BAA Call N00014-23-S-C001
Special Program Announcement for Office of Naval Research
Research Opportunity:
"Science of Artificial Intelligence – Basic and Applied Research for the Naval Domain"

I. INTRODUCTION

This announcement describes the following technology areas listed at https://www.nre.navy.mil/our-research/onr-technology-and-research

1. Machine Learning, Reasoning and Intelligence
2. Computational Methods for Decision Making – Automated Image Understanding
3. Command Decision Making (CDM)
4. Cognitive Science for Human Machine Teaming
5. Tactical AI for Marine Corps

All Technology Areas fall under the Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology (S&T) (N00014-23-S-B001), which can be found at https://www.nre.navy.mil/work-with-us/funding-opportunities/announcements.

The submission of proposals, their evaluation, and the placement of contracts and grants will be carried out as described in the above Long Range Broad Agency Announcement.

The purpose of this announcement is to focus attention of the scientific community on (1) the area to be studied, and (2) the planned timetable for the submission of white papers and full proposals.

II. TOPIC DESCRIPTION

ONR is interested in receiving white papers and proposals in support of advancing artificial intelligence for future naval applications. Work under this program will consist of basic and applied research, with projects funded under Budget Activity 1, Basic Research, and Budget Activity 2, Applied Research, as defined in the DoD Financial Management Regulation, Vol. 2B, Ch. 5. The overall S&T efforts will be conducted at the Technology Readiness Level (TRL) 1 – 5 stage.

Topic 1

Title: Human-inspired Computational Models of Vision-Language Interactions for Agents

Background: A unique characteristic of human intelligence is sophisticated language and its interactions with vision (and other senses). These interactions enable effective and efficient communication and collaboration, and enlarge the scope and complexity of concepts and tasks agents can learn with vision or language alone. In recent years, both computer vision and natural language processing have made significant advances largely along separate paths, notably in visual object recognition and large language models (e.g. BERT, GPT-3), as well as in tandem, image/video captioning, image generation from text (e.g. DALL-E, Imagen), and visual language models (e.g. Flamingo); however, these advances have not lead to learning complex concepts and tasks with the deep semantic inferences that agents need to perform tasks or answer complex queries. To elevate agents' intelligence to significantly higher levels, ONR needs to investigate intricacies of human vision-language (VL) interactions and develop principled computational models for VL interactions for agents. Also, certain fundamental problems may be addressed most effectively through VL interactions. Examples include grounding AI agents in our physical world; situated scene understanding using VL dialogue; as language is replete with ambiguous spatial and temporal references that vision can resolve effectively. Another fundamental problem is few-shot learning, an often cited example of which is an agent learning "chair," where a few chair images together with a brief description of chair is more effective than either approach of showing the agent thousands of chair images or describing chair.

While robust embodied, situated intelligence requires joint vision and language, current VL systems are generally restricted and brittle (using symbolic approaches) and do not have a deep understanding of language (based on neural net models). Language and vision have different strengths. Language is capable of conveying generalizations (chairs have legs) that would take many visual examples, and is capable of abstract task specification (turn the chair onto its side), to enable fluid collaboration. Vision on the other hand conveys details that are difficult for language (the exact curve in the back of that chair), but are needed for physical interaction and prediction. Also, language is fundamentally about the physical world and our understanding of language is not complete without sufficient models of grounding.

In this topic, ONR wants to develop principled foundations for building VL computational systems that are open-domain, compositional, and capable of strong generalization. Developing such systems presents many challenges as vision and language have different representations and processing architectures. Recent advances mentioned above (and their extensions) may provide promising building blocks for developing sophisticated VL interaction models. However, we may have to integrate them with different approaches that are based on explicit knowledge and meaning, since current systems are generally not compositional, are unable to generalize well and deal with complex situations, extracting latent knowledge from their implicit representations is nontrivial, their decisions are not transparent and their inferences are shallow and sometimes nonsensical or even wrong.

Objective: The goal of this basic research topic is to develop a principled computational framework and architecture for vision-language interaction, informed by human performance, that is open-domain and capable of strong compositional generalization. Interactions that enable agents to learn and reason about the real world with high levels of complexity in a transparent manner, result in multimodal dialogue for human-agent collaboration performing challenging tasks, and more.

Research Concentration Areas: Developing the architecture, and its computational components, for principled vision-language interaction requires research in a number of areas that include the following. How do we bridge the different representations for vision and language? What are the methods for joint image and language alignment and parsing, particularly when pairings are inaccurate? How can vision ground language and vice versa? What are the methods for language and vision providing context for each other for better learning and inference? How do we use high-level semantic language in learning and inferring visually difficult or rare activities (e.g. loitering), which can be described succinctly but are visually ambiguous or their examples are hard to obtain? How do we architect systems that are open-domain to overcome limited capabilities and brittleness of current systems and that also learn easily from data and exhibit the strong generalization capacities of compositional systems? Can we develop mathematical tools for understanding and predicting performance of deep neural nets and transformer models, which have played such an important role in recent advances? Equally important is the design of complex real-world application scenarios and testbeds for theoretical development and evaluation.

Research Topic Chiefs:
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Topic 2

Title: Mission-focused AI (AI Fundamental and Applied Research)

Background: Future watch floor and planning cells will need to manage military missions that are becoming increasingly complex, and involve the coordination of new capabilities across warfighting domains without a comparable increase in staffing. With the speed of these transactions driven closer towards machine and not human, novel AI methods are needed to help human staff plan and/or consider future actions, monitor, and react to the large and constantly changing data environment surrounding a military mission. For example, in the current mission planning process staffs typically consider three enemy and own force courses of actions due to the time restraints during the process. Machine learning should allow the consideration of a far greater number of courses of action across a greater number of variables, distilling those considerations and options back into information that best supports decision making (e.g. choice architecture).

<u>Objectives:</u> The goal of this basic and applied research topic is to investigate and develop techniques to support mission planning and execution activities that are dynamic, uncertain, and require coordination across different areas. Solutions are sought that will provide applications or foundational knowledge that enable the generation and evaluation of Courses of Actions (COA), transfer of learning across mission areas, countering mission focused AI, and interactive machine learning applications. Researchers may use game datasets such as from *StarCraft* or *Supreme Commander: Forged Alliance Forever* or unclassified datasets generated from mission simulators to support research.

<u>Research Focus Areas:</u>

1. Multi-class mission state classifiers: Naval watch floors monitor the state of a mission across multiple warfare areas (e.g. operations, logistics, intelligence, readiness). The mission state can be represented as multiple measures of effectiveness across each of these areas. The development of methods to assess the current mission state and predict future mission state, taking into account the inter-related nature of the different warfighting areas, is desired. (**Applied Research Focused**)

2. Methods to generate and rank Courses of Action (COA): Each sequence of decisions an AI algorithm makes in a game or mission simulation setting can be thought of as a course of action. These courses of action are driven by the terrain and environment, available forces, and mission objectives. The challenge is that these inputs are multidimensional. Terrain can include grids/rasters representing elevation or weather, 3D models representing surface objects, and polygons representing ground type; available forces may be represented as tabular data. The goal will be to develop a machine learning model which can take these multi-modal inputs and output a collection of feasible courses of action (i.e. sequences of decisions) and then rank them based on effectiveness. **(Applied Research Focused)**

3. Methods for dynamic adversary evaluation, alerting, and COA updates: Novel methods are needed to evaluate adversary course of actions during a mission given an expected set of potential courses of action and a sequence of mission events. While movement information is valuable, many other activities (e.g. communications) must be considered to determine overall behaviors relevant for COA consideration. Potential adversary/enemy courses of action (generated by a human operator or via another model) should be evaluated as part of ongoing operations and result in alerts and COA updates when changes occur. **(Applied Research Focused)**

4. Apply transfer learning across mission contexts: In transfer learning applied to AI methods, the goal is to accelerate the learning needed to answer one question by jump starting learning by using the lower layers of a neural network trained to answer another question. In a military domain, the challenge is to show that (for example) a decision tool to coordinate long range targeting developed in one mission context (opponent, location) can be used to rapidly train a service in a second mission context. **(Applied Research Focused)**

5. Countering Mission Focused AI: Assuming the adversary may be using similar machine learning techniques to guide mission planning and execution, devise techniques to misdirect their models into incorrectly estimating the current state of the mission space. The goal will be to devise a minimal set of actions which can lead to incorrect model estimation for the types of models described in the preceding problem statements. The basis for determining a minimal set of actions may include time, amount of resources, risk to objectives, or a combination of these (or other) metrics. **(Basic and Applied Research)**

6. Interactive Machine Learning: Frequently the problems that must be solved in mission analysis do not have sufficient data to form a viable training set for deep learning techniques or the problem is one that is not conducive to full delegation to an AI. Interactive machine learning can be used to work around these problems by incorporating the model into the human processes rather than replacing them. The goal will be to develop methods for a model to learn interactively as an operator applies the standard process. As the model learns it should then be able to make recommendations which reduce time and increase accuracy as the operator conducts the task. Quantifying uncertainty of the model results is crucial to ensure model recommendations are interpreted correctly during the incremental learning process. **(Basic and Applied Research)**

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Topic 3

Title: Collaborative AI (CAI)

Background: This topic seeks basic and applied research into creation of a class of AI-enabled software agents that are designed to dynamically interact with human decision makers in support of data-driven knowledge management tasks. CAI can be defined as AI approaches that involve the cultivation of collaboration between agents, both artificial and human, that can cooperate on common interest goals, with mutual engagement and working toward joint actions, can coordinate their effort, and can effectively communicate to address ambiguity and solve problems. The topic views key properties of CAI agents:

- **Cooperative**: agents help find ways to improve joint outcomes, even in the presence of conflict
- **Coordinated**: agents understand tasks and adapt to changing situations to achieve task objectives
- **Communicative**: agents can effectively interact with and leverage feedback from humans

We seek approaches that address and demonstrate all three properties of CAI agents, augment human decision makers with the role of advisors (decision aids and data brokers), and as a result can demonstrate that they significantly outperform teams without these capabilities.

Navy, Marines, and DoD as a whole, conduct operations across the globe that involve the production and capturing of data, cataloging data in various formats, managing that data, and automating data feeds that must be exploited to inform collaborative decision making. There are numerous analogs of these tasks outside the military domain. Historically, human teams have been constrained by resources and limited in time to extract, synthesize, and act on these massive data sets. Individually, humans have been overwhelmed by both the volume of and wide range of data types that must be processed with limited time constraints in support of task objectives (e.g., object recognition and change detection in images and video data to patterns and priorities in text and network data). Through real world experimentation, we seek to understand and overcome the challenges that limit our ability to build, test, evaluate, and deploy new AI capabilities into operational Naval decision support tools.

Objectives: Research under this topic will aim to create collaborative agents capable of working with humans towards common goals and support data intensive tasks under resource and time constraints in real-world settings. While using simulated, non-military applications is acceptable and expected, approaches must be capable of shifting from simulation environments to real world settings with humans, using real world data, dealing with real world complexities, and supporting goal-directed task feedback loops. The resulting agents must be incentivized to optimize on satisfying task objectives in data-driven environments with minimal data (see Figure 1 for desired CAI research direction).

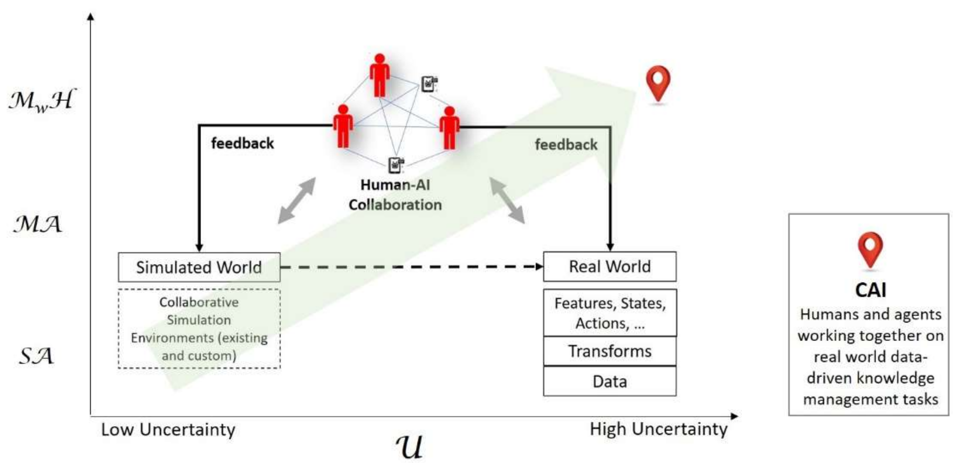

Figure 1. *Complexity increases with Uncertainty (U) in real world settings and degree of cooperative relationships from single agents (SA) to coordinated multi-agents (MA) to multi-agents collaborating with humans (M_wH)*

Real world settings will have unique challenges, from workflows involving large real-time data feeds and complex data processing pipelines, to new developing new agent training strategies and performance measurements. Real world tasks involve goals that are complex and can be difficult to specify and maintain as situations evolve. New approaches and methods are required for human and agents to effectively work together to solve data-driven knowledge management tasks, where agents can understand task objectives and know when to ask for help in realistically complex environments and have the potential to operate with sparse data. A central objective of the desired research is to enable the broader practical application of agents to real-world tasks.

<u>Research Focus Areas</u>:

1. Development of CAI agents to augment human teams on data-driven tasks

Research efforts will develop the necessary AI and human machine interaction capabilities where agents learn to effectively collaborate on goal-directed, data-driven knowledge management tasks. Task-focused collaborative agents should optimize on joint rewards and cooperative behaviors, augmenting humans by acting as partners to support common goals in a timely manner. All developed agents must possess all key properties of collaborative agents as defined by this special notice: cooperative, coordinated, and communicative.

Agents must be cooperative in order to work alongside human teammates towards achieving common goals, acting as partners in solving time and mission critical problems. These decision aids need to understand and support the task at hand, including any relevant environmental and operating constraints, needed information, and uncertainty in the data or task. Agents should recognize and perform tasks by proactively finding, organizing, and processing data in preparation for brokering information across a human team. Agents should also exhibit cooperation by integrating human feedback relevant to task performance in order to improve their capabilities or to better understand task objectives.

Relatedly, agents must be capable of facilitating two-way communication not only between other agents, but also between humans and AI, using common grounding to ensure clear, timely, relevant, complete and concise interactions. Agents should initiate these interactions when appropriate to support collaborative decision making, and should be able to rationalize, as necessary, interactions about the task to get or give needed clarification.

Lastly, agents must be capable of coordinating and adapting in the face of changing behaviors, novel situations, unexpected events, missing information, and new task settings or priorities. Given that team roles, structure, formation, and composition may change given the dynamics of the tasking and situation, such agents should maximize complementary knowledge, skills and abilities of other agents and humans.

The proposed research will demonstrate significantly improved performance of human-AI teams engaged in goal-directed, data-driven tasks. CAI agents should prove capable of facilitating information sharing, deconflicting tasks, and flagging inconsistent, changed, or missing information. CAI research will ultimately improve team performance by minimizing human workload and statificing time and/or task constraints.

2. Application of CAI agents in real world settings

A common scenario across many data-driven domains involves human teams that are overwhelmed in data and must make sense of and act on a flood of disparate, multimodal information in time constrained situations. Take, for example, the complexities of managing the humanitarian response to Typhoon Haiyan in 2013. Reacting to the devastation resulting from one of the strongest tropical cyclones on record, numerous international leaders pledged support after the disaster. This necessitated that multinational organizations collaborate with each other, various humanitarian aid organizations, and local authorities to ensure the delivery of supplies, personnel, funds, and other resources, all while monitoring multiple timelines, variable communications, and changes to the infrastructure in affected areas. The parties coordinating these efforts each had differing command or reporting structures, levels of experience, and access to critical information that would allow a successful relief operation. In addition, data collection, data preparation, and data processing may be conducted using a variety of decision support tools, requiring subsequent consolidating and interpretation when quick response times are critical. Note: This is a representative use case for decision makers needing to manage data and revise plans. Proposers are encouraged to use a use case from any problem domain that they are familiar with (and could get representative data for to use during initial development) in describing how they would develop CAI agents. In the future, we envision integrating CAI agents with staffers and their tools, significantly accelerating and improving the accuracy of such data-intensive tasks and supporting the overall collaborative decision-making process. They will do this by offering some level of subject matter expertise, monitoring and managing available data and its flow, missing data, data changes etc.

The primary application domains of interest include operational planning, intelligence analysis, and crisis response planning, although performers are welcome to select a domain that exhibits a similar use case and scenario where performer have access to sufficient data. Critically, the selected domain should reflect the complexities of performing data-driven knowledge management tasks in a team setting under severe time constraints. CAI agents should not be conceived as general purpose agents for all possible tasks and contingencies but rather tailored to well specified tasks, task objectives, and data requirements. Agent capabilities need to address specific problems, challenges, complexities, and uncertainties in real world settings through real world experimentation.

Agent development and training efforts can utilize synthetic, simulated, or real-world data to train and deploy agents (e.g. existing or customized environments relevant to CAI research), but success will be measured based on future ability of agents to be transfer to real-world problem solving and integration into Naval operational decision support tools. Data sources would include intelligence data, logistics data, statistical data, enemy military situations, enemy forces and intent, and area of operations (including topographic, hydrographic, terrain, vegetation, and other environmental data), etc. Real-time data feeds must be transformed and fused into data representations and pipelines that can be used to train agents. Data are also required to conduct quantitative analyses and to construct predictive or simulation models in support of task objectives, such as developing operation plans, operation orders, intelligence analysis products, or crisis response plans.

Agent development approaches need to transition from operating solely in simulation to real world environments, where agents must be able to deal with historical and real time data, and use training strategies that adapt to real world uncertainties and dynamics. Simulation environments should support realistic collaborative scenarios wherein agents work together with other agents and human teams.

While the actual integration and interaction of CAI agents with Naval systems in operational environments is beyond the scope of this effort, demonstration of feasibility is critical.

Program Structure:
We request a maximum 5-page white paper prior to full proposal submission. The white paper will describe the following:

- Description of agent capabilities being proposed, and their expected utility
- Proposed technical approach to CAI agents
- A summary of the most critical technical problems / research questions to be addressed be the proposed research
- Domain and data-driven task (use case(s)) to be used to develop the agent technology
- Strategy for training agents
- Strategy for deployment of agents in a real-world setting
- Anticipated data requirements for using developed agents
- Simulation environments, data, and metrics you plan to use in developing and testing your agents

Full proposals will expand on the white paper and include the following:

- Present a clear story of the proposed research, an understanding of the current state of the art, where the science and technology are headed, and specific contributions to be made
- Describe the science and capabilities required to achieve a successful end state for a collaborative AI capability
- Specify an application domain and task in which teams can demonstrate past performance
- Frame the research and progress along well-defined research & development milestones; provide milestone descriptions in text and provided details to quarter year
- Clearly identify datasets, benchmarks, and simulation environments planned to be leveraged
- Provide sufficient detail on agent training strategies and how agents will be evaluated
- Define technical measures and metrics of key aspects and constructs of collaborative agent capabilities. Metrics should include progress in terms of how well agents cooperate, coordinate, and communicate in support of data-driven tasks. Additional metrics may include degree of cooperative behaviors, adaptiveness to novel situations or priorities, effectiveness of interactions, trustworthiness, improved task performance, etc.
- Identify principle performers on research team
- Define a program schedule and critical program performance metrics supported by a Program Objective And Milestone Chart (POAM)
- Cost & labor scope for two 24-month phase of effort

Proposals need to define 2 phases each with a notional duration of 24 months.

Phase 1: Initial Capability Development (24 Months): Phase 1 will focus on research and development of a proof of concept capability and will conclude with a functional feasibility demonstration. Phase 1 research should focus on tasks for which proposers are thoroughly familiar, and for which they will be able to obtain data to support the creation of CAI agents. Phase 1 results will be assessed based on the following: (1) promising technical approaches and progress along key milestones as identified by the proposer, (2) major technical accomplishments, (3) robustness of approaches to key properties and challenges in contributing to collaborative AI, (4) demonstration of the approach to domain and task of the proposers choosing to include lessons learned with data, training strategies, and metrics, (6) scientific contribution to advancing agent technologies towards CAI objectives, (7) use of open source development and best practices for reproducibility, and (8) concepts and plans for real world experimentation to be addressed in Phase 2.

Successful Phase 1 efforts will have opportunity to proceed to Phase 2.

Phase 2: Scalability Demonstration & Technology Maturation (24 Months): Phase 2 will evolve proof of concept capabilities into full collaborative multi-agent prototypes and focus on real world experimentation and demonstration. Phase 2 will explore real world deployment and integration of CAI agents, for example, into a Naval mission planning domain to augment Naval planning staff.

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REFERENCES

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Dafoe, Allan, Edward Hughes, Yoram Bachrach, Tantum Collins, Kevin R. McKee, Joel Z. Leibo, Kate Larson, and Thore Graepel. 2020. "Open Problems in Cooperative AI."

Panait, Liviu A., and Sean Luke. n.d. "Collaborative Multiagent Learning: A Survey." 48.

IV. WHITE PAPER SUBMISSION

Although not required, white papers are strongly encouraged for all offerors seeking funding. Each white paper will be evaluated by the Government to determine whether the technology advancement proposed appears to be of particular value to the Department of the Navy. Initial Government evaluations and feedback will be issued via e-mail notification from the Technical Point of Contact. The initial white paper appraisal is intended to give entities a sense of whether their concepts are likely to be funded.

Detailed Full Proposal (Technical and Cost volumes) will be subsequently encouraged from those Offerors whose proposed technologies have been identified through the above referenced e-mail as being of "particular value" to the Government. However, any such encouragement does not assure a subsequent award. Full Proposals may also be submitted by any offeror whose white paper was not identified as being of particular value to the Government or any offeror who did not submit a white paper.

For white papers that propose efforts that are considered of particular value to the Navy but either exceed available budgets or contain certain tasks or applications that are not desired by the Navy, ONR may suggest a full proposal with reduced effort to fit within expected available budgets or an effort that refocuses the tasks or application of the technology to maximize the benefit to the Navy.

White papers should not exceed 5 single-sided pages, exclusive of cover page, references, and resume of principal investigator, and should be in 12-point Times New Roman font with margins not less than one inch. White papers shall be in Adobe PDF format (preferred) or in Microsoft Word format compatible with at least Microsoft Word 2016.

The Cover Page can be found at https://www.nre.navy.mil/work-with-us/how-to-apply/submit-contract-proposal for contract submissions and at https://www.nre.navy.mil/work-with-us/how-to-apply/submit-grant-application for grant submissions.
The 5-page body of the white paper should include the following information:

- Technical Concept: A description of the technology innovation and technical risk areas.
- Future Naval Relevance (where applicable) – A description of potential Naval relevance and contributions of the effort to the agency's specific mission.
- Operational Naval Concept (where applicable) – A description of the project objectives, the concept of operation for the new capabilities to be delivered, and the expected operational performance improvements.
- Operational Utility Assessment Plan (where applicable) – A plan for demonstrating and evaluating the operational effectiveness of the Offeror's proposed products or processes in field experiments and/or tests in a simulated environment.
- Rough Order of Magnitude (ROM) cost estimate

A resume of the principal investigator, not to exceed 1 page, should also be included after the 5-page body of the white paper.

White papers must be submitted through Fedconnect at www.fedconnect.net in accordance with Section D. Application and Submission Information, Section 2. Content and Form of Application Submission, paragraph d. White Paper Requirements, ii. White Paper Submission in N00014-23-S-B001.

To ensure full, timely consideration for funding, white papers should be submitted **no later than Sunday, October 30, 2022 at 1200 EST**. White papers received after that date will be considered as time and availability of funding permit.

The planned date for completing the review of white papers is **Wednesday, November 30, 2022**.

V. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION

Full proposals should be submitted under N00014-23-S-B001 by **Sunday, October 30, 2022 at 1200 EST**. Full Proposals received after that date will be considered as time and availability of funding permit.

ONR anticipates that both grants and contracts will be issued for this effort.

Full proposals for contracts should be submitted in accordance with the Appendix 2 of N00014-23-S-B001. Full proposals for grants should be submitted via Grants.gov in accordance with Appendix 1 of N00014-23-S-B0001.

The period of performance for projects may be from **3 – 5 years**.

Although ONR expects the above described program plan to be executed, ONR reserve the right to make changes.

Funding decisions should be made by **Wednesday, November 30, 2022 at 1200 EST**. Selected projects will have an estimated award date of **4 – 6 months after selection**.

VI. SIGNIFICANT DATES AND TIMES

Event	Date	Time
Recommended White Paper Submission Date*	**October 30, 2022**	**1200 EST**
Notification of White Paper Valuation*	**November 30, 2022**	**1200 EST**
Recommended Full Proposal Submission	**November 30, 2022**	**1200 EST**
Notification of Selection: Full Proposals *	**December 30, 2022**	**1200 EST**
Awards *	**4 – 6 months after selection**	**1200 EST**

Note: * These are approximate dates.

VII. Small Business Subcontracting

As indicated in ONR Broad Agency Announcements large businesses and non-profit organizations must submit a subcontracting plan along with their research proposal. While large businesses and non-profits are responsible for making these subcontracting arrangements, ONR will help facilitate prime contractor/small business contracting connections by posting to the ONR external website contact information of small businesses that have indicated their subcontracting interests and technological niche for prime contractor consideration for this program. This is not an endorsement, but an effort by ONR to help bring these parties together to provide superior solutions.

If you are a small business, and your company is interested in subcontracting activities with large businesses and/or non-profits considering your technology for this program, please provide the following information by email, to the ONR Small Business Director at ellen.simonoff@navy.mil with the subject line, "BAA Call N00014-23-S-C001". Provide this information:

1) Company Name and Website
2) Individual (POC) name and POC email address
3) Business Size and socio-economic category
4) Brief Technology Description (no more than 3 sentences)
5) Technology Key Words (no more than 10 words)

Note: Do not include ANY proprietary information. This information will be posted on the ONR website under this BAA call and will available to the public.

VIII. POINTS OF CONTACT

In addition to the points of contact listed in N0014-23-S-B001, the specific points of contact for this announcement are listed below:

Technical Points of Contact:

Topic 1:
Dr. Behzad Kamgar-Parsi, ONR 311, 703-696-5754, behzad.kamgarparsi.civ@us.navy.mil;
Dr. Thomas McKenna, ONR 341, 703-696-4503, thomas.m.mckenna4.civ@us.navy.mil.

Topic 2:
Peter Squire, ONR 341, 703-696-0407, peter.n.squire.civ@us.navy.mil

Topic 3:
Dr. Jeffrey Morrison, ONR Code 341, (703) 696-4875, jeffrey.g.morrison.civ@us.navy.mil

Business Point of Contact/Contracting Officer:
Charles S. Weiner, 813-465-3473, charles.s.weiner.civ@us.navy.mil

VIII. SUBMISSION OF QUESTIONS

Any questions regarding this announcement must be provided to the Technical Points of Contact and/or the Business Point of Contact listed above. All questions shall be submitted in writing by electronic mail.

Answers to questions submitted in response to this BAA Call will be addressed in the form of an Amendment and will be posted to the following web pages:

- Beta.sam.gov Webpage –Contract Opportunities – https://beta.sam.gov/
- Grants.gov Webpage – http://www.grants.gov/
- ONR BAAs, FOAs and Special Program Announcements Webpage - https://www.nre.navy.mil/work-with-us/funding-opportunities/announcements

Questions regarding **White Papers or Full Proposals** should be submitted NLT two weeks before the dates recommended for receipt of White Papers and/or Full Proposals. Questions after this date may not be answered.