



Broad Agency Announcement
Learning Introspective Control (LINC)
INFORMATION INNOVATION OFFICE

HR001121S0036

8/23/2021

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PART I: OVERVIEW INFORMATION

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Information Innovation Office (I2O)
- **Funding Opportunity Title** – Learning Introspective Control (LINC)
- **Announcement Type** – Initial announcement
- **Funding Opportunity Number** – HR001121S0036
- **Catalog of Federal Domestic Assistance Numbers (CFDA)** – Not applicable
- **Dates**
 - Posting Date: August 23, 2021
 - Proposers’ Day: August 26, 2021
 - Questions Due: September 7, 2021, 1500 (ET)
 - Abstract Due Date and Time: September 13, 2021, 1500 (ET)
 - Proposal Due Date: October 26, 2021, 1700 (ET)
- **Program Overview** – The Learning Introspective Control (LINC) program aims to develop machine learning-based introspection technologies that enable physical systems, with specific interest in ground vehicles, ships, drone swarms, and robotic systems, to respond to events not predicted at design time. LINC technologies will update control laws as required in real time while providing guidance and situational awareness to the operator, whether that operator is human or an autonomous controller.
- **Total Amount Anticipated to be Awarded** – Up to \$24M may be awarded for TA1: up to \$10.3M may be awarded for Phase 0, up to \$8.4M may be awarded for Phase 1, and up to \$5.3M may be awarded for Phase 2.
- **Anticipated Individual Awards** – Multiple awards are anticipated.
- **Types of Instruments that May be Awarded** – Procurement Contracts, Cooperative Agreements, or Other Transactions (OT)
- **Agency Contact**
 - Points of Contact
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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, and 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, and proposed research should investigate innovative approaches that enable revolutionary advances in science, devices, or systems. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.

All proposers should read all sections. The technical information contained in the discussion of each individual Technical Area (TA) is relevant to the execution of all TAs.

A. Program Overview

The Learning Introspective Control (LINC) program aims to develop machine learning-based introspection technologies that enable physical systems, with specific interest in ground vehicles, ships, drone swarms, and robotic systems, to respond to events not predicted at design time. LINC technologies will update control laws as required in real time while providing guidance and situational awareness to the operator, whether that operator is human or an autonomous controller.

Currently, control design aims to model the range of operating environments which are anticipated at design time. When encountering a physical attack, unforeseen conditions, or unanticipated use that places the system outside the design envelope, the plant¹ can fail. Custom-tailored aftermarket remedies are not commonly available and require a skilled technician to install. Modifications to existing systems through procurement channels can take months or years. The Department of Defense (DoD) systems are particularly long-lived, so ongoing adaptation would permit continual modification as missions and theaters change, providing a strategic advantage over an adversary.

LINC will develop machine introspection and learning technologies that can characterize a damaged or modified military platform from its behavior, and then update the control law to maintain stability and control. A platform equipped with LINC technology will continually compare the real-time behavior of the platform, as measured by on-board sensors, with a learned model of the plant, determine whether the observed behavior of the platform differs from that model in ways that might compromise stability and control, and implement an updated control law when required. The current approach to handling platform damage or modification places the

¹ In control theory, a plant comprises a process plus actuators. A transfer function, which usually uses Laplace notation, characterizes the relationship between input and output signals.

burden of recovery and control on the operator, whether that operator is human or an autonomous controller. The LINC capability is being developed to aid operators in maintaining effective control of military platforms that suffer damage in battle or have been modified in the field in response to emergent requirements identified during operations.

LINC-enabled control systems will be capable of building a model of the physical system by observing the system’s behavior, including responses to operator input. Substantial changes in system behavior are to be expected over time, due to end-user modifications, damage, or unusual wear and tear, and those behavioral changes also affect system control. LINC will learn these behavioral changes and modify the control response to maintain uninterrupted operation. After startup and after major changes, a period of time is required for LINC to learn the current system instantiation’s behavior; however, the time should be kept to a minimum and speed of learning is a key metric.

Learning the system’s behavior is not a one-time event. Changes in dynamics due to external factors can affect a system’s control response. A LINC-enabled system should be able to detect disruptive changes in control response and quickly develop a control regime based not only on the learned model, but also on changes that take place after the model has been learned. Thus, “learning the model” is an iterative process. Systems must continue to learn and relearn the model by observing changing system behavior.

B. Program Structure and Plan

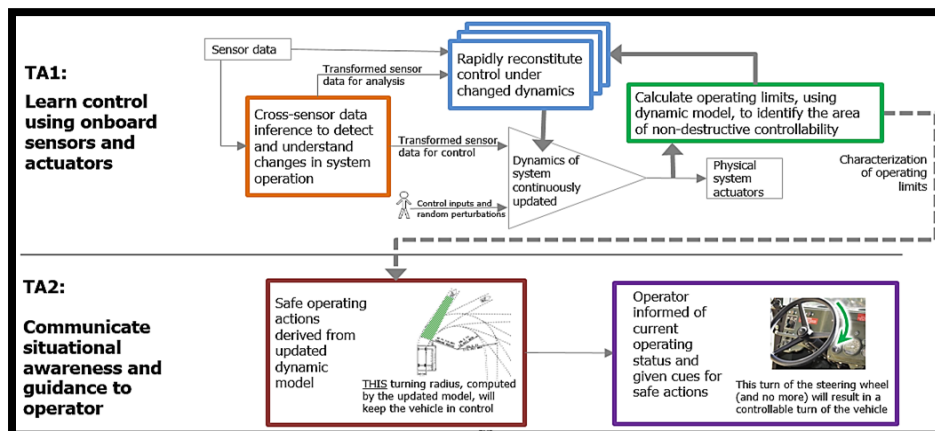
1. PROGRAM TECHNICAL AREAS

LINC has two TAs:

TA1: Learn Control Using Onboard Sensors and Actuators

TA2: Communicate Situational Awareness and Guidance to the Operator

In addition to these two TAs, Integrated Test and Development will be performed by a member of the Government Team. The graphic below depicts the activities and interactions of TA1 and TA2.



NOTE: This BAA is soliciting proposals for TA1 only. TA2 details are provided solely for informational purposes. Proposals for TA2 will be solicited under a separate BAA, approximately 12 months into the program. Integrated Test and Development will be performed by a member of the Government Team.

Detailed descriptions of the TAs are given in the sections that follow. This BAA is soliciting proposals for TA1 only. TA1 performers will begin work with Phase 0 of the program and continue into Phase 1 and Phase 2. TA2 performers will be awarded at the start of Phase 1 following the issuance of a second LINC BAA. A member of the Government Team will carry out Integrated Test and Development. Information on TA2 and the Government Team is included here to provide necessary context for TA1 proposers.

TA1: Learn Control Using Onboard Sensors and Actuators

When a physical system becomes unstable, due, for example, to damage or modification to the system, the algorithms that govern its control system are no longer valid and need to be modified to account for the change to the physical system. Vehicle examples might include a tire puncture (damage) or the addition of a radar dish to the top of the vehicle (modification).

TA1 will create new control regimes using onboard sensors. The regimes should be able to perform cross-sensor data inference to characterize changes in system operation, rapidly prune solution spaces to reconstitute control under changed dynamics, and identify an area of non-destructive controllability by continually recalculating operating limits.

TA1 proposals should provide significant innovations that address the following key concerns:

State-of-the-art (SOTA) algorithms are not robust to unknown or unstructured parameter uncertainty. Operating requirements can cause operators to exceed published limits. When this occurs, unexpected changes in behavior can emerge, frustrating efforts to control the system. An example is a very large and long ship in a channel encountering a heavy cross-wind. To maintain steerage, the harbor pilot accelerates, causing Bernoulli boundary effects to strongly pull the ship to one side. The pilot attempts correction, but the boundary effect is asymmetric and flips in mid-channel. The asymmetric command authority was unanticipated by the ship's architect, and pilot-induced oscillation causes the ship to ground, blocking the channel. The dynamic model of the plant needs to be continuously updated to inform the reconstitution of control.

In a complex system, rapid convergence to a common solution shared by all elements in the system is difficult and may not guarantee safe operation. For example, in a drone swarm, changes in operating characteristics caused by age or damage can affect behavior and must be incorporated into swarm operation. SOTA approaches, such as time-critical cooperative control of autonomous systems and iterative trial-and-error driven by genetic algorithms, use hypothesis-generation and branch-testing methods and fail to converge rapidly from a broad range of initial conditions. In a complex system, lack of common bounds and aligned objective functions lead to non-convergence. An alternative is to settle for a worst-case implementation, which can lead to partial limited control range or to divergent solutions in which the systems will "buck" each other. Detecting changes in capability can allow a drone swarm to uniformly adapt to changes.

SOTA uses fixed assumptions about the operating model, which is a model of the actual physical response of the platform or system to environmental and control-actuator inputs. Dynamic state and parameter estimation using Kalman filters and queueing theory with slack-based control depend on models that contain fixed assumptions. The assumptions are valid at design time, but field operation may differ radically. For adaptive Kalman filters, the range of adaptation is limited. When systems rely on fixed assumptions about the range of system dynamics, sensor data may be misinterpreted. Another SOTA example is Model Reference Adaptive Control, in which adaptation is slow and is indifferent to system fault or sensor fault. If a sensor fault occurs, then the resulting control adaptation can lead to system damage.

A successful proposal will address all three of these areas: cross-sensor data inference, reconstitution of control under changed dynamics, and calculation of dynamic operating limits.

Cross-Sensor Data Inference involves inferring unanticipated changes to system operation. The average new vehicle has several hundred sensors, which gather extensive data about the physical world, allowing formulation of a complex and detailed world view that provides ample information for adaptation. LINC will develop algorithms that adapt to changes unforeseen at design time by using multiple onboard models to explore, characterize, and evaluate alternative interpretations of sensor data.

A successful proposal will leverage multiple SOTA techniques, which may include but are not limited to, dimensionality reduction through parametric analysis, game physics engines, mechanical digital twins, lightweight pre-trained time-sliced computation, reentrant models, and pre-trained neural networks.

Reconstitute Control Under Changed Dynamics entails learning of physical system changes (e.g., a drone damaged by bird strike) and adapting system operation to respond to the problem. Some current approaches build a custom system that reasons across the entire plant, but the National Aeronautics and Space Administration found this method resulted in developer cognitive overload due to complexity of system integrations, leading to suboptimal decisions and errors. A successful proposal will explain the process for learning normal operation of a system and then sensing real-time changes in system dynamics. Learned behavior and cross-checking are used to normalize data and provide accurate information to the control system.

Proposers may use multiple methods to develop algorithms that converge quickly and produce a safe path. Example approaches may include, but are not limited to, reducing operating dimensionality through automatic parametric analysis and lightweight pre-trained neural networks that provide a collection of pre-solved starting points.

Calculate Dynamic Operating Limits includes observing changes in performance and exploring alternative models, after systems have been damaged or have undergone field modifications. To move through alternate control models, sets of adversarial networks can rapidly challenge and discard non-working control models, quickly reducing the exploration space for a new dynamic model. LINC would use the newly-learned dynamic model to restore control.

In a related approach, multiple physics models can explore the effects of changes not anticipated at design time. Examples include a ground vehicle to which armor or a roof-mounted antenna has been added. When an asymmetric load such as a dish antenna is added to a truck bed, the change in Center of Gravity (CG) and the change in wind-loading can make the truck unstable to the point of tipping over. If a large rotating antenna or sensor platform is added to a truck, the rotating load represents a new set of parameters and parameter uncertainty. The movement of the antenna and the wind loading of the antenna introduce additional periodic and stochastic energy injections to the system. In the Suez Canal ship example, use of a physics model would have included adding terms for the Bernoulli effects to the nominal laminar flow model.

A successful proposal will address the limitations associated with having fixed assumptions underlying the operating model, thus allowing quick exploration of the operating space and rapid identification of the area of non-destructive controllability. Use of multiple physics models, coupled with quick test and abandonment, reduces the computing load to fit within platform Size, Weight, and Power (SWAP).

TA1 proposals must encompass all 3 Phases, with Phases 1 and 2 proposed as separately-priced options.

A successful TA1 proposal will show how the Government-Furnished Equipment (GFE) development system in each phase will adapt its operation to continue functioning under a range of circumstances. The GFE development system for Phase 0 is planned to be an Army Ground Vehicle Robot (GVR-BOT), which is derived from the iRobot PackBot. The GVR-BOT system may take advantage of a remote 24-core processor. The GVR-BOT also may be augmented with a performer-provided smartphone, whose sensors and processing may be used. During exercises and tests, the development system will be operated remotely by the TA1 performer. The performer will run the system over a course that includes turns and rising and falling terrain. Prior to each exercise, the precise course dimensions and bounds on terrain change will be provided. For planning purposes, expect the exercise area to be approximately 10 meters by 20 meters and to include up-to-30% grades both up and down and repeated right and left tilt of up to 35 degrees, with varying surfaces, such as sand, dirt, gravel, and tarmac. TA1 proposers should explain how they will prepare for the exercises and tests and may want to consider including real-world testing as part of their development environment. To avoid training to the course, the details of the test environment will be released shortly before exercises.

For the test at the end of each phase, performers will travel to a DARPA-provided test site, which may contain challenges beyond those used in the exercises. The tests will be conducted on the Government Team's development system. In the Phase 0 and Phase 1 tests, TA1 performers should plan to bring only software, any added sensors, and the smartphone-based augmentation.

TA2: Communicate Situational Awareness and Guidance to the Operator

NOTE: This BAA is soliciting proposals for TA1 only. TA2 details are provided solely for informational purposes. Proposals for TA2 will be solicited under a separate BAA, approximately 12 months into the program. Integrated Test and Development will be performed by a member of the Government Team.

As stated previously, this BAA is soliciting proposals for TA1 only. The following TA2 details are provided for informational purposes only. The TA2 BAA will be open to all performers except the Integrated Test and Development team. **TA2 may be modified based on the results of Phase 0 research.**

An operator of a physical system (human or autonomous) engages in multiple types of mental activity, ranging, for example, from deciding what route to take to determining how to safely execute a turn. Changes in system behavior and response to operator input must be communicated to the operator in a concise, usable form. TA2 will develop technologies to provide guidance and operating cues that convey details about the new control environment and its safety limitations. This information is necessary to maintain operator trust, which is based on anticipating operator needs and communicating risk, informing the operator of the changing dynamics of the physical system, and cueing operator actions using a learned model of operator behavior.

TA2 proposals should address the following technical concerns:

Operator trust is lost when options are not provided, leading to intuitive and often incorrect actions. SOTA examples include ecological interface design and deep learning, in which guidance to operators is not explained, and the guidance keeps changing, so operators begin to lose confidence in the guidance provided. System diagnostic displays are designed to support repair of complex dynamic systems, not to guide the operator. Therefore, these displays require interpretation by the operator, which increases cognitive load and can lead to misunderstanding and confusion. Conventional display or driver alerts are predesigned for specific tasks and environments. In a modified vehicle, confusing guidance, even if it is technically correct, either misleads the driver or is ignored, resulting in accidents.

Operators are not informed about situation-specific operating limits. In a recent shipping incident, corrective action was made more difficult by the interaction between ship and harbor. The vessel's SOTA displays provided no cueing for corrective action. Rather, they were conventional interfaces and tailored displays, which use predefined representations for changing information. Predefined representations make it difficult or impossible to portray changes in system dynamics; it is up to the operator to infer them. The need for explainable AI is typically traced to the requirement for humans to understand why an Artificial Intelligence (AI)/Machine Learning (ML) system makes the decisions it does. What is lacking in such a system is dynamic generation of options for action.

A successful proposal will address these two areas:

Produce Viable Control Options for the operator involves calculating viable control options under current circumstances, based on TA1's new control regime. LINC will inform the operator of changes in system limitations, so that the operator, human or machine, can use the changed system to the limits of its abilities and continue operation uninterrupted by damage. LINC's display and cueing system will continuously inform the operator of the status of LINC's ability to understand what is occurring, as well as providing information on what actions will keep the

system in a safe operating environment. This will anchor operator situational awareness and enable it to be regained after unanticipated system-changing events.

Operator trust is retained by providing actionable options. This will be accomplished by translating a dynamic model of operating limits into acceptable operator inputs. This informs the operator that a change has taken place and that new guidance is based on an updated system model. It also provides assurance that the suggested safe operating actions have been derived from up-to-date dynamic models.

Create Means to Inform Operator of Options, Accurately, Quickly, and Clearly, entails taking the system's new dynamics and translating it into situation-specific status updates and operator cues for safe actions. Options are communicated based on real-time changing control limits. Operator trust is enhanced when actionable options are clearly grounded in the context of the current situation. LINC will provide the operator with situation-specific cues that are based on the current circumstances; for example, the operator may be informed that turning the steering wheel 90 degrees will result in a controllable turn of the vehicle being driven.

TA1-TA2 Interaction

A key component of the program is the capability for TA1 to communicate an accurate and concise representation of the system (a model) to TA2. This model represents the learned dynamics of the system. While some information will be system-specific, a key goal of the program is to develop a simple Application Program Interface (API) to facilitate the transmission of dynamic models and control limits, as learned and created by TA1 to TA2. This API should be flexible and easily adapted to multiple platforms.

Integrated Test and Development

A member of the Government Team will develop an Integrated Test and Development environment that increases fidelity, leading to transition. In Phase 0, the planned test system is a GVR-BOT, based on an iRobot PackBot, with multiple sensors that can be selectively modified to challenge PackBot control and operation. The U.S. Army Ground Vehicle Systems Center (GVSC), another member of the Government Team, will supply the GVR-BOTs. In Phase 1, a more complex system will be used, such as a light pick-up truck. In all phases, the Government Team will provide a set of challenge problems for performers to execute that will address the metrics given in each BAA. The platform selected for Phase 1 will be identified during Phase 0. A representative system would be an electric pick-up truck with a large water container in its bed. Phase 2 development will be on a DoD-relevant system of similar complexity to the Phase 1 system. Phase 2 requires sufficient speed to be relevant to the operation of the system in realistic conditions, as outlined in the program metrics.

Throughout all three program phases, the Government Team member executing the Integrated Test and Development task will be responsible for hosting and conducting the program exercises and tests to verify performance with respect to program metrics under variable and diverse terrain characteristics. The Government Team member executing the Integrated Test and Development task will be responsible for providing exercise and test locations.

Prior to each exercise, the Government Team member executing the Integrated Test and Development task will provide precise course dimensions and bounds on terrain change to TA1 and TA2 performers. Plans for the end-of-phase tests will be developed by the Government Team, and the tests will be conducted at a DARPA-provided site. Unlike the exercises, end-of-phase tests will *not* provide course dimensions and terrain characteristics to TA1 and TA2. Exercises will be conducted on each performer's development system or on the Government Team's development system, and end-of-phase tests will be conducted on the Government Team's development system. For Phase 0, TA1 performers may bring software, sensors available from the PackBot manufacturer (FLIR), and smartphone-based augmentation to end-of-phase tests.

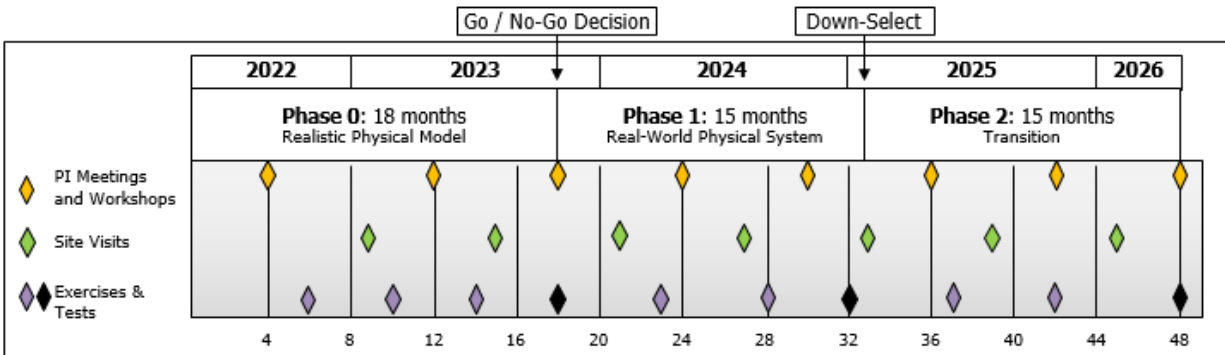
Successful execution of exercises and tests will require the Government Team member executing the Integrated Test and Development task to have a deep understanding of each of the TA1 and TA2 technical approaches. This deep understanding will inform the design of exercises and end-of-phase tests that will stress performer systems in a manner that yields useful feedback. That Government Team member also will be responsible for the collection, logging, review, and analysis of all test artifacts. Within 30 calendar days after each exercise and test, the Government Team member will publish performance results with respect to program metrics and will work with DARPA to develop improvements for future exercises and tests.

Additional responsibilities of the Government Team member executing the Integrated Test and Development task include providing an environment that enables real-time development for TA1 and TA2, and providing a collaboration environment with relevant APIs and system-level tools, so as to avoid duplication and inconsistency among performers. The APIs will provide high-speed communications between TA1 and TA2 for systems status, changes in control laws, and derived physical models, in addition to other critical information identified by the program.

2. PROGRAM PHASES

LINC is being planned as a 48-month, 3-phase program. Phase 0 lasts for 18 months, and Phases 1 and 2 are each 15 months long. Phase 0 will be a TA1-only effort to demonstrate the feasibility of learning control from introspective analysis of on-board sensor data. Multiple awards are anticipated for TA1. At the end of Phase 0, performers must demonstrate creation of a dynamic model of the system under test (an Army GVR-BOT, which is a modified iRobot PackBot) and maintain control under circumstances that would otherwise cause the system to fail.

The GVR-BOT is a common military robot platform, with over 2,000 procured by the U.S. military. It has been extensively enhanced and modified for multiple missions. Successful demonstration of this model will be used as justification to continue with the program. As part of TA1, the API used to communicate the dynamic model and control information to TA2 is expected to be delivered by month 10 to ensure that it is available for the TA2 solicitation. Information on TA2 is included in this BAA to provide context for TA1 proposers.



Principal Investigator (PI) meetings are planned for M4 and M12, and every 6 months thereafter during contract performance. Site visits are planned for every 6 months, beginning in month 9, alternating with PI meetings.

Exercises are planned for months 6, 10, 14, 23, 28, 37, and 42. Tests are planned for months 18, 32, and 48.

Proposers to TA1 Phase 0 must include separately-priced options for continuing work under Phases 1 and 2. Options may be exercised, at the Government's sole discretion, based on technical progress measured against the metrics and milestones defined in this BAA and the availability of funding. It is expected that TA2 efforts will begin at the start of Phase 1, with a down-select planned at the end of Phase 1.

Each phase of the program will consist of exercises and end-of-phase tests. Exercises are expected to last 3.5 days, with platform setup on the first day and an exercise debrief at the end by the Government Team member executing the Integrated Test and Development task. Tests are expected to last four (4) days, with platform setup on the first day and a test debrief at the end by the Government Team member executing the Integrated Test and Development task. Performers should bring any add-on system devices to the events and be able to install them during the setup period.

Phase 0

Three exercises are planned for Phase 0, each intended to demonstrate increasing speed and capability in the automated development of dynamic models plus control law. Phase 0 will conclude with an end-of-phase test to demonstrate that Phase 0 metrics have been met. The GFE development system for Phase 0 is planned to be an Army GVR-BOT, which is derived from the iRobot PackBot, and will be furnished as GFE to each TA1 performer. The only TA1 hardware modifications permitted are additions to the PackBot of a smartphone and PackBot sensors available from FLIR Systems, Inc. These additions must be easily removable and easy to transport to exercises and test locations.

To evaluate the performance of LINC techniques, the effects of battle damage and field modifications will be simulated during exercises through the introduction of a variety of hindrances developed by the Government Team member executing the Integrated Test and Development task. These hindrances, which can change during the exercise, may include asymmetric loads, unsure footing, non-linear dynamic loads, changes in gain for actuators, loss of individual sensors, and off-axis loading. The system should sense these changes and moderate controls as needed to allow uninterrupted operation of the robot. The interior behavior of dynamic loads will not be visible, so performers should not use machine vision to judge the state of the system. The systems will be operated by TA1 performers during the exercises. Evaluations will be based on time to complete the trials and the number of upsets or failures that occur.

Computing for Phase 0 exercises and the end-of-phase test may take place on local or remote resources. A radio link such as Wi-Fi will be provided for communications with the GVR-BOT. A GFE remote computing platform will be available for the exercises to support the computations. Please see metrics in Section I.C below for processing capabilities by phase. A successful TA1 proposal will address providing an API to support TA2.

Phase 1

Three exercises are planned for Phase 1, each intended to demonstrate (1) increasing speed and capability in the automated development of dynamic models; (2) control law adaptations leading to operator actions that keep the system operational under adverse events; and (3) integration with an operator cueing system. In Phase 1, the envelope of feasible operations will change during the exercise, and the development system, provided as GFE, will be more complex than the GVR-BOT used in Phase 0. A representative Phase 1 system would be an electric pick-up truck with a large water container in its bed. The computing resources are expected to be a cell phone and on-board computing only (rather than radio-linked remote computing). The operator will be a human sending commands over a radio link. TA2 will provide a means of cueing and updating the operator as to changes in the system. A down-select is expected to occur at the end of Phase 1 at the Government's sole discretion.

Phase 2

Phase 2 development will be on a DoD-relevant system of similar complexity to the Phase 1 system.

Phase 2 requires a LINC system capable of speeds high enough to be relevant to use the operational system in realistic conditions, as outlined in the program metrics. Any integration required will use standard connections. For planning purposes, consider a system using a Controller Area Network (CAN Bus) ISO 11898 and On-board diagnostics (OBD-II) interfaces. Substantial power and computing resources will be available on-board. This may be supplemented by additional computing in the 8-16 core server class. Additional training environments may be available using high-fidelity digital twins. The operator may be human or an autonomous system. The API developed earlier in the program will supply the information needed for TA2 to guide and cue the operator. The development system will be selected in cooperation with Army Combat Capabilities Development Command (DEVCOM) and the U.S. Navy.

C. Program Metrics

Program performance metrics by Phase for each TA are shown in the table below. These metrics will be used by the Government when making program decisions as well as decisions regarding the exercise of individual performer contract options.

| | Metrics | Phase 0 (Realistic Physical Model) Single Crippling Event ¹ 24 cores, 100GB ~4.5kJ | Phase 1 (Real-World Physical System) Series of Crippling Events ¹ 4 cores, 16 GB ~45J | | Phase 2 (Transition System) Indigenous Computing |
|-----|--|--|--|--|---|
| TA1 | Time to reconstitute control | 5 minutes for demonstration physical model ² 10 ³ improvement over current practice | 10 seconds for real-world physical system 10 ² improvement over Phase 0 | | Control is restored without pausing system |
| | Safe and continuing operation | Continued, non-destructive operation for 10 minutes | Completes 30-minute exercise challenge without damage or harm to the system | | Anticipates and responds to changing circumstances without causing damage |
| | Increasing complexity | Operates with static load | Operates with changing environment (e.g., water or land) | Operates with dynamic load, which changes envelope | Operates with changing dynamic loads |
| TA2 | Retain operator trust by providing options | [Starts in Phase 1] | A cue correctly alerts the operator to a change in the system; the safe envelope is communicated, for multiple sequential changes in the system; and the cue is used 80% of the time | | The operator is notified of changes to the system caused by dynamic loads, and that information is used by the operator |
| | Inform operator of situation-specific operating limits | [Starts in Phase 1] | The operator stays in control while encountering unexpected circumstances, based on cues provided by the system | | Safe operating is maintained across complex changes to the system, permitting continued operation |

¹ Event(s) that would cripple a system through physical or cyber-physical means. Compute can be done telematically.

² Current time to reconstitute control for a hexapod robot is days. Five minutes represents a 10³ improvement.

D. Government-furnished Property/Equipment/Information

The Government anticipates providing hardware platforms for exercises and tests.

The development platform for Phase 0 will be the GVR-BOT Gen 2.0, which is a modified iRobot PackBot. This teleoperated robot is small and easy to transport. Weighing 24 pounds without batteries, its deck is seven inches high, 27 inches long and 20 inches wide. It can move at speeds of almost 6 mph, and its batteries enable four hours of continuous operation with up to

10 miles of travel on one charge. This robot includes Global Positioning System (GPS), accelerometers, and an inclinometer among its sensors.

Effects of field modifications will be approximated by affixing a water tank to the top of the GVR-BOT. The tank will have a remotely-operated valve that allows remote draining of water from the tank. In addition, some sensors, such as motor tachometers, may be turned off, in order to require inference across data from multiple sensors.

Remote computing capability for the exercises and tests will be provided by the Government and can be accessed remotely by the performers prior to the exercises and tests.

Key features of the GVR-BOT are described in the following table:

| GVR-BOT Feature | Feature Details |
|--|---|
| Weight (without batteries and flippers): | 9.07kg (20 lbs) |
| Size: | 68.0 X 40.5 X 18.0 cm (26.8 X 15.9 X 7.1 in) |
| Tracked Flippers: | 1.0 kg each (2.2 lbs) |
| Untracked Flippers: | 0.4 kg (0.9 lbs) each |
| Top Speed: | 2.0 m/s (4.5 mph) |
| Ambient Temperature Range: | -20 to +50 C (-4 to +122 F) |
| Main processor: | Nvidia TX2 PN: 900-83310-0001-000 Specifications: <ul style="list-style-type: none"> • Dual-Core NVIDIA Denver 2 64-Bit CPU, 2.0GHz • Quad-Core ARM® Cortex®-A57 MPCore, 2.0GHz • 256 CUDA cores • 8GB 128-bit LPDDR4 Memory • 32GB eMMC 5.1 Storage + additional 32 GB SD card • 7.5W (MAXQ power mode)/ 15W (MAXN power mode) |
| Robot Power | <ul style="list-style-type: none"> • Up to four BB-2590 Li-Ion batteries (requires one battery cradle per two batteries) • Base chassis consumes approximately 30 Watts when powered up and stationary |
| Payloads | <p>Four payload ports</p> <ul style="list-style-type: none"> • Three payload bays can physically contain existing, modified PackBot 510 payload tub-sized modules • Mounting rails for the fourth payload bay can be installed above the Front Electrical Housing (not included), if an IOP Mounting Plate is not installed |
| Communications | <ul style="list-style-type: none"> • Communicates with any Wi-Fi enabled computer at 2.4 GHz frequency • Maximum communications range is ~100m |
| Software Interface | Designed to meet the IOP V1 standard, internally (between components) and externally (to OCU) and ROS (Robotic Operating System) 1 (Melodic). The operating system of the robot is Ubuntu Linux 18.04 |
| Sensors | Internal IMU (9DOF) provides 3-axis accelerometer, 3-axis gyro, 3-axis magnetometer heading, and orientation information |

| GVR-BOT Feature | Feature Details |
|-----------------|--|
| | <ul style="list-style-type: none"> • Internal GPS Transceiver with external antenna port – a SMA Jack connection is needed to attach an active 3.3V antenna (not included) • Internal Real Time Clock (RTC) keeps time synchronization after shutdown of the robot for ~72 hours if no batteries are installed |

The GVR-BOT Gen 2.0 supports two interfaces, and either may be selected by the performer: IOP (Interoperability Profile) v1 and ROS (Robotic Operating System) 1 (Melodic). The operating system of the robot is Ubuntu Linux 18.04. Please refer to the GVR-BOT Gen 2.0 User’s Guide [https://www.schafertmd.com/DARPA/I2O/LINC/PD/content/downloads/GVR-BOT2.0_Users_Guide_V01.11.pdf] for additional details.

The GVR-BOT Gen 2.0 is a modified iRobot PackBot. The Phase 0 development platform is a modified GVR-BOT Gen 2.0. Details on the modifications may be found in the section on Integrated Test and Development.

See <http://wiki.ros.org/> for additional resources for the ROS interface, including libraries, tutorials, software packages, and publications.

See <https://www.flir.com/products/PackBot/> for additional information about the PackBot system.

The GVR-BOT hardware, including batteries, chargers, a laptop for operator control, and a GPS antenna will be provided as GFE to each LINC team.

The following optional hardware may be purchased and integrated by the performer:

- Additional sensors available from the PackBot manufacturer, FLIR
- An Android cell phone as an additional sensor platform

Purchase of additional equipment, power and mounting equipment, for the GVR-BOT is allowable. A cell phone (for additional sensors and computing) is also allowable. For purchasing additional equipment or the GVR-BOT and specifications, refer to the Army GVR-BOT Gen 2.0 User’s Guide: https://www.schafertmd.com/DARPA/I2O/LINC/PD/content/downloads/GVR-BOT2.0_Users_Guide_V01.11.pdf. For pricing details, please contact Bren-tronics, Inc., at <https://www.bren-tronics.com/>.

A. Intellectual Property

The program 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 establish an open, standards-based, multi-source, plug-and-play

architecture that allows for interoperability and integration. This includes the ability to easily add, remove, substitute, and modify software and hardware components. This will facilitate rapid innovation by providing a base for future users or developers of program technologies and deliverables. This includes the ability to easily add, remove, substitute, and modify software and hardware components. This will facilitate rapid innovation by providing a base for future users or developers of program technologies and deliverables. Therefore, it is desired that all noncommercial software (including source code), software documentation, hardware designs and documentation, and technical data generated by the program be provided as deliverables to the Government, with a minimum of Government Purpose Rights (GPR), as lesser rights may adversely impact the lifecycle costs of affected items, components, or processes.

The operating platforms and transition platforms may contain proprietary intellectual property that would be shared with LINC performers. Performers will be required to sign associate contractor agreements to protect this information and to use the information only for LINC research.

To facilitate the exchanging of ideas, sharing of research, and management of the program, performers must be able to provide a video teleconference capability, such as Zoom or Microsoft Teams, that can support Controlled Unclassified Information (CUI) in accordance with National Institute of Standard and Technology (NIST) SP 800-171. Performers should expect to host at least one demonstration at their facility; the facility must have the capability to hold up to 20 people. Some of the participants may be non-US persons.

Deliverables and work products submitted to DARPA by TA1 and TA2 performers must contain no material subject to any restrictions, including but not limited to International Traffic in Arms Regulations (ITAR), and Export Administration Regulations (EAR).

The events at the exercises and tests may be recorded and the recordings released publicly.

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.

There will be an end-of-phase test at the conclusion of Phase 0 to demonstrate the feasibility and utility of the LINC technology. Successful completion of the test is required for the program to continue to Phase 1. TA2 will be competed in a separate solicitation.

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. If warranted, portions of resulting awards may be segregated into pre-priced options. 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 fund proposals in phases with options for continued work, as applicable.

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, 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.

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

Members of the Government Team executing the Integrated Test and Development effort may not propose to or team with potential performers on TA1 or TA2.

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, contact the BAA Coordinator listed herein.

B. Content and Form of Application Submission

All submissions, including abstracts and proposals must be written in English, using Times New Roman 12-point font, with page margins not smaller than one inch. 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. Abstracts should follow the same general format as described for proposals (see Section IV.B.2., “Proposals Format”) but include ONLY Sections I and II of Volume I, Technical and Management Proposal. The cover sheet should be clearly marked “ABSTRACT,” and the total length should not exceed four pages. The maximum pages count excludes the cover page in Volume I, Technical and Management Proposal, Section I, and official transmittal letter but does include any figures, tables, and charts. Official transmittal letter is not required.

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. Volume I is limited to 29 pages. Bracketed numbers before each section denote recommended page limits.

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 (HR001121S0036)
 - (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. {5} Technical rationale, technical approach, and constructive plan for accomplishment of technical goals in support of innovative claims and deliverable creation. (In the full proposal, this section should be supplemented by a more detailed plan in Section III of the Technical and Management Proposal.)
- B. {5} 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. {2} 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 I.E of this BAA. There will be no page limit for the listed forms.
- D. {2} General discussion of other research in this area.
- E. {1} 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 of your full proposal. 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. {2} 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: It is recommended that 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. {2} 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 I.E of this BAA., “Intellectual Property.”
- C. {5} Detailed technical approach enhancing and completing that the Summary of Proposal.
- D. {1} Comparison with other ongoing research indicating advantages and disadvantages of the proposed effort.
- E. {1} Discussion of proposer’s previous accomplishments and work in closely related research areas.
- F. {1} Description of Security Management architecture and/or approach for the proposed effort. Detail unique additional security requirements information system certification expertise for CUI or classified processing, Operation Security (OPSEC), program protection planning, test planning, transportation plans, work being performed at different classification levels, and/or utilizing test equipment not approved at appropriate classification level (may not be applicable for fundamental research).
- G. {1} Description of the facilities that would be used for the proposed effort.
- I. {1} Description of milestones, cost, and accomplishments.

b) Volume II, Cost Proposal

All proposers, including FFRDCs, must submit the following:

1. Cover sheet to include:
 - (1) BAA number (HR001121S0036);
 - (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 FAR-based procurement contract (specify), cooperative agreement, or Other Transaction;

(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; 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 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)/Agreements Officer (AO), 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 subawardee should be submitted electronically to LINC@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/AO as is required of the awardee. See Section IV.B.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 Part II Section VIII 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.

(d) Unclassified Submissions

DARPA anticipates that submissions received under this BAA will be unclassified. However, should a proposer wish to submit classified information, an unclassified email must be sent to the BAA mailbox requesting submission instructions from the Technical Office Program Security Officer (PSO). If a determination is made that the award instrument may result in access to classified information, a Security Classification Guide (SCG) and/or DD Form 254 will be issued by DARPA and attached as part of the award.

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/reprs-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 an 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) 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 Cooperative Agreement, Technology Investment 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.”

j) 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.

4. Submission Information

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 HR001121S0036. 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.

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

The proposal must be received via DARPA's BAA Website (<https://baa.darpa.mil>) on or before, October 26, 2021, 1700 Eastern Time, in order to be considered during the initial round of

selections; however, proposals 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>). Proposals submitted after the due date specified in the BAA or due date otherwise specified by DARPA may be selected. Proposers are warned that the likelihood of available funding is greatly reduced for proposals submitted after the initial closing date deadline.

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.

Unclassified full proposals sent in response to this BAA shall 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, and is typically available during regular business hours, Eastern Time.

(1) For Proposers Requesting Cooperative Agreements

Proposers requesting 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. 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: Research and Related Senior/Key Person Profile (Expanded), available on the Grants.gov website at https://apply07.grants.gov/apply/forms/sample/RR_KeyPersonExpanded_2_0-V2.0.pdf. This form must be completed and submitted.

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

- Degree Type and Degree Year.
- Current and Pending Support, including:
 - 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. 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.

(2) For Proposers Requesting Technology Investment Agreements

Proposers requesting Technology Investment Agreements (TIA) awarded under 10 U.S.C. 2371 must include the completed form indicated below. This requirement only applies only to those who expect to receive a TIA as their ultimate award instrument.

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 form below to collect the necessary information to satisfy these requirements.

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_2_0-V2.0.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:

- Degree Type and Degree Year.
- Current and Pending Support, including:
 - 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.

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

Refer to Section IV.B.4.b for proposal submission instructions.

5. Funding Restrictions

Pre-award costs will not be reimbursed unless a pre-award cost agreement is negotiated prior to award.

6. Other Submission Requirements

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 HR001121S0036 summary will be a link to the FAQ. Submit your question/s by E-mail to LINC@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 technical team has the expertise and experience to accomplish the proposed tasks. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final outcome that achieves

the goal can be expected as a result of award. The proposal identifies major technical risks and planned mitigation efforts are clearly defined and feasible. The portability and universality of the approach to learned adaptive control will be considered in evaluating the technical merit of the solution.

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.C. 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.

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).

It is expected that the effort will leverage all available relevant prior research in order to obtain the maximum benefit from the available funding. For efforts with a likelihood of commercial application, appropriate direct cost sharing may be a positive factor in the evaluation. 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.

4. Plans and Capability to Accomplish Technology Transition

The proposer clearly demonstrates its capability to transition the technology to the research, industrial, and/or operational military communities in such a way as to enhance U.S. defense. In addition, the evaluation will take into consideration the extent to which the proposed intellectual

property (IP) rights structure will potentially impact the Government's ability to transition the technology.

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.

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 personnel are required to attend. Performers should also anticipate regular program-wide PI Meetings and periodic site visits at the Program Manager's discretion. Meetings may be physical or virtual. PI meetings may be co-incident with exercises.

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

Monthly status reports containing technical progress and financial updates will be required. The number and types of reports will be specified in the award document, but at a minimum will include monthly technical and financial status reports. The reports will be prepared and submitted in accordance with the procedures contained in the award document and will be 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 Entrepreneur 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 to 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 Transition Working Groups; and (3) Additional funding for awardees to hire an embedded entrepreneur to achieve specific commercialization milestones and work towards the delivery of a robust transition plan for 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 concurrent 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 Program Manager (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 commercial milestones to deliver 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's Commercial Strategy team.

DARPA's Commercial Strategy team 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 LINC@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 LINC@darpa.mil.

The Technical POC for this effort is John-Francis Mergen.
DARPA/I2O
ATTN: HR001121S0036
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

Collaborative Efforts/Teaming

It is DARPA's desire to receive comprehensive, quality responses to this solicitation. To facilitate strong, collaborative teaming efforts and business relationships, a website [<https://www.schafertmd.com/darpa/i2o/LINC/pd/>] has been established. Specific content, communications, networking, and team formation are the sole responsibility of the participants. Neither DARPA nor the DoD endorses the destination web site or the information and organizations contained therein, nor does DARPA or the DoD exercise any responsibility at the destination. This website is provided consistent with the stated purpose of this solicitation.

Proposers' Day

A Proposers' Day for this effort will be held as a hybrid event on August 26, 2021, both in Arlington, VA, and virtually through Zoom. The Special Notice regarding this Proposers' Day can be found at <https://sam.gov/opp/69db6bff225344f481f229edc1e2b97a/view>.

For further information regarding the LINC Proposers' Day, including slides from the event, please see <http://www.darpa.mil/work-with-us/opportunities> under HR001121S0036.

Questions received in writing or electronically by noon on Proposers' Day will be reviewed and potentially answered on Proposers' Day. Those questions not answered on Proposers' Day will receive a response through the FAQ process. In-person attendees at Proposers' Day will have the opportunity to submit questions in writing that morning.

Associate Contractor Agreement (ACA)

This same or similar language will be included in procurement contract awards against HR001121S0036. Awards other than FAR based contracts will contain similar agreement language:

(a) It is recognized that success of the LINC research effort depends in part upon the open exchange of information between the various Associate Contractors, to include Foreign Nationals 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 LINC 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, to include selected Foreign National 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, to include selected Foreign National Contractors;
- (3) delineation of detailed interface responsibilities;
- (4) entering into a written agreement with the other Associate Contractors, to include selected Foreign National 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 LINC 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, to include selected Foreign National Contractors, a provision which shall conform substantially to the language of this ACA, including this paragraph (e).

(f) Associate Contractors for the Program Name research effort include:

| Contractor | Technical Area |
|------------|----------------|
|------------|----------------|

(g) It is expected that foreign nationals will be among the performers. All material shared under the ACA must be viewable by foreign nationals.

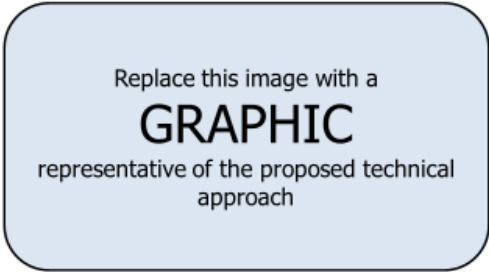
IX. APPENDIX 1 – PROPOSAL SUMMARY SLIDE



FP-001 – Prime Contractor
 PI: Title Firstname Lastname (xx% LOE)
 Subcontractors:
 Title: Proposal Title

TA#

- Summary of proposed overall technical approach:
- How does the approach address the key challenges of the program?
 - What is unique about your approach? Why will it succeed?
 - What are the limitations (if any) to your approach?
 - How will you compensate for them?



Strengths:

- Bullet
- Bullet
- Bullet
- Bullet

Technical Rationale:

- What are you trying to do? Articulate your objectives using absolutely no jargon.
- Summarize how you plan to accomplish technical goals and program metrics stated in the BAA.
- How will progress be measured?
- What are the major technical risk elements and the plan to address/mitigate them?

Team organization, milestones, schedule:

- Show the proposed team organization
- Summarize technical milestones (intermediate and end-of-phase milestones)
- Compact illustration of project schedule

| Cost Summary | Phase 0 | Phase 1 | Phase 2 | Total |
|--------------|---------|---------|---------|-------|
| Proposed | \$ | \$ | \$ | \$ |

Distribution Statement

1