	Metrics Targets (AIE, Phase 1, Phase 2)	Metrics Targets (AIE, Phase 1, Phase 2)
Accuracy		a1: Accuracy of a single model * (see note below)	a2: Multi-model ensemble accuracy *
Timeliness	t1: Time for <b>accurate</b> model extraction (from code/documents) (nm, 10x, 50x)	t2: Time to extend/modify model (10x, 50x, >200x)	t3: Time to create simulators for validation and prediction (nm, 50x, >200x)
Maintainability	t1 for hand-off to new owner (nm, 10x, 50x)	t2 for hand-off to new owner (nm, 10x, 50x)	t3 for hand-off to new owner (nm, 10x, 50x)
Generalizability <sup>†</sup>	Semantic domains supported (2, 4, 8)	Mathematical frameworks supported (2, 4, 6)	Simulator components supported (3, 10, 100)
Scalability <sup>‡</sup>	Extracted model size (Number of variables) (10s, 100s, 1000s <sup>†</sup> )	Number of components that can be (de)composed (2, 5, 10)	Simulator configurations automatically explored (nm, 100, 1000)

**Notes and definitions:**

AIE refers to results produced during the Automating Scientific Knowledge Extraction Artificial Intelligence Exploration (ASKE AIE)

nm = not measured

\* At hackathon 1 the T&E team will define and baseline measures of forecasting skill (for predictions from models and ensembles) and fitness-for-purpose (for conditionals and counterfactuals) for COVID-19 models. Analogous measures for the Space Weather domain will be created at hackathon 2. The PAD will then be updated with targets for Phase 1 and 2.

10x = Activities that take "days to weeks" with current tools improved to "hours to days"

50x = Activities that take "weeks to months" with current tools improved to "hours to days"

>200x = Activities that take years or are too expensive or impractical to do at all can be done in "days to weeks"

† As a simple example, a "very complicated" SEIR model with populations broken out by 8 demographic groups and 50 states could have 1600 variables

# The Phase 1 targets for generalizability and scalability are estimated based on what we believe will be minimally necessary to succeed on the COVID-19 and SW use-cases.

Table 2 Program Metrics

## Schedule, Meetings, and Milestones

ASKEM is planned as a 42-month program with two 21-month phases. Phase 1 will focus on the program goals of improving the accuracy, timeliness, and maintainability of models. Phase 2 will add increased focus to the generalizability and scalability objectives. Phase 1 will begin with performers addressing core capabilities, starting with the epidemiology use case and adding the space weather use case after the initial component evaluation at six (6) months. By the end of the phase, a complete system will be implemented that ties together all the pieces of the ASKEM program. Phase 2 will push the boundaries of domain generality by, for example, introducing additional modeling regimes to the use cases such as magnetosphere-ionosphere coupling; and of scalability by requiring more complex models, ensuring the approaches are performant and usable well beyond the “proof of principle” level.

Events will include the kick-off meeting, five (5) hackathons/assessments (three in Phase 1 and two in Phase 2, each of which will last approximately two weeks and include a Technology Evaluation and/or System Assessment), and six (6) principal investigator (PI) meetings (held at the completion of each hackathon/assessment). Proposers should plan and budget for the attendance of appropriate and relevant personnel at all events. Relevant personnel may vary by event type; however, best practice is to assume that hackathons should be attended by everyone likely to contribute to the objectives, and PI meetings should be attended by everyone with

significant roles in the program who could contribute to, or benefit from, the discussions at the meeting.

For budgeting purposes, assume the locations of events will alternate between Washington, D.C., and San Diego, CA, and that PI meetings that follow hackathons/assessments will be co-located. The Government also anticipates making visits to performer sites at least once per year, which should be budgeted for as 1-day events.

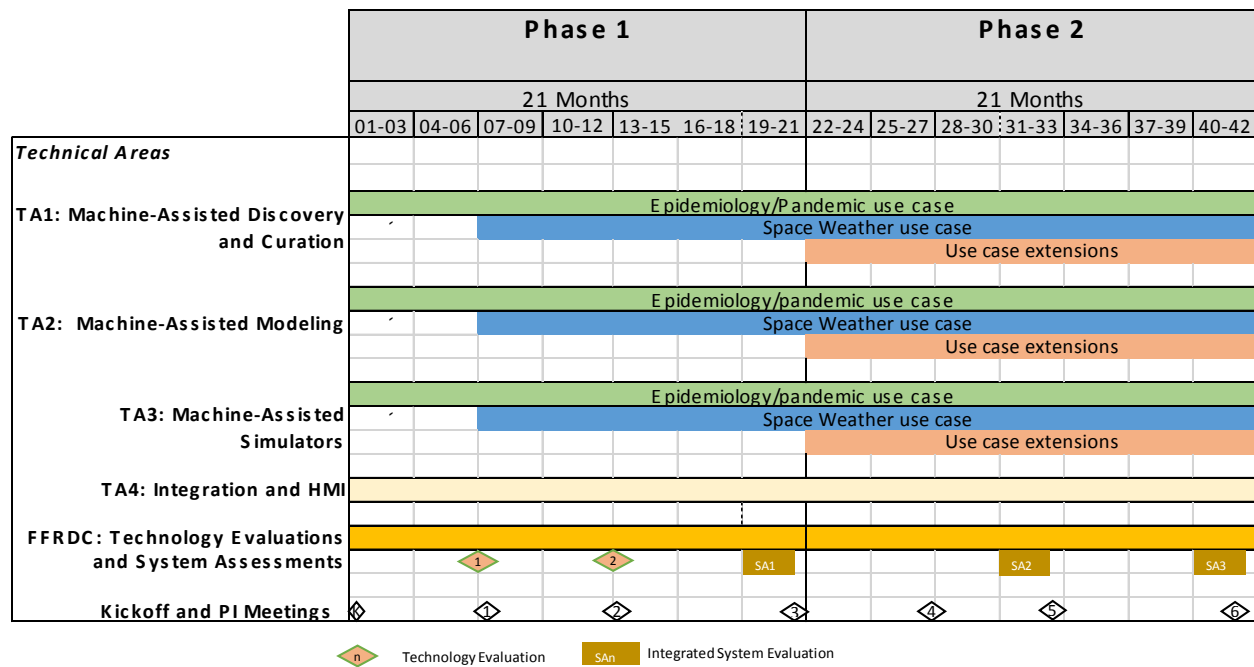


Figure 2 Program Schedule

### C. Intellectual Property

ASKEM will emphasize creating and leveraging open-source technology and architecture. Intellectual Property rights asserted by proposers are strongly encouraged to be aligned with open-source regimes. A key goal of the program is to seed the establishment of a sustainable open-source ecosystem for scientific modeling. Thus, it is desired that all non-commercial software (including source code), software documentation, and technical data generated by the program is provided as deliverables to the Government with open-source or unlimited rights, as lesser rights may negatively impact the potential for this modeling ecosystem to become self-sustaining.

## II. Award Information

### A. General Award Information

Multiple awards are anticipated. The amount of resources made available under this BAA will depend on the quality of the proposals received and the availability of funds.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this solicitation and to make awards without discussions with proposers. The Government also reserves the right to conduct discussions if it is later determined to be necessary. Resulting awards will be segregated into pre-priced options, which will be funded by phase and the availability of funds. Additionally, DARPA reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that DARPA desires to award only portions of a proposal, negotiations may be opened with that proposer.

The Government reserves the right to request any additional, necessary documentation once it makes the award instrument determination. Such additional information may include but is not limited to Representations and Certifications (see Section IV.B.3.d, “Representations and Certifications”). The Government reserves the right to remove proposers from award consideration should the parties fail to reach agreement on award terms, conditions, and/or cost/price within a reasonable time, and the proposer fails to timely provide requested additional information. Proposals identified for negotiation may result in a procurement contract, grant, cooperative agreement, or other transaction, depending upon the nature of the work proposed, the required degree of interaction between parties, whether or not the research is classified as Fundamental Research, and other factors.

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

In accordance with 10 U.S.C. § 2371b(f), the Government may award a follow-on production contract or Other Transaction (OT) for any OT awarded under this solicitation if: (1) that participant in the OT, or a recognized successor in interest to the OT, successfully completed the entire prototype project provided for in the OT, as modified; and (2) the OT provides for the award of a follow-on production contract or OT to the participant, or a recognized successor in interest to the OT.

In all cases, the Government contracting officer shall have sole discretion to select award instrument type, regardless of instrument type proposed, and to negotiate all instrument terms and conditions with selectees. DARPA will apply publication or other restrictions, as necessary, if it determines that the research resulting from the proposed effort will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Any award resulting from such a determination will include a requirement for DARPA permission before publishing any information or results on the program. For more information on publication restrictions, see the section below on Fundamental Research.

## **B. Fundamental Research**

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

‘Fundamental research’ means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

As of the date of publication of this solicitation, the Government expects that program goals as described herein may be met by proposed efforts for fundamental research and non-fundamental research. Some proposed research may present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Based on the anticipated type of proposer (e.g., university or industry) and the nature of the solicited work, the Government expects that some awards will include restrictions on the resultant research that will require the awardee to seek DARPA permission before publishing any information or results relative to the program.

University or non-profit research institution performance under this solicitation may include effort categorized as fundamental research. In addition to Government support for free and open scientific exchanges and dissemination of research results in a broad and unrestricted manner, the academic or non-profit research performer or recipient, regardless of tier, acknowledges that such research may have implications that are important to U.S. national interests and must be protected against foreign influence and exploitation. As such, the academic or non-profit research performer or recipient agrees to comply with the following requirements:

- (a) The University or non-profit research institution performer or recipient must establish and maintain an internal process or procedure to address foreign talent programs, conflicts of commitment, conflicts of interest, and research integrity. The academic or non-profit research performer or recipient must also utilize due diligence to identify Foreign Components or participation by Senior/Key Personnel in Foreign Government Talent Recruitment Programs and agree to share such information with the Government upon request.
  - i. The above described information will be provided to the Government as part of the proposal response to the solicitation and will be reviewed and assessed prior to award. Generally, this information will be included in the Research and Related Senior/Key Personnel Profile (Expanded) form (SF-424) required as part the proposer’s submission through Grants.gov.
    - 1. Instructions regarding how to fill out the SF-424 and its biographical

sketch can be found through  
Grants.gov.

- ii. In accordance with USD(R&E) direction to mitigate undue foreign influence in DoD-funded science and technology, DARPA will assess all Senior/Key Personnel proposed to support DARPA grants and cooperative agreements for potential undue foreign influence risk factors relating to professional and financial activities. This will be done by evaluating information provided via the SF-424, and any accompanying or referenced documents, in order to identify and assess any associations or affiliations the Senior/Key Personnel may have with foreign strategic competitors or countries that have a history of intellectual property theft, research misconduct, or history of targeting U.S. technology for unauthorized transfer. DARPA's evaluation takes into consideration the entirety of the Senior/Key Personnel's SF-424, current and pending support, and biographical sketch, placing the most weight on the Senior/Key Person's professional and financial activities over the last 4 years. The majority of foreign entities lists used to make these determinations are publicly available. The DARPA Countering Foreign Influence Program (CFIP) "Senior/Key Personnel Foreign Influence Risk Rubric" details the various risk ratings and factors. The rubric can be seen at the following link:  
<https://www.darpa.mil/attachments/092021DARPACFIPRubric.pdf>
- iii. Examples of lists that DARPA leverages to assess potential undue foreign influence factors include, but are not limited to:
  1. Executive Order 13959 "Addressing the Threat From Securities Investments That Finance Communist Chinese Military Companies":  
<https://www.govinfo.gov/content/pk>

[g/FR-2020-11-17/pdf/2020-25459.pdf](https://www.ed.gov/FR-2020-11-17/pdf/2020-25459.pdf)

2. The U.S. Department of Education’s College Foreign Gift and Contract Report: [College Foreign Gift Reporting \(ed.gov\)](https://www.ed.gov/FR-2020-11-17/pdf/2020-25459.pdf)
3. The U.S. Department of Commerce, Bureau of Industry and Security, List of Parties of Concern: <https://www.bis.doc.gov/index.php/policy-guidance/lists-of-parties-of-concern>
4. Georgetown University’s Center for Security and Emerging Technology (CSET) Chinese Talent Program Tracker: <https://chinatalenttracker.cset.tech>
5. Director of National Intelligence (DNI) “World Wide Threat Assessment of the US Intelligence Community”: [2021 Annual Threat Assessment of the U.S. Intelligence Community \(dni.gov\)](https://www.dni.gov/2021-Annual-Threat-Assessment-of-the-U.S.-Intelligence-Community)
6. Various Defense Counterintelligence and Security Agency (DCSA) products regarding targeting of US technologies, adversary targeting of academia, and the exploitation of academic experts: <https://www.dcsa.mil/>

DARPA’s analysis and assessment of affiliations and associations of Senior/Key Personnel is compliant with Title VI of the Civil Rights Act of 1964. Information regarding race, color, or national origin is not collected and does not have bearing in DARPA’s assessment.

University or non-profit research institutions with proposals selected for negotiation that have been assessed as having high or very high undue foreign influence risk, will be given an opportunity during the negotiation process to mitigate the risk. DARPA reserves the

right to request any follow-up information needed to assess risk or mitigation strategies.

- iv. Upon conclusion of the negotiations, if DARPA determines, despite any proposed mitigation terms (e.g. mitigation plan, alternative research personnel), the participation of any Senior/Key Research Personnel still represents high risk to the program, or proposed mitigation affects the Government's confidence in proposer's capability to successfully complete the research (e.g., less qualified Senior/Key Research Personnel) the Government may determine not to award the proposed effort. Any decision not to award will be predicated upon reasonable disclosure of the pertinent facts and reasonable discussion of any possible alternatives while balancing program award timeline requirements.

- (b) Failure of the academic or non-profit research performer or recipient to reasonably exercise due diligence to discover or ensure that neither it nor any of its Senior/Key Research Personnel involved in the subject award are participating in a Foreign Government Talent Program or have a Foreign Component with an a strategic competitor or country with a history of targeting U.S. technology for unauthorized transfer may result in the Government exercising remedies in accordance with federal law and regulation.

- i. If, at any time, during performance of this research award, the academic or non-profit research performer or recipient should learn that it, its Senior/Key Research Personnel, or applicable team members or subtier performers on this award are or are believed to be participants in a Foreign Government Talent Program or have Foreign Components with a strategic competitor or country with a history of targeting U.S. technology for unauthorized transfer , the performer or recipient will notify the Government Contracting Officer or Agreements Officer within 5 business days.

1. This disclosure must include specific information as to the personnel involved and the nature of the situation and relationship. The Government will have 30 business days to review this information and conduct any necessary fact-finding or discussion with the performer or recipient.
2. The Government's timely determination and response to this disclosure may range anywhere from acceptance, to mitigation, to termination of this award at the Government's discretion.
3. If the University receives no response from the Government to its disclosure within 30 business days, it may presume that the Government has determined the disclosure does not represent a threat.

ii. The performer or recipient must flow down this provision to any subtier contracts or agreements involving direct participation in the performance of the research.

(c) Definitions

i. Senior/Key Research Personnel

1. This definition would include the Principal Investigator or Program/Project Director and other individuals who contribute to the scientific development or execution of a project in a substantive, measurable way, whether or not they receive salaries or compensation under the award. These include individuals whose absence from the project would be expected to impact the approved scope of the project.
2. Most often, these individuals will have a doctorate or other professional degrees, although other



individuals may be included within this definition on occasion.

- ii. Foreign Associations/Affiliations
  - 1. Association is defined as collaboration, coordination or interrelation, professionally or personally, with a foreign government-connected entity where no direct monetary or non-monetary reward is involved.
  - 2. Affiliation is defined as collaboration, coordination, or interrelation, professionally or personally, with a foreign government-connected entity where direct monetary or non-monetary reward is involved.

- iii. Foreign Government Talent Recruitment Programs
  - 1. In general, these programs will include any foreign-state-sponsored attempt to acquire U.S. scientific-funded research or technology through foreign government-run or funded recruitment programs that target scientists, engineers, academics, researchers, and entrepreneurs of all nationalities working and educated in the U.S.
  - 2. Distinguishing features of a Foreign Government Talent Recruitment Program may include:
    - a. Compensation, either monetary or in-kind, provided by the foreign state to the targeted individual in exchange for the individual transferring their knowledge and expertise to the foreign country.
    - b. In-kind compensation may include honorific titles, career advancement opportunities,

promised future compensation or other types of remuneration or compensation.

- c. Recruitment, in this context, refers to the foreign-state-sponsor's active engagement in attracting the targeted individual to join the foreign-sponsored program and transfer their knowledge and expertise to the foreign state. The targeted individual may be employed and located in the U.S. or in the foreign state.
- d. Contracts for participation in some programs that create conflicts of commitment and/or conflicts of interest for researchers. These contracts include, but are not limited to, requirements to attribute awards, patents, and projects to the foreign institution, even if conducted under U.S. funding, to recruit or train other talent recruitment plan members, circumventing merit-based processes, and to replicate or transfer U.S.-funded work in another country.
- e. Many, but not all, of these programs aim to incentivize the targeted individual to physically relocate to the foreign state. Of particular concern are those programs that allow for continued employment at U.S. research facilities or receipt of U.S. Government research funding while concurrently receiving

compensation from the foreign state.

3. Foreign Government Talent Recruitment Programs DO NOT include:

- a. Research agreements between the University and a foreign entity, unless that agreement includes provisions that create situations of concern addressed elsewhere in this section,
- b. Agreements for the provision of goods or services by commercial vendors, or
- c. Invitations to attend or present at conferences.

iv. Conflict of Interest

- 1. A situation in which an individual, or the individual's spouse or dependent children, has a financial interest or financial relationship that could directly and significantly affect the design, conduct, reporting, or funding of research.

v. Conflict of Commitment

- 1. A situation in which an individual accepts or incurs conflicting obligations between or among multiple employers or other entities.
- 2. Common conflicts of commitment involve conflicting commitments of time and effort, including obligations to dedicate time in excess of institutional or funding agency policies or commitments. Other types of conflicting obligations, including obligations to improperly share information with, or withhold information from, an employer or funding agency, can also threaten research security and integrity and

are an element of a broader concept of conflicts of commitment.

vi.

Foreign Component

1. Performance of any significant scientific element or segment of a program or project outside of the U.S., either by the University or by a researcher employed by a foreign organization, whether or not U.S. government funds are expended.
2. Activities that would meet this definition include, but are not limited to:
  - a. Involvement of human subjects or animals;
  - b. Extensive foreign travel by University research program or project staff for the purpose of data collection, surveying, sampling, and similar activities;
  - c. Collaborations with investigators at a foreign site anticipated to result in co-authorship;
  - d. Use of facilities or instrumentation at a foreign site;
  - e. Receipt of financial support or resources from a foreign entity; or
  - f. Any activity of the University that may have an impact on U.S. foreign policy through involvement in the affairs or environment of a foreign country.
3. Foreign travel is not considered a Foreign Component.

vii.

Strategic Competitor

1. A nation, or nation-state, that engages in diplomatic, economic or technological rivalry with the United States where the fundamental strategic interests of the U.S are under threat.

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

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

### **III. Eligibility Information**

#### **A. Eligible Applicants**

All responsible sources capable of satisfying the Government's needs may submit a proposal that shall be considered by DARPA.

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

##### **a) FFRDCs**

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

##### **b) Government Entities**

Government Entities (e.g., Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations. Government Entities must clearly

demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority and contractual authority, if relevant, establishing their ability to propose to Government solicitations and compete with industry. This information is required for Government Entities proposing to be awardees or subawardees.

### **c) Authority and Eligibility**

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

## **2. Other Applicants**

Non-U.S. organizations and/or individuals may participate to the extent that such participants comply with any necessary nondisclosure agreements, security regulations, export control laws, and other governing statutes applicable under the circumstances.

## **B. Organizational Conflicts of Interest**

### FAR 9.5 Requirements

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

### Agency Supplemental OCI Policy

In addition, DARPA has a supplemental OCI policy that prohibits contractors/performers from concurrently providing Scientific Engineering Technical Assistance (SETA), Advisory and Assistance Services (A&AS) or similar support services and being a technical performer. Therefore, as part of the FAR 9.5 disclosure requirement above, a proposer must affirm whether the proposer or *any* proposed team member (subawardee, consultant) is providing SETA, A&AS, or similar support to any DARPA office(s) under: (a) a current award or subaward; or (b) a past award or subaward that ended within one calendar year prior to the proposal's submission date.

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

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

### Government Procedures

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

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

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

### **C. Cost Sharing/Matching**

Cost sharing is not required; however, it will be carefully considered where there is an applicable statutory condition relating to the selected funding instrument. Cost sharing is encouraged where there is a reasonable probability of a potential commercial application related to the proposed research and development effort.

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

### **D. Other Eligibility Criteria**

If a performer is selected for TA4 award, the performer cannot be selected for the other TA(s) either as a prime or subcontractor.

## **IV. Application and Submission Information**

### **A. Address to Request Application Package**

This announcement, any attachments, and any references to external websites herein constitute the total solicitation. If proposers cannot access the referenced material posted in the announcement found at [www.darpa.mil](http://www.darpa.mil), contact the BAA Coordinator listed herein.

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

All submissions, including abstracts and proposals must be written in English with type not smaller than 12 point font. Smaller font may be used for figures, tables, and charts. Copies of all documents submitted must be clearly labeled with the DARPA BAA number, proposer organization, and proposal title/proposal short title.

### **1. Abstracts Format**

Proposers are strongly encouraged to submit an abstract in advance of a full proposal. The cover sheet should be clearly marked “ABSTRACT,” and the total length should not exceed two pages including all figures, tables, and charts. The required cover sheet, and optional submission letter, table of contents, or appendices are not included in the page count.

The suggested abstract components are:

- A. Cover Sheet (required): Include the administrative and technical points of contact (title, name, address, phone, e-mail, lead organization). Also include the BAA number, title of the proposed project (not the BAA title), Technical Area, subcontractors, estimated cost, duration of the project, and the label “ABSTRACT.”
- B. Executive Summary: Clearly describe what is being proposed and what difference it will make (qualitatively and quantitatively).
- D. Technical Plan: Outline the technical challenges inherent in the approach and possible solutions for overcoming potential problems.
- E. Management and Capabilities Plan: Identify the principal investigator and provide a brief summary of expertise of the team.
- F. Cost and Schedule: Provide a rough cost estimate for resources over the proposed timeline of the project, broken down by phase and major cost items (e.g., labor, materials, etc.). Include cost estimates for each potential subcontractor (it may be a rough order of magnitude).

### **2. Proposals Format**

All proposals must be in the format given below. The typical proposal should express a consolidated effort in support of one or more related technical concepts or ideas. Disjointed efforts should not be included into a single proposal. Proposals shall consist of two volumes: 1) Volume I, Technical and Management Proposal (composed of 3 parts), and 2) Volume II, Cost Proposal. The maximum page count for Volume I, including any TA combination submissions, is 25 pages and excludes the cover page, summary slide, official transmittal letter, and any table of contents or appendices, but does include figures, tables, and charts.



NOTE: Non-conforming submissions that do not follow the instructions herein may be rejected without further review.

a) Volume I, Technical and Management Proposal

(1) Section I: Administrative

(a) Cover Sheet to Include

- (1) BAA number (HR001122S0005)
- (2) Technical area;
- (3) Lead Organization submitting proposal;
- (4) Type of organization, selected among the following categories: "LARGE BUSINESS", "SMALL DISADVANTAGED BUSINESS", "OTHER SMALL BUSINESS", "HBCU", "MI", "OTHER EDUCATIONAL", OR "OTHER NONPROFIT";
- (5) Proposer's reference number (if any);
- (6) Other team members (if applicable) and type of organization for each;
- (7) Proposal title;
- (8) Technical point of contact 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), electronic mail (if available);
- (10) Total funds requested from DARPA, and the amount of cost share (if any); AND
- (11) Date proposal was submitted.

(b) Official transmittal letter

(2) Section II: Summary of Proposal

- A. Technical rationale, technical approach, and constructive plan for accomplishment of technical goals in support of innovative claims and deliverable creation.
- B. Innovative claims for the proposed research. This section is the centerpiece of the proposal and should succinctly describe the uniqueness and benefits of the proposed approach relative to the current state-of-art alternate approaches.
- C. Deliverables associated with the proposed research and the plans and capability to accomplish technology transition and commercialization. Include in this section all proprietary claims to the results, prototypes, intellectual property, or systems supporting and/or necessary for the use of the research, results, and/or prototype. If there are no proprietary claims, this should be stated. For forms to be completed regarding intellectual property, see Section IV.B.3.j of this BAA. There will be no page limit for the listed forms.
- D. General discussion of other research in this area.
- E. A clearly defined organization chart for the program team which includes, as applicable: (1) the programmatic relationship of team member; (2) the unique capabilities of team members; (3) the task of responsibilities of team members; (4) the teaming strategy among the team members; and (5) the key personnel along with the amount of effort to be expended by each person during each year.
- F. A summary slide of the proposed effort, in PowerPoint format, should be submitted with the proposal. Submit this PowerPoint file in addition to Volumes 1 and 2. The format for the

summary slide is included as Appendix 1 to this BAA and does not count against the page limit.

(3) Section III: Detailed Proposal Information

- A. Statement of Work (SOW) - Clearly define the technical tasks/subtasks to be performed, their durations, and dependencies among them. The page length for the SOW will be dependent on the amount of the effort. For each task/subtask, provide:
- A general description of the objective (for each defined task/activity);
  - A detailed description of the approach to be taken to accomplish each defined task/activity;
  - Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.);
  - The completion criteria for each task/activity - a product, event or milestone that defines its completion.
  - Define all deliverables (reporting, data, reports, software, etc.) to be provided to the Government in support of the proposed research tasks/activities; and
  - Clearly identify any tasks/subtasks (to be performed by either an awardee or subawardee) that will be accomplished on-campus at a university, if applicable.

*Note: The SOW should be developed so that each Phase of the program is separately defined.*

**Do not include any proprietary information in the SOW.**

- B. Description of the results, products, transferable technology, and expected technology transfer path to supplement information included in the summary of the proposal. This should also address mitigation of life-cycle and sustainment risks associated with transitioning intellectual property for U.S. military applications, if applicable. See also Section IV.B.3.j of this BAA., “Intellectual Property.”
- C. Detailed technical approach enhancing and completing that the Summary of Proposal.
- D. Comparison with other ongoing research indicating advantages and disadvantages of the proposed effort.
- E. Discussion of proposer’s previous accomplishments and work in closely related research areas.
- F. For non-fundamental research proposals, description of Security Management architecture and/or approach for the proposed effort, if appropriate. Detail unique additional security requirements including information system certification expertise for any anticipated CUI processing, Operation Security (OPSEC), program protection planning, and test planning.
- G. Description of the facilities that would be used for the proposed effort (as applicable).
- H. Detail support enhancing that of Summary of Proposal, including formal teaming agreements which are required to execute this program (as applicable).
- I. Provide description of milestone, cost, and accomplishments.

b) Volume II, Cost Proposal

All proposers, including FFRDCs, must submit the following:

1. Cover sheet to include:
  - (1) BAA number (HR001122S0005);

- (2) Technical area;
- (3) Lead Organization submitting proposal;
- (4) Type of organization selected among the following categories: “LARGE BUSINESS”, “SMALL DISADVANTAGED BUSINESS”, “OTHER SMALL BUSINESS”, “HBCU”, “MI”, “OTHER EDUCATIONAL”, OR “OTHER NONPROFIT”;
- (5) Proposer’s reference number (if any);
- (6) Other team members (if applicable) and type of organization for each;
- (7) Proposal title;
- (8) Technical point of contact 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), grant, cooperative agreement, or Other Transaction for Prototype;
- (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) Data Universal Numbering System (DUNS) number;
- (17) Taxpayer Identification Number (TIN);
- (18) Commercial and Government Entity (CAGE) Code;
- (19) Subawardee information; and
- (20) Proposal validity period.

## 2. Additional Cost Proposal Information

### (a) Supporting Cost and Pricing Data

The proposer should include supporting cost and pricing information in sufficient detail to substantiate the summary cost estimates and should include a description of the method used to estimate costs and supporting documentation.

### (b) Cost Breakdown Information and Format

#### **Detailed cost breakdown to include:**

- Total program costs broken down by major cost items (direct labor, including labor categories; indirect rates; subcontracts; materials; other direct costs; overhead charges, etc.) and further broken down by task and phase
- Major program tasks by fiscal year
- An itemization of major subcontracts and equipment purchases.
- Documentation supporting the reasonableness of the proposed equipment costs (vendor quotes, past purchase orders/purchase history, detailed engineering estimates, etc.) shall be provided.
- An itemization of any information technology (IT) purchase, as defined by FAR 2.101 – Documentation supporting the reasonableness of the proposed equipment costs (vendor quotes, past purchase orders/purchase history, detailed engineering estimates, etc.) shall be provided, including a letter stating why the proposer cannot provide the requested resources from its own funding for prime and all sub-awardees.
- A summary of projected funding requirements by month
- The source, nature, and amount of any industry cost-sharing
- Identification of pricing assumptions of which may require incorporation into the resulting award instrument (e.g., use of Government Furnished Property/Facilities/Information, access to Government subject matter experts, etc.)

**Tables included in the cost proposal in editable (e.g. MS Excel) format with calculation formulas intact.** NOTE: If PDF submissions differ from the Excel submission, the PDF will take precedence.

The Government strongly encourages that proposers use the provided MS Excel™ DARPA Standard Cost Proposal Spreadsheet in the development of their cost proposals. A customized cost proposal spreadsheet may be an attachment to this solicitation. If not, the spreadsheet can be found on the DARPA website at <http://www.darpa.mil/work-with-us/contract-management> (under “Resources” on the right-hand side of the webpage). All tabs and tables in the cost proposal spreadsheet should be developed in an editable format with calculation formulas intact to allow traceability of the cost proposal. This cost proposal spreadsheet should be used by the prime organization and all subcontractors. In addition to using the cost proposal spreadsheet, the cost proposal still must include all other items required in this announcement that are not covered by the editable spreadsheet. Subcontractor cost proposal spreadsheets may be submitted directly to the Government by the proposed subcontractor via e-mail to the address in Part I of this solicitation. **Using the provided cost proposal spreadsheet will assist the Government in a rapid analysis of your proposed costs and, if your proposal is selected for a potential award, speed up the negotiation and award execution process.**

Per FAR 15.403-4, certified cost or pricing data shall be required if the proposer is seeking a procurement contract award per the referenced threshold, unless the proposer requests and is granted an exception from the requirement to submit cost or pricing data. Certified cost or pricing data are not required if the proposer proposes an award instrument other than a procurement contract (e.g., a grant, cooperative agreement, or other transaction.)

### **(c) Subawardee Proposals**

The awardee is responsible for compiling and providing all subawardee proposals for the Procuring Contracting Officer (PCO)/Grants Officer (GO), as applicable. Subawardee proposals should include Interdivisional Work Transfer Agreements (ITWA) or similar arrangements. Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each.

All proprietary subawardee proposal documentation, prepared at the same level of detail as that required of the awardee's proposal and which cannot be uploaded with the proposed awardee's proposal, shall be provided to the Government either by the awardee or by the subawardee organization when the proposal is submitted. Subawardee proposals submitted to the Government by the proposed awardee should be submitted electronically to ASKEM@darpa.mil, and the proposed awardee will not be allowed to view. The subawardee must provide the same number of electronic copies to the PCO/GO as is required of the awardee. See Section IV.4.b. of this BAA for proposal submission information.

### **(d) Other Transaction Requests**

All proposers requesting an OT must include a detailed list of milestones. Each milestone must include the following:

- milestone description,
- completion criteria,
- due date, and
- payment/funding schedule (to include, if cost share is proposed, awardee and Government share amounts).

It is noted that, at a minimum, milestones should relate directly to accomplishment of program technical metrics as defined in the BAA and/or the proposer's proposal. Agreement type, expenditure or fixed-price based, will be subject to negotiation by the Agreements Officer. Do not include proprietary data.

## **3. Additional Proposal Information**

### **a) Proprietary Markings**

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

### **b) Security Information**

#### **(1) Controlled Unclassified Information (CUI)**

For unclassified proposals containing controlled unclassified information (CUI), applicants will ensure personnel and information systems processing CUI security requirements are in place.

(a) CUI Proposal Markings

If an unclassified submission contains CUI or the suspicion of such, as defined by Executive Order 13556 and 32 C.F.R. Part 2002, the information must be appropriately and conspicuously marked CUI in accordance with DoDI 5200.48. Identification of what is CUI about this DARPA program will be detailed in a DARPA CUI Guide and will be provided as an attachment to the BAA or may be provided at a later date.

(b) CUI Submission Requirements

Unclassified submissions containing CUI may be submitted via DARPA's BAA Website (<https://baa.darpa.mil>) in accordance with Section IV.4.b of this BAA.

(c) Proposers submitting proposals involving the pursuit and protection of DARPA information designated as CUI must have, or be able to acquire prior to contract award, an information system authorized to process CUI information in accordance with (IAW) NIST SP 800-171 and DoD Instruction (DoDI) 8582.01.

**c) Disclosure of Information and Compliance with Safeguarding Covered Defense Information Controls**

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

DFARS 252.204-7000, "Disclosure of Information"

DFARS 252.204-7008, "Compliance with Safeguarding Covered Defense Information Controls"

DFARS 252.204-7012, "Safeguarding Covered Defense Information and Cyber Incident Reporting"

The full text of the above solicitation provision and contract clauses can be found at

<http://www.darpa.mil/work-with-us/additional-baa#NPRPAC>.

Compliance with the above requirements includes the mandate for proposers to implement the security requirements specified by National Institute of Standards and Technology (NIST) Special Publication (SP) 800-171, "Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations" (see

<https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-171r2.pdf>) and DoDI 8582.01 that are in effect at the time the solicitation is issued.

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

**d) Representations and Certifications**

In accordance with FAR 4.1102 and 4.1201, proposers requesting a procurement contract must complete electronic annual representations and certifications at <https://www.sam.gov/>.

In addition, all proposers are required to submit for all award instrument types supplementary DARPA-specific representations and certifications at the time of proposal submission. See <http://www.darpa.mil/work-with-us/reps-certs> for further information on required representation and certification depending on your requested award instrument.

**e) Human Subjects Research (HSR)/Animal Use**

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

**f) Approved Cost Accounting System Documentation**

Proposers that do not have a Cost Accounting Standards (CAS) compliant accounting system considered adequate for determining accurate costs that are negotiating a cost-type procurement contract must complete a Standard Form, (SF 1408). For more information on CAS compliance, see <http://www.dcaa.mil>. To facilitate this process, proposers should complete the SF 1408 found at <http://www.gsa.gov/portal/forms/download/115778> and submit the completed form with the proposal.

**g) Small Business Subcontracting Plan**

Pursuant to Section 8(d) of the Small Business Act (15 U.S.C. § 637(d)) and FAR 19.702(a)(1), each proposer who submits a proposal for a procurement contract and includes subcontractors might be required to submit a subcontracting plan with their proposal. The plan format is outlined in FAR 19.704.

**h) Section 508 of the Rehabilitation Act (29 U.S.C. § 749d)/FAR 39.2**

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

**i) Grant Abstract**

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

**j) Intellectual Property**

All proposers must provide a good faith representation that the proposer either owns or possesses the appropriate licensing rights to all intellectual property that will be utilized under the proposed effort.

(1) For Procurement Contracts

Proposers responding to this BAA requesting procurement contracts will need to complete the certifications at Defense Federal Acquisition Regulation Supplement (DFARS) 252.227-7017. See <http://www.darpa.mil/work-with-us/additional-baa> for further information. If no restrictions are intended, the proposer should state “none.” The table below captures the requested information:

Technical Data Computer Software To be Furnished With Restrictions	Summary of Intended Use in the Conduct of the Research	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(NARRATIVE)	(LIST)	(LIST)	(LIST)

(2) For All Non-Procurement Contracts

Proposers responding to this BAA requesting a Grant, Cooperative Agreement, or Other Transaction for Prototypes shall follow the applicable rules and regulations governing these various award instruments, but, in all cases, should appropriately identify any potential restrictions on the Government’s use of any Intellectual Property contemplated under the award instrument in question. This includes both Noncommercial Items and Commercial Items. Proposers are encouraged use a format similar to that described in Paragraph (1) above. If no restrictions are intended, then the proposer should state “NONE.”

**k) System for Award Management (SAM) and Universal Identifier Requirements**

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

International entities can register in SAM by following the instructions in this link: [https://www.fsd.gov/sys\\_attachment.do?sys\\_id=c08b64ab1b4434109ac5ddb6bc4bcbb8](https://www.fsd.gov/sys_attachment.do?sys_id=c08b64ab1b4434109ac5ddb6bc4bcbb8).

**4. Submission Information**

For abstract and proposal submission dates, see Part I., Overview Information. Submissions received after these dates and times may not be reviewed.

Abstracts must be received via DARPA's BAA Website (<https://baa.darpa.mil>) on or before the submission date stated in Part 1, Overview Information.

The proposal must be received via DARPA's BAA Website (<https://baa.darpa.mil>) on or before the submission date stated in Part 1, Overview Information. Proposals submissions received after



this deadline may be received and evaluated up to six months (180 calendar days) from date of posting on the System for Award Management, Contract Opportunities (<https://SAM.gov>) or Grants.gov (<http://www.grants.gov>). Proposers are warned that the likelihood of available funding is greatly reduced for proposals submitted after the initial closing date deadline.

DARPA will acknowledge receipt of all submissions and assign an identifying control number that should be used in all further correspondence regarding the submission. DARPA intends to use electronic mail correspondence regarding HR001122S0005. Submissions may not be submitted by fax or e-mail; any submission received through fax or e-mail will be disregarded.

Submissions will not be returned. An electronic copy of each submission received will be retained at DARPA and all other non-required copies destroyed. A certification of destruction may be requested, provided the formal request is received by DARPA within five (5) business days after notification that a proposal was not selected.

**a) Abstract Submission**

Refer to Section VI.A.1. for DARPA response to abstract submissions.

**b) Proposal Submission**

Refer to Section VI.A.2. for how DARPA will notify proposers as to whether or not their proposal has been selected for potential award.

(1) For Proposers Requesting Grants or Cooperative Agreements

Proposers requesting grants or cooperative agreements must submit proposals through one of the following methods: (1) electronic upload per the instructions at <https://www.grants.gov/applicants/apply-for-grants.html> (DARPA-preferred); or (2) hard-copy mailed directly to DARPA. If proposers intend to use Grants.gov as their means of submission, then they must submit their entire proposal through Grants.gov; applications cannot be submitted in part to Grants.gov and in part as a hard-copy. Proposers using Grants.gov do not submit hard-copy proposals in addition to the Grants.gov electronic submission.

Submissions: In addition to the volumes and corresponding attachments requested elsewhere in this solicitation, proposers must also submit the three forms listed below.

Form 1: SF 424 Research and Related (R&R) Application for Federal Assistance, available on the Grants.gov website at [https://apply07.grants.gov/apply/forms/sample/RR\\_SF424\\_2\\_0-V2.0.pdf](https://apply07.grants.gov/apply/forms/sample/RR_SF424_2_0-V2.0.pdf). *This form must be completed and submitted.*

To evaluate compliance with Title IX of the Education Amendments of 1972 (20 U.S.C. § 1681 et.seq.), the Department of Defense (DoD) 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 science, technology, engineering or mathematics disciplines. In addition, the National Defense Authorization Act (NDAA) for FY 2019, Section 1286, directs the Secretary of Defense to protect intellectual property, controlled information, key personnel, and information about critical technologies relevant to national security and limit undue influence, including

foreign talent programs by countries that desire to exploit United States' technology within the DoD research, science and technology, and innovation enterprise. This requirement is necessary for all research and research-related educational activities. The DoD is using the two forms below to collect the necessary information to satisfy these requirements. Detailed instructions for each form are available on Grants.gov.

Form 2: The Research and Related Senior/Key Person Profile (Expanded) form, available on the Grants.gov website at [https://apply07.grants.gov/apply/forms/sample/RR\\_KeyPersonExpanded\\_3\\_0-V3.0.pdf](https://apply07.grants.gov/apply/forms/sample/RR_KeyPersonExpanded_3_0-V3.0.pdf), will be used to collect the following information for all senior/key personnel, including Project Director/Principal Investigator and Co-Project Director/Co-Principal Investigator, whether or not the individuals' efforts under the project are funded by the DoD. The form includes 3 parts: the main form administrative information, including the Project Role, Degree Type and Degree Year; the biographical sketch; and the current and pending support. The biographical sketch and current and pending support are to be provided as attachments:

- Biographical Sketch: Mandatory for Project Directors (PD) and Principal Investigators (PI), optional, but desired, for all other Senior/Key Personnel. The biographical sketch should include information pertaining to the researchers:
  - Education and Training.
  - Research and Professional Experience.
  - Collaborations and Affiliations (for conflict of interest).
  - Publications and Synergistic Activities.
- Current and Pending Support: Mandatory for all Senior/Key Personnel including the PD/PI. This attachment should include the following information:
  - A list of all current projects the individual is working on, in addition to any future support the individual has applied to receive, regardless of the source.
  - Title and objectives of the other research projects.
  - The percentage per year to be devoted to the other projects.
  - The total amount of support the individual is receiving in connection to each of the other research projects or will receive if other proposals are awarded.
  - Name and address of the agencies and/or other parties supporting the other research projects
  - Period of performance for the other research projects.

Additional senior/key persons can be added by selecting the “Next Person” button at the bottom of the form. Note that, although applications without this information completed may pass Grants.gov edit checks, if DARPA receives an application without the required information, DARPA may determine that the application is incomplete and may cause your submission to be rejected and eliminated from further review and consideration under the solicitation. DARPA reserves the right to request further details from the applicant before making a final determination on funding the effort.

Form 3: Research and Related Personal Data, available on the Grants.gov website at [https://apply07.grants.gov/apply/forms/sample/RR\\_PersonalData\\_1\\_2-V1.2.pdf](https://apply07.grants.gov/apply/forms/sample/RR_PersonalData_1_2-V1.2.pdf). *Each applicant must complete the name field of this form, however, provision of the demographic information is voluntary. Regardless of whether the demographic fields are completed or not, this form must be submitted with at least the applicant's name completed.*

(1) **Grants.gov Submissions:** Grants.gov requires proposers to complete a one-time registration process before a proposal can be electronically submitted. First time registration can take between three business days and four weeks. For more information about registering for Grants.gov, see <http://www.darpa.mil/work-with-us/additional-baa>.

(2) For Proposers Requesting Procurement Contracts or OTs and Submitting to a DARPA-approved Proposal Submissions Website

Unclassified full proposals sent in response to this BAA must be submitted via DARPA's BAA Website (<https://baa.darpa.mil>). Note: If an account has already been created for the DARPA BAA Website, this account may be reused. If no account currently exists for the DARPA BAA Website, visit the website to complete the two-step registration process. Submitters will need to register for an Extranet account (via the form at the URL listed above) and wait for two separate e-mails containing a username and temporary password. After accessing the Extranet, submitters may then create an account for the DARPA BAA website (via the "Register your Organization" link along the left side of the homepage), view submission instructions, and upload/finalize the proposal. Proposers using the DARPA BAA Website may encounter heavy traffic on the submission deadline date; proposers should start this process as early as possible.

All unclassified concepts submitted electronically through DARPA's BAA Website must be uploaded as zip files (.zip or .zipx extension). The final zip file should be no greater than 50 MB in size. Only one zip file will be accepted per submission, and submissions not uploaded as zip files will be rejected by DARPA.

Technical support for DARPA's BAA Website may be reached at [BAAT\\_Support@darpa.mil](mailto:BAAT_Support@darpa.mil), and is typically available during regular business hours, Eastern Time.

## **5. Frequently Asked Questions (FAQ)**

DARPA will post a consolidated Frequently Asked Questions (FAQ) document. To access the posting go to: <http://www.darpa.mil/work-with-us/opportunities>. Under the HR001122S0005 summary will be a link to the FAQ. Submit your question/s by E-mail to [ASKEM@darpa.mil](mailto:ASKEM@darpa.mil). Questions must be received by the FAQ/Questions due date listed in Part I, Overview Information.

## **V. Application Review Information**

### **A. Evaluation Criteria**

Proposals will be evaluated using the following criteria, listed in descending order of importance:

### **1. Overall Scientific and Technical Merit**

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

The proposed team has the expertise and experience to accomplish the proposed technical tasks and to manage the team and the research risks. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final outcome that achieves the goal can be expected as a result of award. The proposal identifies major technical risks and planned mitigation strategies are clearly defined and feasible. Absence of technical risks is an indication the proposed effort is evolutionary.

The proposal clearly explains the technical approach(es) that will be employed to meet or exceed each program goal and metric listed in Section I.B. and provides ample justification as to why the approach(es) is feasible. The Government will also consider the structure, clarity, and responsiveness to the Statement of Work; the quality of proposed deliverables; and the linkage of the Statement of Work, technical approach(es), risk mitigation plans, costs, and deliverables of the prime awardee and all subawardees through a logical, well structured, and traceable technical plan.

### **2. Potential Contribution and Relevance to the DARPA Mission**

The potential contributions of the proposed effort are relevant to the national technology base. Specifically, DARPA's mission is to make pivotal early technology investments that create or prevent strategic surprise for U.S. National Security.

DARPA's objective is to develop an open environment in which additional capabilities can be developed by others after the program ends. Intellectual property rights assertions that are consistent with this objective are encouraged.

### **3. Cost and Schedule Realism**

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

DARPA recognizes that undue emphasis on cost may motivate proposers to offer low-risk ideas with minimum uncertainty and to staff the effort with junior personnel in order to be in a more competitive posture. DARPA discourages such cost strategies.

The proposed schedule aggressively pursues performance metrics in an efficient time frame that accurately accounts for the anticipated workload. The proposed schedule identifies and mitigates any potential schedule risk.

## **B. Review of Proposals**

### **1. Review Process**

It is the policy of DARPA to ensure impartial, equitable, comprehensive proposal evaluations based on the evaluation criteria listed in Section V.A. and to select the source (or sources) whose offer meets the Government's technical, policy, and programmatic goals.

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

Award(s) will be made to proposers whose proposals are determined to be the most advantageous to the Government, consistent with instructions and evaluation criteria specified in the BAA herein, and availability of funding.

### **2. Handling of Source Selection Information**

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

### **3. Federal Awardee Performance and Integrity Information (FAPIS)**

Per 41 U.S.C. § 2313, as implemented by FAR 9.103 and 2 C.F.R. § 200.205, prior to making an award above the simplified acquisition threshold, DARPA is required to review and consider any information available through the designated integrity and performance system (currently FAPIS). Awardees have the opportunity to comment on any information about themselves entered in the database, and DARPA will consider any comments, along with other information in FAPIS or other systems prior to making an award.

#### **4. Countering Foreign Influence Program (CFIP)**

DARPA's CFIP is an adaptive risk management security program designed to help protect the critical technology and performer intellectual property associated with DARPA's research projects by identifying the possible vectors of undue foreign influence. The CFIP team will create risk assessments of all proposed Senior/Key Personnel selected for negotiation of a fundamental research grant or cooperative agreement award. The CFIP risk assessment process will be conducted separately from the DARPA scientific review process and adjudicated prior to final award.

### **VI. Award Administration Information**

#### **A. Selection Notices and Notifications**

##### **1. Abstracts**

DARPA will respond to abstracts with a statement as to whether DARPA is interested in the idea. If DARPA does not recommend the proposer submit a full proposal, DARPA will provide feedback to the proposer regarding the rationale for this decision. Regardless of DARPA's response to an abstract, proposers may submit a full proposal. DARPA will review all conforming full proposals using the published evaluation criteria and without regard to any comments resulting from the review of an abstract.

##### **2. Proposals**

As soon as the evaluation of a proposal is complete, the proposer will be notified that (1) the proposal has been selected for funding pending award negotiations, in whole or in part, or (2) the proposal has not been selected. These official notifications will be sent via email to the Technical Point of Contact (POC) and/or Administrative POC identified on the proposal coversheet.

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

##### **1. Meeting and Travel Requirements**

There will be a program kickoff meeting and all key participants are required to attend. Performers should also anticipate regular program-wide PI Meetings and periodic site visits at the Program Manager's discretion.

##### **2. Solicitation Provisions and Award Clauses, Terms and Conditions**

Solicitation clauses in the FAR and DFARS relevant to procurement contracts and FAR and DFARS clauses that may be included in any resultant procurement contracts are incorporated herein and can be found at <http://www.darpa.mil/work-with-us/additional-baa>.

### **3. Controlled Unclassified Information (CUI) and Controlled Technical Information (CTI) on Non-DoD Information Systems**

Further information on Controlled Unclassified Information identification, marking, protecting, and control, to include processing on Non-DoD Information Systems, is incorporated herein and can be found at <http://www.darpa.mil/work-with-us/additional-baa>.

### **4. Terms and Conditions**

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

#### **C. Reporting**

The number and types of reports will be specified in the award document, but will include at a minimum quarterly technical and monthly financial status reports. The reports shall be prepared and submitted in accordance with the procedures contained in the award document and mutually agreed on before award. A final report that summarizes the project and tasks will be required at the conclusion of the period of performance for the award.

#### **D. Electronic Systems**

##### **1. Wide Area Work Flow (WAWF)**

Performers will be required to submit invoices for payment directly to <https://piee.eb.mil/>, unless an exception applies. Performers must register in WAWF prior to any award under this BAA.

##### **2. i-Edison**

The award document for each proposal selected for funding will contain a mandatory requirement for patent reports and notifications to be submitted electronically through i-Edison (<https://public.era.nih.gov/iedison>).

#### **E. DARPA Embedded Entrepreneur Initiative (EEI)**

Awardees pursuant to this solicitation may be eligible to participate in the DARPA Embedded Entrepreneurship Initiative (EEI) during the award's period of performance. EEI is a limited scope program offered by DARPA, at DARPA's discretion, to a small subset of awardees. The goal of DARPA's EEI is to increase the likelihood that DARPA-funded technologies take root in the U.S. and provide new capabilities for national defense. EEI supports DARPA's mission "to make pivotal investments in breakthrough technologies and capabilities for national security" by accelerating the transition of innovations out of the lab and into new capabilities for the Department of Defense (DoD). EEI investment supports development of a robust and deliberate Go-to-Market strategy for selling technology product to the government and commercial markets and positions DARPA awardees to attract U.S. investment. The following is for informational and planning purposes only and does not constitute solicitation of proposals to the EEI.

There are three elements to DARPA's EEI: (1) A Senior Commercialization Advisor (SCA) from DARPA who works with the Program Manager (PM) to examine the business case for the awardee's technology and uses commercial methodologies to identify steps toward achieving a successful transition of technology to the government and commercial markets; (2) Connections to potential industry and investor partners via EEI's Investor Working Groups; and (3) Additional funding on an awardee's contract for the awardee to hire an embedded entrepreneur to achieve specific milestones in a Go-to-Market strategy for transitioning the technology to products that serve both defense and commercial markets. This embedded entrepreneur's qualifications should include business experience within the target industries of interest, experience in commercializing early-stage technology, and the ability to communicate and interact with technical and non-technical stakeholders. Funding for EEI is typically no more than \$250,000 per awardee over the duration of the award. An awardee may apportion EEI funding to hire more than one embedded entrepreneur if achieving the milestones requires different expertise that can be obtained without exceeding the awardee's total EEI funding. The EEI effort is intended to be conducted concurrently with the research program without extending the period of performance.

#### EEI Application Process:

After receiving an award under the solicitation, awardees interested in being considered for EEI should notify their DARPA PM during the period of performance. Timing of such notification should ideally allow sufficient time for DARPA and the awardee to review the awardee's initial transition plan, identify milestones to achieve under EEI, modify the award, and conduct the work required to achieve such milestones within the original award period of performance. These steps may take 18-24 months to complete, depending on the technology. If the DARPA PM determines that EEI could be of benefit to transition the technology to product(s) the Government needs, the PM will refer the performer to DARPA Commercial Strategy.

DARPA Commercial Strategy will then contact the performer, assess fitness for EEI, and in consultation with the DARPA technical office, determine whether to invite the performer to participate in the EEI. Factors that are considered in determining fitness for EEI include DoD/Government need for the technology; competitive approaches to enable a similar capability or product; risks and impact of the Government's being unable to access the technology from a sustainable source; Government and commercial markets for the technology; cost and affordability; manufacturability and scalability; supply chain requirements and barriers; regulatory requirements and timelines; intellectual property and Government Use Rights, and available funding.

Invitation to participate in EEI is at the sole discretion of DARPA and subject to program balance and the availability of funding. EEI participants' awards may be subsequently modified bilaterally to amend the Statement of Work to add negotiated EEI tasks, provide funding, and specify a milestone schedule which will include measurable steps necessary to build, refine, and execute a Go-to-Market strategy aimed at delivering new capabilities for national defense. Milestone examples are available at: <https://www.darpa.mil/work-with-us/contract-management>

Awardees under this solicitation are eligible to be considered for participation in EEI, but selection for award under this solicitation does not imply or guarantee participation in EEI.



## **VII. Agency Contacts**

Administrative, technical, or contractual questions should be sent via email to ASKEM@darpa.mil. All requests must include the name, email address, and phone number of a point of contact.

### **Points of Contact**

The BAA Coordinator for this effort may be reached at ASKEM@darpa.mil.

The Technical POC for this effort is Joshua Elliott.

DARPA/I2O

ATTN: HR001122S0005

675 North Randolph Street

Arlington, VA 22203-2114

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

## **VIII. Other Information**

### **Proposers Day**

A virtual Proposers Day for this effort will be held on December 8, 2021.

The Special Notice regarding this Proposers Day can be found at:

<https://www.schafertmd.com/darpa/i2o/ASKEM/pd/>

For further information regarding the ASKEM Proposers Day, including slides from the event, please see <http://www.darpa.mil/work-with-us/opportunities> under HR001122S0005.

### **Associate Contractor Agreement (ACA)**

This same or similar language will be included in procurement contract awards against HR001122S0005. Awards other than FAR based contracts will contain similar agreement language:

(a) It is recognized that success of the ASKEM research effort depends in part upon the open exchange of information between the various Associate Contractors involved in the effort. This language is intended to ensure that there will be appropriate coordination and integration of work by the Associate Contractors to achieve complete compatibility and to prevent unnecessary duplication of effort. By executing this contract, the Contractor assumes the responsibilities of an Associate Contractor. For the purpose of this ACA, the term Contractor includes subsidiaries, affiliates, and organizations under the control of the contractor (e.g., subcontractors).

(b) Work under this contract may involve access to proprietary or confidential data from an Associate Contractor. To the extent that such data is received by the Contractor from any Associate Contractor for the performance of this contract, the Contractor hereby agrees that any proprietary information received shall remain the property of the Associate Contractor and shall be used solely for the purpose of the ASKEM research effort. Only that information which is received from another contractor in writing and which is clearly identified as proprietary or

confidential shall be protected in accordance with this provision. The obligation to retain such information in confidence will be satisfied if the Contractor receiving such information utilizes the same controls as it employs to avoid disclosure, publication, or dissemination of its own proprietary information. The receiving Contractor agrees to hold such information in confidence as provided herein so long as such information is of a proprietary/confidential or limited rights nature.

(c) The Contractor hereby agrees to closely cooperate as an Associate Contractor with the other Associate Contractors on this research effort. This involves as a minimum:

- (1) maintenance of a close liaison and working relationship;
- (2) maintenance of a free and open information network with all Government-identified associate Contractors;
- (3) delineation of detailed interface responsibilities;
- (4) entering into a written agreement with the other Associate Contractors setting forth the substance and procedures relating to the foregoing, and promptly providing the Agreements Officer/Procuring Contracting Officer with a copy of same; and,
- (5) receipt of proprietary information from the Associate Contractor and transmittal of Contractor proprietary information to the Associate Contractors subject to any applicable proprietary information exchange agreements between associate contractors when, in either case, those actions are necessary for the performance of either.

(d) In the event that the Contractor and the Associate Contractor are unable to agree upon any such interface matter of substance, or if the technical data identified is not provided as scheduled, the Contractor shall promptly notify the DARPA ASKEM Program Manager. The Government will determine the appropriate corrective action and will issue guidance to the affected Contractor.

(e) The Contractor agrees to insert in all subcontracts hereunder which require access to proprietary information belonging to the Associate Contractor, a provision which shall conform substantially to the language of this ACA, including this paragraph (e).

(f) Associate Contractors for the ASKEM research effort include:

Contractor

Technical Area

## IX. APPENDIX 1 – PROPOSAL SUMMARY SLIDE



FP: Prime Organization  
 PI: PI Name (% LOE)  
 Subcontractors: Subcontractor Organization(s) or "None"  
 Title: Proposal Title

TA#

ASKEM

**Summary:**

- Succinctly describe the proposed technical approach (be sure to convey key insights)
- The bullets, combined with the graphic below, should clearly convey what is proposed
- Use the bullets as the "elevator speech" for the proposal
- Etc. (use as many bullets as necessary)

*Insert high-resolution overview graphic of proposed architecture/technical approach*

Source: Prime Organization, Volume 1 (SMOKE)

Summary	Phase 1	Phase 2	Total
Proposed	\$#.##M	\$#.##M	\$#.##M

**Innovation, feasibility:**

- High-level bullets for how the approach is particularly innovative (i.e., goes beyond current state-of-the-art)
- Why the approach is feasible (at a high-level)
- Etc. (use as many bullets as necessary)

**Risks/mitigations:**

- Identification of high-risk elements (e.g., limitations) of your approach
- High-level description of risk(s) mitigation
- Etc. (use as many bullets as necessary)

**Cost:**

- Prime cost and % of overall cost (e.g., ABC, Inc.: \$#.##M, X%)
- Subcontractor X cost and % of overall cost
- Etc.

**Intellectual Property/data rights assertions:**

- Yes/No (with very brief description if "yes"; commercial or non-commercial))

**Key personnel:**

- Name, organization, %LOE
- Name, organization, %LOE
- Etc. (use as many bullets as necessary)

**Foreign National participation:**

- Yes or No

**Project classification:**

- Controlled unclassified, fundamental research, combination, other

**Will the project collect, store or create records that may contain PII?**

- Yes or No

**ITAR/EAR proposed?**

- Yes or No

Submit as an MS PowerPoint Chart. Do not change font (Tahoma). Convert all red text to black text upon submission. Do not alter existing black text.

1