
# Program Solicitation

# Biological Technologies Office (BTO)

# Organoid Cytomorphic Intelligence Resulting from Convergent Understanding and Information Transfer (O-Circuit)

# DARPA-PS-26-28

**May 1, 2026**

# PROGRAM SOLICITATION OVERVIEW INFORMATION

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Biological Technologies Office (BTO)
- **Funding Opportunity Title** – Organoid Cytomorphic Intelligence Resulting from Convergent Understanding and Information Transfer (O-Circuit)
- **Announcement Type** – Initial Announcement
- **Funding Opportunity Number** – DARPA-PS-26-28
- **Dates**
  - Posting Date: **May 1, 2026**
  - Proposer Workshop: **April 10, 2026**
  - Questions Due Date: **May 7, 2026 by 5:00 PM, Eastern Time (ET)**
  - Abstracts Due Date and Time: **May 20, 2026 by 5:00 PM (ET)**
  - Oral Proposal Package Due Date and Time: **By Government request, estimated 24 days after selection notification**
- **Summary** – The Defense Advanced Research Projects Agency (DARPA) is soliciting innovative approaches to develop a biological, converged Sense-Compute-Action system, capable of using odorant detection information to control drone navigation tasks. The O-Circuit program will have two Task Areas (TAs): development of a biological processing unit (BPU) with learning and computing memory capabilities (TA1, "Architecture"), and integration of a BPU with a biologically based odorant sensing system and a drone navigation platform (TA2, "Action"). TA1 (Architecture) will develop advanced BPU systems with the capacity to learn more complex functions and retain memory as compared to state-of-the-art neural cultures (e.g., organoid-based systems). TA2 (Action) will integrate a BPU, a biological odorant sensor array, and drone-based navigation into a Sense-Compute-Action system that will detect operationally relevant odorants (e.g., explosives precursors, chemical agent surrogates, industrial chemicals) and issue navigation commands in response to these olfactory array inputs. As a result of this solicitation DAPRA expects to receive a refined prototype protocol for creating and imprinting BPU with a Sense-Compute-Action function upon completion of Phase 2 (see chart 1.5.2 table 2.) O-Circuit is a three-phase program; only Phase 1 and Phase 2 are being solicited currently. The acquisition process for O-Circuit will proceed through a two-stage process, starting with (1) written abstracts which will inform invitations to brief (2) an Oral Proposal Package (OPP) at DARPA.
- **Anticipated Awards –** The total value for Phase 1 and 2 of this program is $36M, funding approximately five to seven awards.
- **Types of instruments that may be awarded** – Other Transaction (OT) for Prototype agreements
- **Agency Contact**

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- **Attachments**

A. Abstract Summary Slide Template
B. Abstract Template
C. Model Other Transaction (OT) Streamlined, Fixed

**PROGRAM SOLICITATION**
**Defense Advanced Research Projects Agency (DARPA)**
**Organoid Cytomorphic Intelligence Resulting from Convergent Understanding and Information Transfer (O-Circuit)**

## 1. PROGRAM INFORMATION

### 1.1. Background

Semiconductor technology currently governs computation for all forms of information management from communications, entertainment, and transportation to finances, healthcare, and energy. While semiconductor-based computation is readily deployed in well-resourced environments, it is challenged by sustained applications in low resource, field environments (i.e., 'at the edge') due to inherent power inefficiencies. This is a particular limitation for the military when operating in austere settings, especially if trying to deploy high end artificial intelligence and machine learning (AI/ML) algorithms which have high energy demands, particularly for algorithm training/learning. New physical computing architecture paradigms could fundamentally alter our ability to create more efficient computational capabilities.

In contrast to the high-power needs of semiconductor-based computing, biological computing is a basic function of living systems that has been optimized over 3.5 billion years to efficiently interrogate the environment, process information, and perform useful activities (Sense-Compute-Action). Biological neural architectures achieve their extraordinary efficiency through natural molecular parallelism, conducting trillions of biological reactions simultaneously to minimize energy usage (the human brain consumes only ~20 watts, representing orders of magnitude difference in energy requirements as compared to digital processing). In addition, biology can self-assemble, self-repair, and excels at generalizable, adaptable learning.

Neuromorphic computing attempts to emulate biological neural computations and has made impressive advances but is still limited compared to biological computation. Notably, neuromorphic computing is imperfect in how closely it can mimic neural architectures, how well the biological computations that are being emulated are understood, by challenges of scale, and by the need to embed biological functionality in nonbiological mediums. Rather than attempting to emulate neural computing *in silico*, it may be possible to directly leverage biological neurons to engineer highly energy efficient biological processing units (BPUs) for specific computational purposes.

While such BPUs for advanced computations have previously been theorized, they are becoming realizable. Significant interest in creating alternatives to animal research and building better model systems for therapeutics development and neuroscience research have motivated recent advances in neural cell culturing and more complex organoids, assembloids, and connectoids. Studies have also shown that neural cell cultures are capable of basic computational functions when given structured information as an input (e.g., playing 'Pong', classifying input patterns). However, such demonstrations have been limited to relatively simple tasks and do not retain performance over time (i.e., 'computational memory'). It is hypothesized that the low complexity of the neural cultures relative to brains of mammals or even insects may be a major impediment and, perhaps, using more biologically relevant and complex architectures in BPUs could significantly increase

their capabilities.

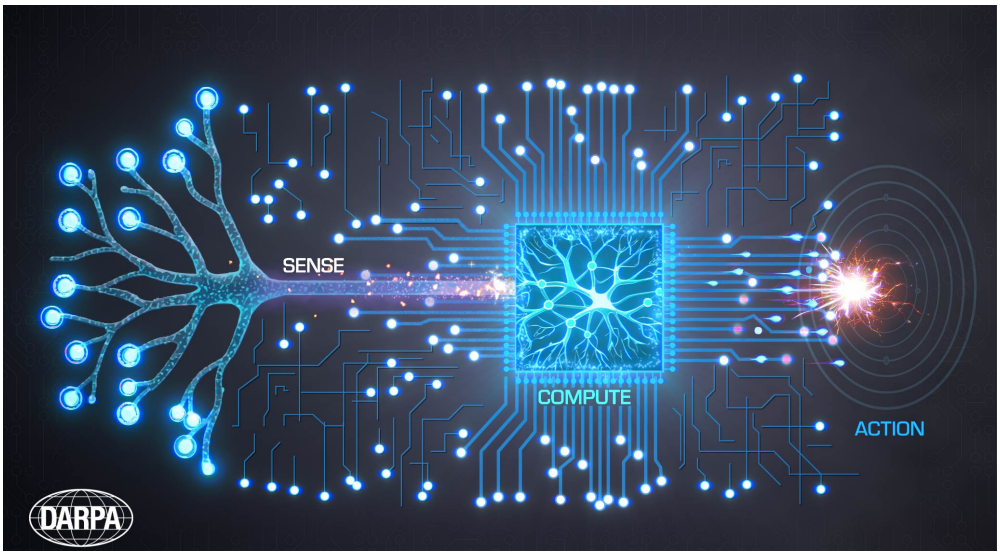
This program will create BPU architectures that are capable of learning to interact with dynamic, simulated and real-world environments, and retain this learning over multiple days. BPUs will be assessed in simulated game environments, and, when integrated with biological receptors and a drone platform, real-world environments to detect, identify, and autonomously locate volatilized chemical odorants.

This Program Solicitation (PS) calls specifically for Abstracts to be submitted by **May 20, 2026, 5:00 PM (Eastern Time)**. Abstracts will be reviewed by the Government; if selected, the proposer will be asked to provide an Oral Proposal Package. Oral Proposal Packages will be reviewed by the Government, and if selected, may result in an Other Transaction for Prototype Agreement.

This PS encourages solutions from all responsible sources capable of satisfying the Government's needs, including large and small businesses, *nontraditional defense contractors* as defined in 10 U.S.C. § 3014, and *research institutions* as defined in 15 U.S.C. § 638.

### 1.2. Program Description and Proposal Scope

The O-Circuit program is a 32 month, two-phase, effort with a notional 10-month third phase (for a total of 42 months), that seeks to build BPUs capable of learning retention and integrated Sense-Compute-Action functions. The program will enable unconventional biological computation to not only augment traditional *in silico* methods for computing and sensing, but also out-perform them in austere or electronically contested edge environments.




O-Circuit consists of two Task Areas (TA). TA1 (Architecture) will develop BPUs with advanced learning and memory capabilities and TA2 (Action) will develop a Sense-Compute-Action system that integrates BPUs with biologically based odorant sensing and drone navigation. Abstracts for TA1 and TA2 are sought in response to this PS and proposers can propose against either TA or both TAs. If proposers are proposing against both TA1 and TA2, they must submit two abstracts (one aligned to each TA). Additional details on each TA, expected proposal content, and project considerations are provided below.

### 1.2.1. Task Area 1 (TA1): Architecture

Under TA1, performers will develop novel BPUs that have the capacity to learn more complex functions and retain this learning as compared to state-of-the-art (SOA) BPU systems. Such approaches could include (but are not limited to): creating complex BPU architectures (e.g., organoids and assembloids) that integrate memory, reward, and/or learning neural circuits inspired by naturally occurring brain regions; enhancing the BPU synaptic connectivity and plasticity by optimizing cell composition and cell ratios; and tuning metabolic processes with genetic modification and/or pharmacology. BPUs will be assessed for learning and memory capabilities using a Government-provided virtual test environment similar to 'Ms. Pac-Man' (see **Section 1.5**), which has been previously validated relative to both human capabilities and conventional *in silico* machine learning algorithms. Performers may use any number of novel strategies for constructing, training, and quantifying computational learning and memory during BPU architecture development, all of which can (but do not have to) be separate from the Government Test and Evaluation (T&E) team-provided 'Ms. Pac-Man' environment. Refer to **Section 1.5** for additional details on how the Government plans to assess TA1 systems.

Proposers must clearly describe how their approach will revolutionize and improve BPU computational learning and memory. Novel ideas for creating effective BPU architectures are encouraged, with the above examples simply provided for illustrative purposes. In all cases, proposals must include clear rationales for why proposed techniques will dramatically improve BPU computational learning and memory capabilities. These rationales should include both the conceptual basis of the improvement (e.g., the cell biology and/or neural architecture that is inducing or maintaining useful plasticity and learning), as well as estimates on how much improvement may be expected from the proposed mechanisms. Proposals must also include plans for how the computational learning and memory capabilities of the BPU constructs will be characterized at the cellular and functional levels beyond the program metrics (see **Section 1.5**). Examples include how quickly one or multiple behaviors can be adopted in the test environment (e.g., one-shot or zero-shot learning feasibility, how many training samples are necessary); learning generalization between states; and direct encoding of a behavior into predetermined biological circuits versus supporting gradual reinforcing of a function into a generalized neural architecture. These examples are illustrative only and proposers are encouraged to provide novel approaches.

Proposers do not need to discuss the development of the virtual test environment itself as it will be provided by the Government T&E team (see **Section 1.8**). Proposals may include alternative environments to 'Ms. Pac-Man', but must clearly describe the benefits, and how the environment can be used to assess learning and memory capabilities using equivalent performance metrics to 'Ms. Pac-Man'. The government-selected 'Ms. Pac-Man' environment has been useful for comparing *in silico* machine learning models to human performance based on clear benchmarks (e.g., random score: ~310; average human score ~16,000 given 2 hours of training and 5 minutes./match). Additionally, the 'Ms. Pac-Man' test environment will be developed to facilitate adjustability of gameplay complexity and difficulty for exploring various training strategies. As such, there must be a very clear and strong set of justifications that lay out the advantages, as well as a clear basis for a set of metrics that are as challenging (or more challenging) than those

delineated in **Table 1**. Note that human subjects research (HSR), including collection of video game performance data, is not part of this PS and is considered out of scope.

Proposers should also consider the timelines necessary for creating and maintaining cells, organoids, and assembloid structures that enable iterative testing of BPUs. Proposals should include clear strategies, such as combinatorial and/or parallel iterating and testing approaches, that support sufficient design/build/test/learn cycles to quantify progress relative to the Phase 1 and 2 metrics (**Table 1**).

### 1.2.2. Task Area Two (TA2): Action

Under TA2, performers will develop biological wetware architectures (i.e. physical bio-computing designs) that integrate a biological odorant sensor array with a BPU to drive drone-based chemotaxis in a biological Sense-Compute-Action system. The biological odorant sensor array (e.g., using heterologous expressed olfactory receptors or olfactory receptor neurons) will be integrated with a BPU and tested against a custom panel of odorants for odorant detection capability and in-field, drone-based chemotaxis. Refer to **Section 1.5** for additional details on how the Government plans to assess TA2 systems.

Proposers are encouraged to clearly describe their strategy to construct the biological sensor array, which may include, but is not limited to, heterologous expression of olfactory receptors in BPU or bioengineered components; integration of olfactory sensory neurons or olfactory tissues into BPUs; generation of olfactory sensory organoids; and use of biology-inspired solutions for concentrating odorants at the detection interface. Other areas of exploration may include using olfactory receptors and/or olfactory organs from various species and/or developing synthetic receptors with engineered binding sites to generate arrays with suitable receptive and dynamic ranges for combinatorial coding and extensible/expandable odorant sensing capacity. The odorant sensor array must be biological in nature and must be integrated with a sufficient degree of biological processing (e.g., some form of BPU architecture) such that it can generate signatures in response to all of the different odorants (see **Section 1.5**). Proposals will thus outline approaches to connect their odorant sensor arrays to a BPU for information processing using biological integration or through an electronic interface.

Proposers are encouraged to submit novel integrated biological sensor array/BPU solutions. Proposals should provide theoretical or quantitative justification for why the proposed odorant sensor array has the potential for detecting a wide range of odorants. The proposed BPU design does not need to be advanced from SOA approaches, but proposals should outline its design and rational. Proposals should also describe how the BPU integrates with the odorant sensor array with sufficient complexity such that the BPU system can detect/read out individual odorants and navigate a drone (aerial or ground with at least 10 lb. cargo capacity) to the location of a target odorant source within a designated time window (see **Sections 1.4.1** and **1.5**). Some level of *in silico* signal processing/decoding can be used as part of the Sense-Compute-Action processing pipeline and should be specified. However, given the O-Circuit goal of maximizing the energy efficiency benefits of biological processing, proposals that *maximize biological processing* and *minimize conventional in silico computing* (for both TA1 and TA2) will be favored.

Proposals will include an exemplar list of odorants that the sensor array/BPU will be tested against,

which should represent agents from multiple chemical categories. Proposals must specify which categories they are proposing and should include 4-5 categories. Examples of different categories include, but are *not* limited to, pesticide/herbicides, industrial chemicals (e.g., chemicals commonly associated with refining plants to produce fuels, solvents, plastics, and paints/coatings), common safety items (e.g., natural gas additives), explosives precursors (e.g., 2-ethyl-1-hexanol, ammonia), environmental odorants, and food odorants. Proposers may consider including odorants that share characteristics with operationally relevant military chemicals. Note: O-Circuit is an unclassified program and proposals must be consistent with that designation. Proposals will specify a minimum of 3 exemplar odorants (single chemicals) per category. In Phase 1, the sensor array/BPU system will be required to detect 50 odorants, and in Phase 2, the systems will be required to detect 100 odorants (see **Section 1.5**). Providing the complete panel of 100 odorants is not required for the Abstract submission stage but will be a required component of the invited Oral Proposal Packages (see **Section 1.3** and **4**).

Proposals should also delineate how the odorant sensing capability will advance between phases (e.g., increasing the complexity or diversity of the odorant receptor array, greater complexity to the sensory processing, etc.). Similarly, proposals should include how the sensor array/BPU system's ability to manipulate the drone platform to better localize an odorant source will be developed and enhanced, such that it can differentiate and navigate between two different odorants in Phase 2.

Animal Subject Research (ASR) is within scope of this effort if strategies involve the acquisition and use of relevant biological materials. Proposers planning to conduct ASR must plan for initial approvals of experimental protocols by their Institutional Animal Care and Use Committee (IACUC) and secondary review by the U.S. Army Medical Research and Development Command's (USAMRDC) Animal Care and Use Review Office (ACURO). No ASR can begin prior to ACURO approval. Please note recent updates to the National Defense Authorization Act (NDAA) regarding limits on painful research involving domestic dogs and cats (FY26 NDAA SEC. 732). More information about DARPA regulations on ASR can be found at:

https://www.darpa.mil/policies/human-animal-research.

### 1.2.3. Additional Scoping Considerations / Areas to Avoid

Areas of research and approach features specifically not of interest under O-Circuit include:

- Biological processing approaches that are not centered around neural tissue (e.g., DNA computation, bacterial computation)
- Approaches that are focused on developing methods of computing that are based on/inspired by biology, but are implemented *in silico* (e.g., neuromorphic computing, memristor chips)
- Proposals in which the primary focus is on advancing neural culture interface infrastructure for its own sake (e.g., novel multielectrode arrays/MEAs, advanced organoid microfluidics) without clear rationale, testing and demonstrations that such designs will dramatically improve BPU computational learning or memory capabilities

- Proposals in which the primary focus is on advancing cellular support infrastructure (e.g., microfluidics). With that said, some work dedicated to modifying and/or advancing such technology to accomplish specific computation goals can be in scope (e.g., ensuring microfluidics are capable of supporting a chemical reward function for learning, or ensuring sufficient nutrients are available to an organoid BPU that is larger or more complex than what SOA systems can support), so long as such development is critical to support the computation capabilities that are the central focus of the proposal
- Similarly, proposals that are primarily focused on non-biological hardware research and development for the drone and sensor goals of TA2 are out of scope. While physical hardware will be necessary to achieve TA2 objectives, proposers are encouraged to leverage preexisting drone and drone navigation systems. Some degree of hardware modification and advancement may be acceptable, if this work improves integration of the hardware and wetware systems
- For TA2, approaches where the biological sensor array is not signaling through the BPU
- Approaches that leverage *in vivo* neural processing in animals or insects to accomplish computational tasks (e.g., biobot-based approaches, real-time interfacing with behaving rodents)
- Basic science research exclusively focused on advancing our understanding of neural computation

### 1.3. Acquisition Strategy

The Government's aim is to lower the administrative burden to entry, reduce program risk, foster competition, and accelerate the initiation of performer work. To facilitate this objective, the Government will use the following acquisition process for O-Circuit:

1. **Abstracts:** Through this solicitation, the Government requests each proposer to submit an Abstract (see **Section 4.2** for additional instructions) in response to either TA1, TA2, or both TAs. If a proposer is responding to both TAs, they must submit two Abstracts (one in response to TA1 and one in response to TA2). The current solicitation is only for Phase 1 and Phase 2 of the program and submitted abstracts should only include information on proposed efforts under Phase 1 and Phase 2. The Government will review all submitted Abstracts for problem and solution space comprehension, execution capability, and budget (see **Section 4.3**). Selected proposers will be invited to provide an Oral Presentation (see **Section 4.4**) to the Government.
2. **Oral Proposal Package:** Upon the Government's request, proposers may have the opportunity to present their proposal to the DARPA program team. The Government will evaluate all Oral Proposal Packages (see **Section 4.4**) and anticipates that selected proposers will be given an Other Transaction (OT) for Prototype award with a 32-month (18-month Phase 1, 14-month Phase 2) period of performance.

Participation in any given Phase does not guarantee funding in a subsequent Phase. The process and requirements for Abstract and Oral Proposal Package submissions are detailed in **Section 2.1**.

### 1.4. Program Structure

O-Circuit will be executed in three Phases over 42 months (see **Figure 1**). Phase 1 (18 months) and Phase 2 (14 months) are being solicitated at this time. Instructions for Phase 3 (10 months) may be released to Phase 2 performers during Phase 2 (see **Section 2.1**). Phase 1 is focused on developing and testing the initial BPU cultures, with TA1 focused on BPU architectures that provide significant computational learning and memory capabilities and TA2 focused on BPUs integrated with an odorant sensory array and a drone navigation system that provides multiplexed odorant detection capabilities and chemotaxis. In Phase 2, both TAs will refine their BPU systems to provide increased performance (e.g., improved learning and longer memory for TA1, and expanded odorant detection and accuracy for TA2, see **Table 1**). Also during Phase 1 and 2, the TA1 and TA2 performers will work with each other to identify possible teaming strategies that will support building an integrated Phase 3 effort that combines TA1 and TA2 BPUs into a single, highly capable Sense-Compute-Action system. There will need to be technical exchanges between both the TA1 and TA2 performers during Phase 1 and Phase 2 to support this team building (see **Table 2; Section 1.4.3**). The Government will lead these exchanges to ensure that TA1 data sharing supports identifying clear opportunities to enhance the overall capabilities of the TA2 olfactory and drone systems, and vice versa. Non-disclosure agreements (NDAs) and/or Associate Contractor Agreements may be required to facilitate these interactions.

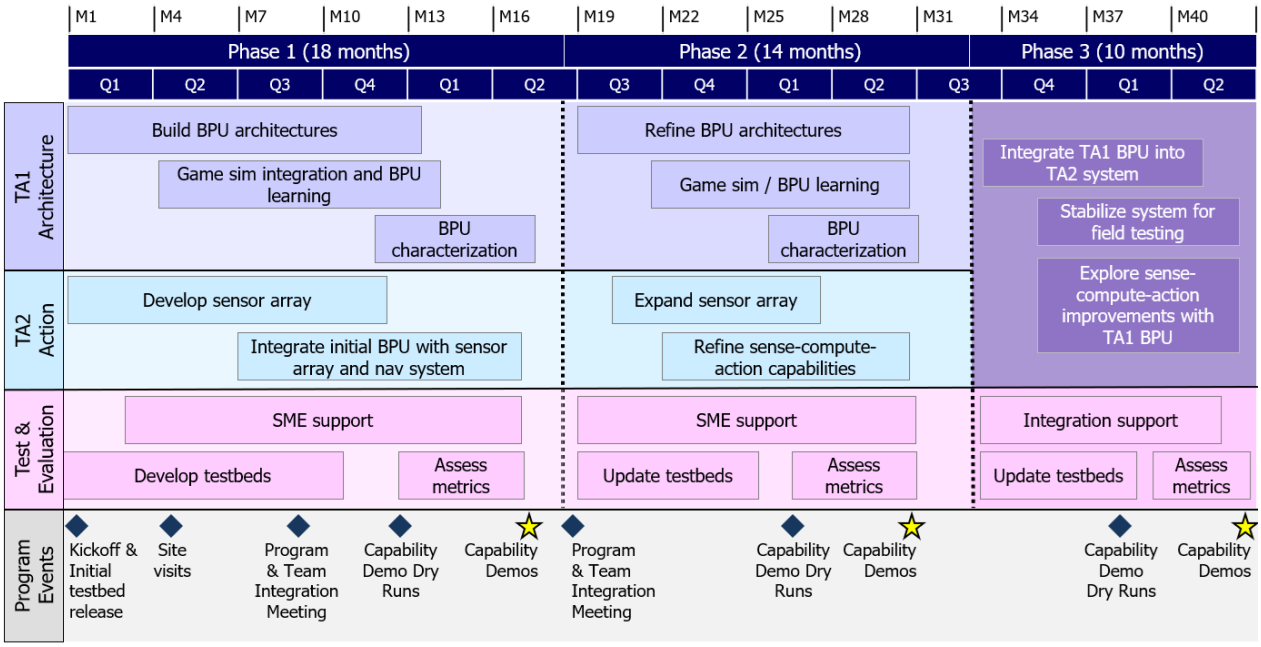



**Figure 1.** Program Schedule.

#### 1.4.1. Phase 1

In Phase 1, TA1 performers will focus on exploring new BPU architectures and quantifying their capacity for computational learning and memory. Neural cultures do not have learning nor memory in the traditional sense, as such, for the purposes of this solicitation *learning* is defined as the ability to receive encoded inputs describing the current state of a real or virtual environment and

to produce goal-directed outputs that effectively update the environmental state. Specifically, this goal-directed information processing will involve effectively controlling a video game based on 'Ms. Pac-Man'. *Computational memory* is defined as the ability of a BPU to retain this learned capability over time.

It is expected that multiple avenues by which learning and computational memory can be enhanced in BPUs will be explored by performers, such as increasing the size and complexity of neural cultures (e.g., organoids, assembloids, connectoids) by integrating neural circuits into the cultures that could provide learning, reward, or memory functions (e.g., inspired by the naturally occurring circuits in brains); providing a more robust mix of cell types (e.g., cell type combinations more likely to encourage robust synaptic communication, growth and pruning); providing well-structured reward functions (either biologically within the BPU or provided externally); novel methods of encoding information to the BPU; new mechanisms of stimulating BPU neurons (e.g., leveraging high electrode count encoding, precise electrical stimulation, optical stimulation, microfluidics and chemical stimulation); improved approaches to increase nutrient and gas exchange; and novel closed loop paradigms to reinforce behaviors.

All TA1 performing teams will use a common simulation environment to explore BPU learning and memory improvements: based on a Ms. Pac-Man Atari game emulator. The T&E team will be providing, updating, and maintaining this software environment. The first release will be made available to performer teams during Month 1 of Phase 1. Additional releases may occur throughout Phase 1 (and potentially Phase 2) to refine the environment. To this end, performers should account for regularly interacting with the T&E team to provide feedback and data regarding desired updates (e.g. to support their BPU training strategies) so that the software environment can be successfully refined for program goals (note: the Government team will be the final arbitrator on what is considered a necessary update). The T&E 'Ms. Pac-Man' environment will also be used to conduct end-of-phase metrics assessments and Capability Demonstrations, as coordinated by the T&E team (see **Table 2** and **Section 1.4.5**), at the T&E site.

In Phase 1, TA2 performers will begin developing their Sense-Compute-Action systems with integrated odorant sensor arrays. The integrated system will provide sufficient neural processing (e.g., via some form of BPU) to support accurate detection of a broad panel of odorants. Performers will likely explore integrating olfactory sensory neurons and/or odorant receptors (e.g., GPCRs, ligand-gated ion channels, etc.) into BPUs either directly through biological connections (e.g., expressing receptors in BPU neurons, connecting a sensory-specific organoid to the BPU) or indirectly through an artificial communication layer for accurate odorant discrimination and subsequent basic navigation responsivity (e.g., drone direction; see **Section 1.5**). Odorant panels will be proposer-selected but will include three specific odorants specified by the T&E team (see **Section 1.5.3**) that will be used for Capability Demonstration purposes. The Capability Demonstration for TA2 performers will be at the T&E site.

The T&E team will provide each TA2 performer with information regarding the specific drone systems, aerial and ground, in Month 1 that will be used for the end of Phase Capability Demonstrations. Teams are strongly encouraged to purchase at least one such system as soon as possible in Phase 1 (approximately $50,000 per drone). If desired, TA2 performers can use

different drone system(s) for their own internal development processes, but only the T&E selected systems will be available for the end of Phase Capability Demos. Due to T&E site restrictions, performers will not be able to bring their own internal drone system(s), even if the system is the one specified by T&E, to the Capability Demos. Instead, performers will be provided with a test drone by T&E. This will require performers to develop a modular olfactory enabled BPU design that can be readily moved between drone systems of the same make and model as specified by T&E.

While some degree of hardware development may be needed for effective integration of the drone(s) with the biological receptor array and BPU, proposers are encouraged to leverage existing drone platforms and interfacing technologies to avoid excessive focus on hardware development. Performers are expected to propose their own methods of collecting auditable data to validate their capabilities relative to program metrics for both TA1 and TA2. Additionally, there will be at least one opportunity prior to the end of Phase demonstration for 'dry run' testing at the T&E site to address logistical challenges (e.g., transportation and setting up of the TA1 and TA2 BPU systems). For planning purposes, the location can be assumed to be on the West Coast, with several days dedicated to both the dry run and the final demonstration.

### 1.4.2. Phase 2

In Phase 2, TA1 performers will continue refining their BPU architectures and training strategies to further increase computational learning and memory capacity, as captured by performance scoring targets approaching human level proficiency within the virtual test environment task (see **Section 1.5**). TA2 performers will expand the capabilities of their BPU architectures and odorant sensor arrays to increase the number of odorants detected and the accuracy by which they are discriminated (see **Section 1.5**). Performers are expected to collect sufficient data at their own research sites to quantify their progress relative to program metrics, and an end of Phase Capability Demonstration administered by the T&E team will take place at the T&E test site. There will be at least one opportunity prior to the end of Phase demonstration to do dry run testing with the T&E team in order to address logistical challenges (e.g., transportation and setting up of the BPUs). For planning purposes, the location can be assumed to be on the West Coast, with several days dedicated to both the dry run and the final demonstration.

### 1.4.3. Phase 1 & 2 Program Meetings

Periodically in both Phase 1 and Phase 2, all the TA1 and TA2 performers will participate in joint program meetings (**Table 2**). These meetings will include technical exchanges in which all performers (both TAs) will share results illustrating current progress and capabilities towards program goals. Teams will also begin work in developing teaming strategies that will support the Phase 3 goal of integrating the TA1 and TA2 capabilities. While the Phase 3 strategy does not need to be finalized until the end of Phase 2, following each technical exchange, performer teams will be required to submit a short teaming strategy update report that captures their interactions with other performer teams and outlines possible teaming strategies for Phase 3 (to include both technical goals of integrating BPUs into a single system, as well as other goals such as necessary IP and data sharing considerations; see **Table 2**). These reports are expected to become more detailed with each iteration. To account for research uncertainties, there will not be a need to

describe exclusive teaming privileges early in the program (i.e., it will not be necessary for one team to exclusively commit to teaming with another team(s) early in the program). During the latter stages of Phase 2, performer teams that were selected to be eligible for Phase 3 will be eligible to submit a joint proposal to the Government for Phase 3 in response to the specific Phase 3 guidance to be released during Phase 2. Team performance, readiness, and proposed Phase 3 plan will be assessed along with other solicitation requirements to determine which, if any, team will receive a Phase 3 award.

#### 1.4.4. Phase 3 (for planning purposes; not solicited at this time)

In Phase 3, it is anticipated there will be one performer team that further refines and integrates TA1 and TA2 technologies into a single Sense-Compute-Action system. Details for Phase 3 will be released during Phase 2, but notionally the Phase 3 combined team will incorporate the best BPU advances from TA1 with the most advanced odorant sensing, drone navigation and localization system from TA2 (see **Section 1.5**). It is anticipated that the Phase 3 team building will be informed through the Phase 1 and Phase 2 performer technical exchange interactions. It is also anticipated that Phase 3 will not include further refinement of the TA1 BPU architectures, nor the TA2 odorant sensor arrays. Phase 3 cumulates with a finalized prototype protocol that details how the BPU architecture is created and imprinted with a Sense-Compute-Action function.

#### 1.4.5. Capability Demonstrations

Capability Demonstrations will be held at the end of each Phase where TA1 and TA2 performer progress against the program metrics will be evaluated and compared by the T&E team. The detailed Capability Demonstration plan for Phase 1 and Phase 2 will be released by the T&E team at the program kickoff event. Notionally, the demonstrations will have performers travel with their BPU systems to the West Coast T&E site for assessment against program metrics. Each Capability Demonstration will also include a public participation element in which teams external to the program can apply to compete against the in-program efforts. This will ensure the technological development under O-Circuit continues to outpace the state of the art. Should external teams appear significantly advanced, they will be made aware of opportunities to have their work integrated into DARPA research.

### 1.5. Program Goals/Metrics

#### 1.5.1. Table 1. O-Circuit Program Metrics

| | Metric | Phase 1 | Phase 2 | Phase 3 (notional) |
|---|---|---|---|---|
| **TA1 (Architecture)** | 'Ms. Pac-Man' Score | >2200 | >16,000 | |
| | Daily Energy Consumption | 10 mWh | 10 mWh | |
| | Memory Persistence | 24 hrs | 72 hrs | |
| **TA2 (Action)** | Odorants (*n* @ 1 ppm) | 50 | 100 | |
| | Discrimination Accuracy | >70% | >90% | |
| | 2D+ Gradient Descent (50m distance) | 1 odorant | 15 min 2 odorants | 5 min 3 odorants |

### 1.5.2. Table 2. O-Circuit Programmatic Milestones

| Phase | Milestone (ACA*) | TA1 | TA2 |
|---|---|---|---|
| Phase 1 | 1 | Kickoff Meeting<br>ACURO submission (if applicable) | |
| | | T&E team releases version 1.0 of the virtual test environment | T&E team releases odorant test plan<br>T&E team releases nav testing plan |
| | 4 | T&E team releases updated virtual test environments and test plans | |
| | 6 | - | Submit odorant panel and drone plan to T&E team |
| | 8 | Program Meeting: technical updates & developing proposed Phase 3 teaming strategies | |
| | 10 | T&E team releases updated Capability Demonstration test plan (if applicable) | |
| | 11 | Phase 1 Interim progress report update: current status relative to program metrics and Phase 3 teaming strategy update | |
| | 13 or 14 | Dry Run (optional) at T&E Site for Capability Demonstrations | |
| | 16 | Phase 1 Capability Demonstrations (at T&E site)<br>Data package submission for status relative to all program metrics | |
| | 18 | Phase 1 final report; Initial protocol for creating and imprinting BPU with a Sense-Compute-Action function | |
| Phase 2 | 19 | Program Meeting: Phase 2 kickoff & updated Phase 3 teaming strategies | |
| | 25 | T&E team releases updated test plans (if applicable) | |
| | 26 or 27 | Dry Run (optional) at T&E Site for Capability Demonstration | |
| | 29 | Phase 2 Interim progress report update: current status relative to program metrics and update on Phase 3 teaming strategy<br>Phase 2 Capability Demonstration (at T&E site) | |
| | 30 | Phase 3 submissions (combined TA1 and TA2 efforts) | |
| | 32 | Phase 2 final report; Refined protocol for creating and imprinting BPU with a Sense-Compute-Action function | |
| Phase 3 | 33 | Phase 3 kickoff (virtual) | |
| | 36 | T&E team releases of updated Phase 2 Capability Demonstration test plan (if applicable) | |
| | 38 | Dry Run (optional) at T&E Site for Capability Demonstration | |
| | 42 | Phase 3 Capability Demonstration (at T&E Site)<br>Final Program Report; Finalized protocol for creating and imprinting BPU with a Sense-Compute-Action function | |

*ACA: (Month) After Contract Award

### 1.5.3. Phase 1 Metrics

Functional learning and computational memory of the TA1 BPU architectures will be quantified using gameplay performance in a common virtual test environment, an emulation of the Atari game, 'Ms. Pac-Man'. The T&E team will develop and provide the environment for performer use

during the first month of the program (**Table 2**). The computational memory metric, "memory persistence", will be based on measuring 'Ms. Pac-Man' performance scores 24 hours (Phase 1) following a performer-selected BPU training/task encoding period. Any amount of time can be used for encoding the BPU with 'Ms. Pac-Man' capabilities (i.e., the 'training' period); however, once that training period ends, there must be a gap of time without training (24 hours) at which point gameplay performance will be reassessed. It is not required for the BPU to be entirely inactive during this interval. The 'Ms. Pac-Man' score metric will be based on standard scoring rules of the game environment. A gameplay score at any time following encoding/training that meets the 'Ms. Pac-Man Score' metric will be accepted even if the memory persistence metric is not met (**Table 1**). Performers should assess the repeatability of their reported 'Ms. Pac-Man' score and compare to scoring achieved by an untrained BPU.

In addition to learning and computational memory, TA1 efforts will need to measure the amount of energy consumed by the BPU on a daily basis (including time periods in which the BPU is actively engaged in learning/memory tasks). Specifically it is the energy consumption of the BPU (e.g., via measuring nutrients consumed only) that is the main program metric (**Table 1**), but efforts will also be expected to report on the overall bill of materials that is used to support the BPU system (e.g., total fluids involved, life support power, etc.) to provide clarity on the overall system SWaP.

TA2 metrics will assess the capability of the biological sensor arrays to accurately detect the performer-selected odorants (**Table 1**).

It is not necessary to validate detection of all 50 distinct odorants (47 performer and 3 T&E specified chemicals) in a single session (e.g., tests could be run periodically over multiple days). However, the T&E team will seek to evaluate BPU systems configured such that all odorants in the panel are detectable at any given time (i.e., it is not desired to simply show that an array and BPU configuration can be set up to detect 10 distinct odorants but must be re-configured prior to detecting the other 40 odorants). Discrimination accuracy is defined as the BPU system's ability to reproducibly detect any of the 50 odorants in its environment. Performers will be expected to report out the data regarding the individual signatures associated with all the selected odorants. This will be important to support the Phase 2 and Phase 3 goals that involve the drone system being able to navigate appropriately when there are multiple odorants present in the environment.

TA2 teams will use their own odorant test platforms to collect sufficient data to quantify their efforts relative to program metrics. Odorants are to be detected at 1 ppm (or lower), and the detected concentration of the odorant in the test chamber/environment is to be reported by performers for all odorants. Additionally, for the end of Phase 1 Capability Demonstrations (**Table 2**), performers will validate their systems against an odorant test platform that will be provided by the T&E team (which will reflect some, or all of, the same odorants previously tested by the performers). Performers will work with the T&E team prior to the end of Phase 1 Demonstrations to develop a strategy for using the T&E team test platform with the performer Sense-Compute-Action system.

TA2 performers must also show that their BPU architecture is capable of processing the olfactory receptor input such that it can navigate a drone to the source of a given odorant. This target odorant

will be selected by the T&E team and will be one of the 3 pre-specified T&E odorants that will be provided prior to the oral proposals. The BPU architecture does not need to control all aspects of the drone platform, but will be evaluated for capabilities to process the inputs from the odorant sensor array and outputting appropriate navigational information for the drone platform (e.g., forward/back, right/left).

Tests must involve some series of evaluations that physically locate the source when the drone is up to 50 meters from the source (**Table 1**). Performers are expected to clearly quantify the performance of their system to show its efficiency in locating the odorant source. At a minimum, tracked parameters must include the following: time elapsed, distance, path traveled, and the source location accuracy (i.e., the error distance between the actual source and the location identified by the BPU system). During Phase 1, program performers will work with the T&E team such that details of the performer test environment can be configured to better prepare them for the end of Phase Capability Demonstrations that will occur at the T&E test site. Note that the olfactory sensor array/BPU system that is used for the navigation testing must be the same as the one used for the detection of the 50 odorants.

There are no specific SWaP requirements for the TA2 BPUs and receptor arrays. However, the sensor array/BPU system must be on board the drone to satisfy the gradient descent metric. Additionally, TA1 and TA2 efforts will be expected to report on the overall bill of materials used to support the BPU system and odorant receptors to provide clarity on the overall system SWaP.

### 1.5.4. Phase 2 Metrics

In Phase 2, TA1 efforts will improve the learning and memory capabilities of the BPU architectures. The overall increase in learning capabilities will be assessed relative to the BPU's improved ability to interact with the test video game environment, i.e. improving the score to a value reflective of a human's ability to play the game following a few hours of learning. Computational memory will likewise be assessed by testing the game play capability following a longer time window (72 hours) after the end of the training period. While the capability of the BPU systems should increase, the overall energy efficiency (as measured by the energy consumption) should remain commensurate with natural brain processing (**Table 1**).

TA2 efforts in Phase 2 will focus on increasing the total number of odorants that can be detected. By the end of Phase 2, 100 odorants should be detectable (97 plus the three specified by the T&E team). TA2 performers will be expected to continue to maintain their own navigation environments for capturing sufficient data to quantify status relative to program metrics, but will also be required to conduct navigation tests at the T&E site as part of the end of Phase 2 Capability Demonstrations. Performers will have multiple opportunities to interact with the T&E group throughout Phase 2 to update their own testing environments to enable better preparation for the end of Phase Capability Demonstrations.

As in Phase I, for both TAs, performers will report on the overall SWaP profile of the systems.

### 1.5.5. Phase 3 Metrics

Phase 3 is notional and is not being solicited as part of this PS. Details for Phase 3 may be released during Phase 2.Participation in Phase 2 neither guarantees nor precludes selection for Phase 3 of

the O-Circuit program. Phase 2 participation is not required for consideration for Phase 3. DARPA will carefully evaluate the findings and results from Phase 2, along with stated program objectives and mission needs, to determine the most appropriate method for identifying and selecting performers for Phase 3. Potential approaches include, but are not limited to, issuing a forthcoming Phase 3 solicitation or announcement, leveraging rapid acquisition marketplaces such as ERIS or Tradewinds, or other methods deemed suitable. DARPA retains full discretion in determining the Phase 3 selection process and will provide additional details during Phase 2. Notionally, this phase will focus on further improving the overall BPU system Sense-Compute-Action capabilities and demonstrating that improvements lead to an enhanced ability to efficiently traverse a 3-odorant gradient to identify the location of a specific source. This will require integrating the improved learning and memory capabilities from TA1 BPU architectures into TA2 odorant sensory arrays in order to improve the drone's navigation ability in dynamic chemical environments.

### 1.6. Ethical Considerations

The biological computational capabilities being developed under this solicitation are intended to significantly advance the field of biocomputing but are still far removed from natural brains. However, the growing field of biological computation could raise ethical concerns. As such, proposals should include a component that highlights any key bioethics considerations that may be relevant to the specific approach being proposed. Additionally, performer teams will be required to periodically reassess/update their ethical consideration assessment throughout the program (e.g., as part of their end of Phase reporting).

### 1.7. T&E: Government Independent Test and Evaluation

The O-Circuit program will include an independent T&E component as part of the Government team. The T&E team (not being sought in this solicitation) will be responsible for developing the simulated game environment used for assessing BPU capabilities for TA1. They will also provide drone platforms that will be used for the end of Phase Capability Demonstrations to TA2 performers (making details of those platforms available to performers so that matching systems can be acquired if desired), develop a TA2 odorant testbed for assessing detection accuracy for both Phase 1 and Phase 2, and develop a drone navigation, odorant detection and gradient navigation testbed. The T&E team will be responsible for developing, planning, and running the end of Phase Capability Demonstrations and for assessing all performers against program metrics. Proposals should account for data sharing and interactions with the T&E team throughout all program Phases.

## 2. PS AUTHORITY

This PS may result in the award of an Other Transaction (OT) for Prototype agreement, which can include not only commercially-available technologies fueled by commercial or strategic investment, but also concept demonstrations, pilots, and agile development activities that can incrementally improve commercial technologies, existing Government-owned capabilities, and/or concepts for broad defense and/or public application(s). As a result of this solicitation DAPRA expects to receive a refined prototype protocol for creating and imprinting BPU with a Sense-Compute-Action function upon completion of Phase 2 (see **Section 1.5.2 Table 2**). The Government reserves the right to award an OT for Prototypes under 10 U.S.C. § 4022, or make no

award at all. In all cases, the Government agreements officer shall have sole discretion to negotiate all agreement terms and conditions with selected proposers. The OT agreement will not require cost sharing unless the proposer is a traditional defense contractor who is not working with a non-traditional defense contractor participating in the program to a significant extent.

### 2.1. PS Procedure

In response to this solicitation proposers are asked to submit up to two **eight (8)-page abstracts** as described in **Section 4.2**. This process allows DARPA to ascertain (1) whether the proposers understand the key challenges of the O-Circuit program, and (2) whether they are capable of executing a proposed concept. Specific evaluation criteria used to make the assessment can be found in **Section 4.3**. If DARPA finds that both conditions are met, it may request the proposer submit an Oral Proposal Package (OPP) as described in **Section 4.4**, and participate in an oral presentation to DARPA, where the proposed technical solution will be evaluated. After the Oral Presentations, DARPA will make a determination as to which proposers may be awarded an OT for Prototype agreement for Phase 1 and Phase 2 of the program. The Government will not pay proposers responding to this PS for the costs associated with Abstract submissions or Oral Presentations.

DARPA will use the following process to facilitate the O-Circuit source selection:

**a.** **Proposers Workshop:** The Program Manager held a Proposers Workshop on **April 10, 2026**, where he described the program and its goals and solicited questions from the audience in real time. A comprehensive list of questions and answers from the Proposers Workshop will be provided via a question and answer (Q&A) document. Participation in the Proposers Workshop was optional and is not a requirement for proposers seeking to submit an abstract. Additional details about the Proposers Day were provided in Special Notice **DARPA-SN-26-48** separate from this PS and can be accessed here: (https://sam.gov/opp/5fac31291e664f4ca05ec202d143636f/view).

**b.** **Program Solicitation Questions and Answers (Q&A) (Informational Only):** DARPA will host a Q&A session during the O-Circuit Proposers Workshop and will post a consolidated Q&A document. The Q&A document will be available online at https://www.darpa.mil/research/programs/o-circuit. Following the Proposers Workshop, questions can be sent to O-Circuit@darpa.mil. DARPA will respond to any relevant and/or PS clarification question(s) prior to the final abstract due date and post consolidated Q&As at the DARPA Opportunities page (http://www.darpa.mil/research/programs/o-circuit).

**c.** **Abstracts (Required)**: Abstracts shall be submitted as specified in **Section 4.2** of this PS. The Government will review all submitted abstracts for technical comprehension and ability (see **Section 4.3**). Selected proposers will be invited to provide an OPP and participate in an in-person oral presentation to the Government (see **Section 4.4**). Note that *proposers must submit an abstract(s) in response to this solicitation to be considered for participation in the O-Circuit program. Proposers will not be invited to submit an OPP, provide an oral presentation, or be included in any further progression of the program without participating in the abstract phase of the solicitation*.

**d.** **Oral Proposal Package (OPP) (Required if selected)**: Oral presentations are anticipated to take place approximately **four weeks** after notification of selection. OPP content and format including final requirements, templates, submittal instructions, and proposed presentation dates for oral presentations will be provided in the invitation to submit an OPP (see **Section 4.4**). The Government will review all OPPs, which will not be made public or provided to other proposers. For Phase 1 and Phase 2, proposers must only propose an **OT for Prototype** with fixed payable Payment Milestones. (Note – Payment Milestones represent a completed event and do not necessarily correspond 1:1 to the Program Milestones listed in **Table 2)**. Payment Milestone schedule is based on key observable events in the critical path to accomplish program objectives. Payments are triggered by successful performance of observable technical events. Fixed payable milestones are payments based on successful completion of the milestone accomplishments agreed to in the milestone plan.

**e.** **Phase 1 & 2 (32 months):** DARPA will review OPPs and oral presentations to determine which proposed solution(s) sufficiently meet the evaluation criteria. Upon favorable review, and subject to the availability of funds, the Government may award an OT for Prototype under 10 U.S.C. § 4022 with fixed, payable milestones for Phase 1 and Phase 2. The award will be to develop BPU architectures (TA1) and/or BPU action systems (TA2) with an 18-month Phase 1 period of performance and a 14-month Phase 2 period of performance. DARPA anticipates issuing proposal instructions for a notional Phase 3 to selected Phase 2 performers at approximately month 30 during Phase 2 execution. Phase 3 may be an add to the existing OTs, but DARPA reserves the right to negotiate new OT for Prototype Projects for Phase 3.

Abstracts (result if successful: invitation to participate in Oral Presentations)

Abstracts shall be submitted as specified in **Section 4** of this PS. The Government will evaluate abstracts against the criteria stated in this PS.

It is important to note that proposers *must* submit an Abstract in response to this solicitation to be considered for participation in either TA1, TA2, or both TAs of the O-Circuit program. Proposers will not be invited to submit an OPP, or be included in any further progression of TA1/TA2 of the program, without participating in the Abstract phase of the solicitation.

Proposers responding to this PS may be invited to further explain their proposed approach and solution via an OPP. Oral Presentations will take place approximately **four weeks** after notification from the Government that an OPP is requested. Additional instructions (to include content due date and presentation date/time) will be provided within the official invitation to participate in oral presentations.

Awards (for Phase 1 and Phase 2)

DARPA will review OPPs to determine which proposed solutions sufficiently meet the evaluation criteria provided in the invitation to submit an OPP. Upon favorable review, and subject to the availability of funds, the Government may award an OT for Prototypes under 10 U.S.C. § 4022

with fixed milestones and payments for Phase 1 selectees.

Performers in Phase 2 may be provided with instructions to submit a Phase 3 continuation proposal prior to the end of Phase 2.

## 3. ELIGIBILITY INFORMATION

### 3.1. Eligible Applicants

#### 3.1.1. Federally Funded Research and Development Centers (FFRDC) and Government Entities

##### 3.1.1.1. FFRDCs and University Affiliated Research Centers (UARCs)

FFRDCs and UARCs are subject to applicable direct competition limitations and cannot propose to this PS in any capacity unless they meet the following conditions: (1) FFRDCs/UARCs must clearly demonstrate, with specific details, that the proposed work, expertise, and facilities are not otherwise available from the private sector, and (2) FFRDCs/UARCs must provide a letter on official letterhead from their sponsoring organization citing the specific authority establishing their eligibility to propose to Government solicitations and compete with industry, and their compliance with the associated FFRDC/UARC sponsor agreement's terms and conditions. This information is required for FFRDCs/UARCs proposing to be awardees or subawardees. FFRDC/UARC proposals that do not include these elements may be deemed non-conforming and removed from consideration.

FFRDCs/UARCs that can only be funded through their existing sponsor contracts should not submit an abstract directly to this PS.

##### 3.1.1.2. 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.

##### 3.1.1.3. 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. § 4892 (formerly 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.

#### 3.1.2. 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.

### 3.2. Organizational Conflicts of Interest (OCI)

Without prior approval or a waiver from the DARPA Deputy Director, a contractor cannot simultaneously provide scientific, engineering, technical assistance (SETA), advisory and assistance services (A&AS), or similar support and also be a technical performer. As part of the OPP, all members of the proposed team (including any potential subawardees or consultants) must affirm whether they (their organizations and individual team members) are providing SETA or similar support to any DARPA office(s) through an active award or subaward. All facts relevant to the existence or potential existence of Organizational Conflicts of Interest (OCI) must be disclosed in the Administrative and National Policy Requirements document, should the proposer be invited to submit an OPP.

If SETA, A&AS, or similar support is being or was provided to any DARPA office(s), the OPP must include in the Administrative and National Policy Requirements document:

- 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.

Under this section of the OPP, the proposer is responsible for providing this disclosure with each OPP submitted. The disclosure must include the proposer's OCI status, 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 avoid, neutralize, or mitigate such conflict, prevent the existence of conflicting roles that might bias the proposer's judgment, and prevent the proposer from having unfair competitive advantage. Prior to the start of OPP evaluations, the Government will assess potential conflicts of interest based on the OPPs submitted. DARPA will promptly notify the proposer if any appear to exist. The Government assessment does NOT affect, offset, or mitigate the proposer's responsibility to give full notice and planned mitigation for all potential organizational conflicts.

If, in the sole opinion of the Government after full consideration of the circumstances, a proposal fails to fully disclose potential conflicts of interest and/or any identified conflict situation cannot be effectively mitigated, the OPP will be rejected without technical evaluation and withdrawn from further consideration for award.

If a prospective proposer believes a conflict of interest exists or may exist (whether organizational or otherwise) or has questions on what constitutes a conflict of interest, the proposer should send his/her contact information and a summary of the potential conflict via the specific email address identified in this PS before time and effort are expended in preparing an OPP and mitigation plan.

## 4. GUIDELINES FOR ABSTRACTS, ORAL PRESENTATIONS, AND PROPOSALS

### 4.1. General Guidelines

**a.** Do not include elaborate brochures or marketing materials; only include information relevant to the submission requirements or evaluation criteria.

**b.** Use of a diagram(s) or figure(s) to depict the essence of the proposed solution is permitted.

**c.** All Abstracts, Oral Presentations, and supporting documents shall be unclassified.

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

**e.** Questions can be sent to O-Circuit@darpa.mil by **May 7, 2026 5:00 PM (ET)**.

**f.** Send Abstracts to O-Circuit@darpa.mil by **May 20, 2026 5:00 PM (ET).** Files containing Controlled Unclassified Information must be encrypted when sending over the Internet.

**g.** Submissions sent through other mediums, channels, or after the prescribed PS deadline will not be considered, reviewed, nor evaluated.

**h.** Proposers providing Abstracts that are not invited to an Oral Presentation will be notified in writing as soon as practicable.

**i.** Abstracts and oral presentations should inherently address all of the Heilmeier questions as described here: https://www.darpa.mil/work-with-us/heilmeier-catechism

### 4.2. Abstract Content

**a.** Abstracts should not exceed eight (8) single-sided 8.5" by 11" written pages using 12-point Times New Roman font with 1" margins all around. A complete Abstract is required per TA, and Abstracts submitted for TA1 and TA2 by the same proposer may repeat wording and reference each other as needed.

**b.** Abstracts must include the following:

1. ***Title page*:** Proposer Name, Title, Date, Point of Contact Name, E-Mail Address, Phone, Address, CAGE Code, Phase 1 and Phase 2 ROM, and TA being proposed to (The Title Page does not count against page limits).

   The proposer shall include a statement that no people on the proposer's team work for DARPA as Scientific Engineering Technical Assistance (SETA), Advisory and Assistance Services (A&AS) or similar support services, as DARPA has a policy prohibiting such people from working as a technical performer. Include this statement on the title page; it will NOT count as part of the total written pages limit.

2. ***Technical Understanding*:** Provide a summary of the technical goals of O-Circuit. This summary shall be stated in the proposer's own words without any "copy and paste" of this solicitation. The goal is for the proposer to demonstrate clear

understanding of O-Circuit's purpose and goals. The summary shall be no more than one (1) page and is included in the eight (8) written page limit.

3. ***Technical Approach:*** Provide a summary of the technical plan for achieving the goals of the program. This includes identifying the primary risks and specific technical challenges faced in O-Circuit program and describing the proposed approach to address those challenges and meet programmatic goals and metrics of Phase 1 and 2 (inducing specific tasks outlined to meet the metrics). Presentation of, not just reference to, unpublished data that establishes technical feasibility of the work is welcome. This shall be no more than six (6) pages and is included in the eight (8) written page limit.

4. ***Technical Ability*****:** Detail why the proposer's team and organization believes they can be successful at achieving the goals, if selected, for the O-Circuit program. The proposer may include past experience, organizational capabilities, team members' qualifications, or anything else that demonstrates competence in designing and executing on the O-Circuit goals. This shall be included in the eight (8) written page limit.

5. ***Budget Estimate:*** Please include an estimate of the total project cost including cost sharing, if applicable. The estimate should include a breakdown (by Phase) of the work by direct labor (fully burdened), labor hours, subcontracts, materials, equipment, other direct costs (e.g., travel), indirect costs, profit, cost sharing, and any other relevant costs. This may be presented as a narrative or table (see below) and shall be included in the eight (8) written page limit.

   The table below may be used for this breakdown:

| Categories | Phase 1 Amount | Phase 2 Amount | Total Amount |
|---|---|---|---|
| Direct Labor (fully burdened) | | | |
| Labor hours | | | |
| Subcontracts/Consultants | | | |
| Materials | | | |
| Equipment | | | |
| Travel | | | |
| Other Direct Costs | | | |
| Indirect Costs | | | |
| Profit | | | |
| **Total** | | | |
| Cost Sharing (if applicable/appropriate) | | | |

6. ***References:*** Provide a list of citations, references, or end notes. References are NOT included in the page limit.

7. ***Odorant list (TA2 Abstracts):*** A list of 4-5 chemical categories, with at least 3 exemplar odorants per category specified. Odorants are to be single chemicals, and

the odorant list is NOT included in the page limit and can be included as a separate document.

### 4.3. Abstracts – Process and Basis of Evaluation

Abstract evaluation criteria are listed in order of importance. Individual Abstracts will be evaluated against the evaluation criteria described below:

a. **Problem and Solution Space Comprehension**: The proposed technical understanding is accurate, key challenges and risks are identified, and a plausible strategic plan is presented for achieving program goals within the specific timelines.

b. **Execution Capability:** The proposer demonstrates an ability to achieve the defined goals of the O-Circuit program.

c. **Budget Estimate:** The estimated budget aligns with the proposed technical scope and project plans.

Abstracts will be evaluated by DARPA using the evaluation criteria listed above. The Government will endeavor to complete the evaluation of Abstracts within **10** business days of the closing of the submittal period. As stated above, proposers are required to submit an Abstract for evaluation by DARPA to minimize effort and reduce the potential expense of preparing an unsuccessful proposal. DARPA will respond to successful Abstracts with an invitation to submit an OPP and provide an oral presentation. DARPA will respond to unsuccessful Abstracts, stating as such in an email to the proposer. Upon review of Abstracts, the Government may elect to invite all, some, or none of the proposers to submit OPPs and to oral presentations. *Only Abstract proposers invited by DARPA to participate in OPPs are eligible to provide one.*

### 4.4. Oral Proposal Package Content

If DARPA expresses interest in an Abstract, the proposer will be asked to provide an OPP, that will include an oral presentation (tentatively planned as 1 hour: ~40 minutes presentation, ~20 minutes question and answer period), to provide further details on the proposed solution. Specific instructions (including content submission guidelines) will be provided in the invitation to participate. Tentatively, if selected, proposers can expect to be asked to provide information (for both Phase 1 and Phase 2) regarding: Team introduction/overview, Technical Approach (qualifications, description of innovations and how they will support achieving objectives/metrics, etc.), risks/mitigation plan, cost proposal, data rights, full list of odorants (TA2 only) and any additional information or detail requested with respect to its Abstract. Package content and oral presentations are anticipated to be evaluated by the O-Circuit Program Manager with support from a panel composed of Government subject matter experts (SMEs).

After completing evaluation of OPPs, DARPA will: 1) make a 32-month award for Phase 1 and Phase 2 of the program; or 2) inform the proposer that its proposed concept/technology/solution is not of continued interest to the Government and they are no longer considered for participation in the program. If DARPA does not intend to issue an award for the Phase 1 and 2 effort to an proposer, DARPA may provide brief feedback to the proposer regarding the rationale for the decision.

## 5. AWARDS

### 5.1. General Guidelines

Upon favorable review of the OPP and subject to the availability of funds, the Government may choose to award an OT for Prototypes agreement for Phase 1 and Phase 2.

The Agreements Officer reserves the right to negotiate directly with the proposer on the terms and conditions prior to execution of the resulting OT agreement, including payment terms, and will execute the agreement on behalf of the Government. A copy of the draft OT agreement is attached to this PS for review. In order to speed up negotiations, proposers selected for oral presentations will be required to either attest to compliance of all OT agreement articles or note those they take exception to. Be advised, only a Government Agreements Officer has the authority to enter into, or modify, a binding agreement on behalf of the United States Government.

In order to receive an award:

- **a.** Proposers must have a Unique Identity ID number and must register in the System for Award Management (SAM). Proposers are advised to commence SAM registration upon notification of entry to Phase 1.
- **b.** Proposers must also register in the prescribed Government invoicing system (Wide Area Work Flow: https://wawf.eb.mil/xhtml/unauth/registration/notice.xhtml). DARPA Contracts Management Office (CMO) personnel will provide assistance to those proposers from whom a proposal is requested.
- **c.** Proposers must be determined to be responsible by the Agreements Officer and must not be suspended or debarred from award by the Federal Government nor be prohibited by Presidential Executive Order and/or law from receiving an award.
- **d.** Being asked to submit a proposal does not guarantee that an proposer will receive an award. The Government reserves the right not to make an award.

### 5.2. Fundamental Research & Fundamental Research Risk-Based Security Review Process (FRRBS)

As of the date of publication of this solicitation, the Government expects that Controlled Unclassified Information (CUI) and Controlled Technical Information (CTI) will not be necessary, and that program goals as described herein may be met by proposed efforts for fundamental research and non-fundamental research.

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. Please see:

https://www.darpa.mil/work-with-us/communities/academia/fundamental-research

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 sub-awardee's effort may be fundamental research. It is also possible that the research performed by a potential awardee is fundamental research while its proposed sub-awardee'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.

It is DoW 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.

DARPA's Fundamental Research Risk-Based Security Review Process (FRRBS) is an adaptive risk management security program designed to help protect the critical technology and performer intellectual property associated with DARPA's research projects by identifying the possible vectors of undue foreign influence. DARPA will create risk assessments of all proposed Senior/Key Personnel selected for negotiation of fundamental research awards (to include cooperative agreements and Other Transactions). The DARPA risk assessment process will be conducted separately from the DARPA scientific review process for all fundamental research effort/proposal and adjudicated prior to final award. For additional guidance, information and submission requirement on this process, please visit:

https://www.darpa.mil/about/offices/contracts-management/proposer-transactions

Please note that FRRBS is not a requirement for Abstract submission, but it is a requirement for OPP package submission for fundamental research effort. If key personnel are changed after OPP updated FRRBS paperwork is required with the final proposal.

### 5.3. Representations and Certifications

All proposers are required to submit DARPA-specific representations and certifications for Prototype OT awards in order to be eligible to receive an OT award. See http://www.darpa.mil/work-with-us/reps-certs for further information on required representations and certifications for Prototype OT awards.

### 5.4. Competition Sensitive Information

DARPA policy is to treat all submissions as competition sensitive, 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. 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.

### 5.5. Intellectual Property / Data Rights

The Government will require Government purpose rights, as defined in **Section 6** of this PS, to intellectual property (IP) developed under the program.

### 5.6. Procurement Integrity Act (PIA)

All awards under this PS shall be treated as Federal Agency procurements for purposes of 41 U.S.C. Chapter 21. Accordingly, the PS competitive solicitation process and awards made thereof must adhere to the ethical standards required by the PIA.

## 6. PS DEFINITIONS

**"Data"** refers to recorded information, regardless of form or method of recording, which includes but is not limited to, technical data, software, mask works and trade secrets. The term does not include financial, administrative, cost, pricing or management information and does not include inventions.

**"Government Purpose"** means any activity in which the United States Government is a party, including cooperative agreements with international or multi-national defense organizations, or sales or transfers by the United States Government to foreign governments or international organizations. Government purposes do not include the rights to use, modify, reproduce, release, perform, display, or disclose technical data for commercial purposes or authorize others to do so.

**"Government Purpose Rights"** means the rights to use, duplicate, or disclose Data, in whole or in part and in any manner, for Government Purposes only, and to have or permit others to do so for Government Purposes only.

**"Limited Rights"** means the rights to use, modify, reproduce, release, perform, display, or disclose Data, in whole or in part, within the Government, to include Government support contractors.

**"Nontraditional Defense Contractor"** is defined in 10 U.S.C. § 3014 as an entity that is not currently performing and has not performed, for at least the one-year period preceding the solicitation of sources by the DoD for the procurement or transaction, any contract or subcontract for the DoD that is subject to full coverage under the cost accounting standards prescribed pursuant to 41 U.S.C. § 1502 and the regulations implementing such section. This includes all small business concerns under the criteria and size standards in 15 U.S.C. § 632 and 13 C.F.R. Part 121.

**"Other Transaction"** refers to the type of OT that may be awarded as a result of this PS. This type of OT is authorized by 10 U.S.C. § 4022 for prototype projects directly relevant to enhancing the mission effectiveness of military personnel and the supporting platforms, systems, components, or materials proposed to be acquired or developed by the DoD, or for theimprovement of platforms, systems, components, or materials in use by the armed forces.

**"Prototype Project"** is described in the DoD Other Transactions Guide (Version 2, July 2023)

issued by the Office of the Under Secretary of Defense for Acquisition and Sustainment: https://www.acq.osd.mil/asda/dpc/cp/policy/docs/guidebook/DoD%20OT%20Guide%20(July%202023)%20-%20508%20Update_11Jul2025.pdf

**"Restricted Rights"** applies only to noncommercial computer software and means the Government's right to use, modify, reproduce, perform, display, release disclose or transfer computer software are restricted, except that the Government may use a computer program on a limited number of computers and make the minimum number of copies of the computer software required for safekeeping (archive), backup, or modification purposes. The Government will not transfer the software outside of the Government or for any purpose other than the O-Circuit program, except that the Government may allow the use of the noncommercial computer software outside of the Government under a limited set of circumstances, including use by a covered Government support contractor in performance of its covered Government support contract (management and administrative support), and after the contractor or subcontractor asserting the restriction is notified in writing as far in advance as practicable that a release or disclosure to particular contractors or subcontractor is planned to be made.

**"Small Business Concerns"** is defined in the Small Business Act (15 U.S.C. § 632).

## 7. ACRONYMS

| | |
|---|---|
| A&AS | Advisory and Assistance Services |
| ACA | (Month) After Contract Award |
| ACURO | Animal Care and Use Review Office |
| AI/ML | Artificial Intelligence and Machine Learning |
| ASR | Animal Subjects Research |
| BOE | (Budget) Basis of Estimate |
| BPU | Biological Processing Unit |
| BTO | Biological Technologies Office |
| CMO | Contracts Management Office |
| CTI | Controlled Technical Information |
| CUI | Controlled Unclassified Information |
| DARPA | Defense Advanced Research Projects Agency |
| DFARS | Defense Federal Acquisition Regulation Supplement |
| DoD | Department of Defense |
| DoW | Department of War |
| ET | Eastern Time |
| FAR | Federal Acquisition Regulation |
| FFRDC | Federally Funded Research and Development Center |
| FRRBS | Fundamental Research Risk-Based Security Review Process |
| FOIA | Freedom of Information Act |
| GCPR | G-protein-coupled receptor |
| HSR | Human Subjects Research |
| IACUC | Institutional Animal Care and Use Committee |

| | |
|---|---|
| IP | Intellectual Property |
| MEA | Multi-Electrode Array |
| NDA | Non-Disclosure Agreement |
| NDAA | National Defense Authorization Act |
| NSDD | National Security Decision Directive |
| OCI | Organizational Conflict of Interest |
| OPP | Oral Proposal Package |
| OT | Other Transaction |
| PI | Principal Investigator |
| PIA | Procurement Integrity Act |
| PM | Program Manager |
| PS | Program Solicitation |
| SAM | System for Award Management |
| SETA | Scientific Engineering Technical Assistance |
| SOA | State-of-the-Art |
| SWaP | Size, Weight, and Power |
| TA | Task Area |
| TDD | Task Description Document |
| T&E | Test and Evaluation |
| UARC | University Affiliated Research Center |
| USAMRDC | U.S. Army Medical Research and Development Command |
| U.S.C. | United States Code |