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**SMALL BUSINESS INNOVATION RESEARCH**

**PHASE II STATEMENT OF OBJECTIVES  
FOR**

**NAME: HUMAN MACHINE TEAMING FOR REDUCTION OF OPERATOR COGNITIVE LOAD**

**TOPIC SOCOM224 D004**

**I. INTERNATIONAL TRAFFIC AND ARMS REGULATION:** The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 5.4.c.(8) of the solicitation. Additionally, Offerors will describe compliance mechanisms offerors have in place or will put in place to address any ITAR issues that arise during the course of agreement administration.

**II. BACKGROUND:**

DoD users have a high cognitive load to accomplish all their simultaneous tasks on various mission threads. In order to relieve a portion of this cognitive load, program offices are working with users to identify specific cognitive loads that the human would like to offload to the machine. The machine would act as an Artificial Intelligence Decision Support System (AI-DSS), providing answers, recommendations, and the like back to the operator. This enables the human to focus on tasks only humans can currently accomplish based on complexity, policy, and/or trust. The goal of this effort is to enable a machine to understand real world objects, their interactions, mission goals, legal/policy/doctrinal/physical constraints, the environment and other categories from which inference can be reached to establish a knowledge representation where the machine can provide decision support. This will reduce user's cognitive load, reduce the human decision space, and potentially accelerate Observe, Orient, Decide, and Act (OODA) loop and mission accomplishment, while potentially reducing uncertainty.

This Phase II effort requires the firm to pursue the following innovative research and developmental efforts:

- Identify the most relevant, advanced technology, whether this is open-source frameworks, tools, or algorithms or closed source solutions.
- Pursue applicable intelligent agent technology to achieve the stated goals.
- Properly identify and consider trade space for the larger problem (AI technology and the prescribed mission thread(s)) as well as decision analysis and resolution (DAR) for other decisions made for the prototype(s). This must be applied with the appropriate level of rigor without over-analyzing various aspects. Decisions should be documented in a lean fashion.

Note: Any products mentioned in this SOO are only examples and are not to be construed as the preferred solution.

**III. OVERALL OBJECTIVE:**

The objective of this Statement of Objectives is to develop AI-DSS to achieve a Human Machine Teaming (HMT) construct for specific DoD mission thread(s) that will be provided by the Government.

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#### IV. Requirements

A. **General:** The Contractor shall deliver source code and binaries as well as a design, Infrastructure as Code (IaC) (as applicable) and supporting documentation for Government follow-on testing and demonstration. The code deliverables will be updated with each sprint cycle in the Government Software Development Environment (GSDE) per CDRL A012. Electronic transmission of data is required inside GSDE as the deliverable.

1. **Detailed Requirements:** The Contractor shall identify relevant technology, design, develop, test, integrate, demonstrate, and deliver the software to a USSOCOM designated Cloud Based Software Factory that meet or exceed the following performance requirements:

- a. Pursue *intelligent agent* technology to achieve the stated goals.
- b. Develop AI algorithms or intelligent agents to support the identified objectives.
- c. The factors influencing the decision space are constantly changing, so the solution must be able to continuously reassess the situation.
- d. Many answers or recommendations have a quality or relevance that expires. Therefore, they must include an expiration time.
- e. Consider alternative Knowledge Representations to identify the preferred approach.
- f. Scalability – Solution must be dynamically scalable to handle changes in AI-DSS tasks.
- g. Performance – The solution must provide answers within operationally relevant speeds. This may change based on the mission thread(s).
- h. Quickly convey relevant information to the end user about the decision data (e.g., answer or recommendation). Provenance – The solution shall be able to reveal how the machine derived the answer(s) in a rapidly digestible fashion.
- i. Meets a Technology Readiness Level 6 which is defined as “System/subsystem model or prototype demonstration in a relevant environment. Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology’s demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.
- j. Apply the appropriate compute hardware such as Central Processing Unit [CPU], Graphics Processing Unit [GPU], Field Programmable Gate Array [FPGA], Tensor Processing Unit [TPU] to the various algorithms to achieve operationally relevant performance.
  - a. These compute resources should be available in one or more Commercial Cloud Service Providers (CSP) offerings.

2. **COMPONENT REQUIREMENTS:** None stated.

B. **DOCUMENT DELIVERABLES:** The Contractor shall provide the following documents to the respective specified addresses during the Phase II Period of Performance:

Note: The effort will apply Scaled Agile Framework (SAFe) approaches that employ end user feedback events, rather than traditional *technical reviews*. However, the effort will use the traditional CDRL and Data Item Descriptions (DID) as listed below. They will be tailored to align with agile practices. There will ideally be multiple end user engagements that culminate in a design/trade space/risks event. The maturing software prototype(s), associated documentation, and end user feedback along this journey will be the primary artifacts being evaluated at these events. The optional CDRLs identified below are

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meant to be lean and not cumbersome. The CDRLs identified below are meant to be lean and not cumbersome. The Data Item Descriptions (DID) will be tailored as necessary to achieve this leanness.

### **CDRLs:**

1. Monthly Progress Reports: See CDRL A001.
2. Business Plans: See CDRL A002.
3. Final Technical Report: See CDRL A003.
4. Financial Status Report: See CDRL A004.
5. Contractor Acquired Property: See CDRL A005.
6. Kick-Off/Epic Hypotheses review: See CDRL A006.
7. Developmental Test Plan for Performance Validation: See CDRL A007. Note: The artifact must address the approach to achieving evidence of the hypotheses and goals for Human-Machine Teaming (HMT).
8. Developmental Test Report for Performance Validation: See CDRL A008. Note: The artifact must capture evidence addressing the hypotheses and goals for HMT. This includes multiple prototype demos and user engagements.
9. Maturity and End User Engagement Review Design Review Information Package (DRIP): See CDRL A009. This is will be tailored for agile development. See note above.
10. Maturity and End User Engagement Demo DRIP: See CDRL A0010. This is will be tailored for agile development. See note above.
11. Product Backlog: See CDRL A011.
12. Computer Software Product: See CDRL A012.
13. Meeting Minutes: See CDRL A013.
14. Training Materials: See CDRL A014. Note: These will be limited to artifacts required to show end users how to use the prototype(s) to gain user feedback.

**V. TESTS AND DEMONSTRATIONS:** The Contractor shall conduct tests and demonstrations to validate that the AI-DSS prototype(s) meet or exceed all the requirements specified in this Statement of Objectives and achieve the overall goal of reducing human cognitive burden while retaining or improving overall mission performance. (See CDRL A007 and CDRL A008).

A. The Contractor shall demonstrate that the prototype(s) meet or exceed the performance of the identified hypothesis and Features, User Stories, and Acceptance Criteria (AC) elicited from end users and captured in the Product Backlog. (Note: The Product Backlog is a set of entries in an issue tracking tool that have not yet been implemented.) (See CDRL A007, CDRL A008, and CDRL A011).

**VI. ENVIRONMENTAL AND SAFETY:** N/A

**VII. GOVERNMENT FURNISHED PROPERTY (GFP) / GOVERNMENT FURNISHED PROPERTY (GFE) / GOVERNMENT FURNISHED INFORMATION (GFI):** The government will provide the contractor access to the source code and/or binaries for Mission Command System/Common Operational Picture (MCS/COP) as well as data sources, applicable APIs, and access to sensor control interfaces. The government will also make available access to a dedicated vendor integration team and users in which to conduct left seat/right seat sessions to describe the problem set and what a potential solution would look like. The Government does not intend to provide the Contractor any GFP, GFE or GFI. However, the Contractor shall specify by stock number and nomenclature any GFP/GFE/GFI the Contractor believes is needed to successfully complete the requirements specified in this Statement of Objectives.

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**VIII. PERIOD OF PERFORMANCE:** The maximum Period of Performance for this Phase II effort is twelve (12) months. The Contractor can propose a lessor Period of Performance if a lessor Period of Performance does not jeopardise the Contractor's successful completion of the requirements specified in this Statement of Objectives.

**IX. MEETINGS AND REVIEWS:** The Contractor shall attend the following meetings and reviews.

A. Phase II Kick-Off meeting shall be conducted in Tampa, Florida not later than thirty (30) calendar days after contract award. The Contractor shall provide the Government:

1. A Phase II Kick-Off Meeting Read-Ahead no less than seven (7) calendar days prior to the Phase II Kick-Off / Epic Hypotheses Review Meeting (See CDRL A006).
2. Conceptual drawings no less than seven (7) calendar days prior to the Phase II Kick-Off / Epic Hypotheses Review Meeting (See CDRL A006).
3. An initial Program Management Plan for accomplishing all objectives specified in this Statement of Objectives. (See CDRLs A001).

B. Prototype demonstrations and end user engagements - These meetings shall be conducted at the Contractor's facility or virtual if the end users are unavailable to travel. The first one will occur no more than ninety (90) calendar days after Phase II contract award. Subsequent events will be arranged based on the availability of end users. They will occur no more than 2 months apart. The expectation is that end users will have additional opportunities to provide feedback via other forums such as email, phone calls, etc. The Contractor shall provide teleconference capability for those participants unable to travel. The Contractor shall provide the Government:

1. Trade off considerations for the design/solution. (See CDRL A009 or CDRL A010, as appropriate).
2. Results of any testing to date. (See CDRL A008).
3. Resolution to any Contractor/Government issues, action items, or concerns.
4. An assessment of other potential benefits/impacts of the prototype(s) to be incorporated into the subsequent design/solution that will be provided to the Government at the follow-on events. (See CDRL A009 or CDRL A010, as appropriate).

C. Phase II Close-Out Meeting: The Phase II Close-Out Meeting shall be conducted in Tampa, Florida no earlier than seven (7) calendar days prior to the conclusion of the Phase II Period of Performance. The Contractor shall provide the Government:

1. A briefing on the test verification and validation. (See CDRL A008).
2. An update of the progress to date. (See CDRL A001 and CDRL A004).
3. Resolution to any Contractor/Government issues, action items, or concerns.

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X. **NOTIFICATION:** The Contractor shall notify USSOCOM no less than thirty (30) calendar days prior to tests, demonstrations and reviews at the Contractor's facilities to ensure USSOCOM representatives can attend should they desire to do so.

XI. **TRAVEL REQUIREMENTS:** The Contractor shall comply with the Federal Acquisition Regulation 31.205-46 (<http://www.gsa.gov/perdiem>) on proposing all travel related costs. The Contractor shall include the costs associated with the following travel requirements in the proposal:

A. Phase II Kick-Off Meeting: Tampa, Florida; one (1) overnight, no more than three (3) Contractor representatives.

B. Phase II Close-Out Meeting: Tampa, Florida; one (1) overnight, no more than three (3) Contractor representatives.

C. Vendor/User Engagement (total of 2 travel events): CONUS travel to a customer site Coronado, CA (NSW), Ft Walton Beach, FL (AFSOC), Ft Bragg, NC (JSOC), Ft Bragg, NC (USASOC), Tampa, FL (SOCOM), Jacksonville, NC (MARSOC); four (4) nights, no more than three Contractor representatives. The engagement locations have not yet been determine. For the purpose of preparing the proposal, the Offeror shall include 2 trips to the location that has the greatest travel expense.

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