

SMALL BUSINESS INNOVATION RESEARCH
PHASE II STATEMENT OF OBJECTIVES
FOR
ARTIFICIAL INTELLIGENCE-DRIVEN VOICE CONTROL AT THE EDGE
TOPIC NUMBER SOCOM224-D005
1 JULY 2022

EXPORT CONTROL: 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.

BACKGROUND:

The Department of Defense is interested in technologies to automatically process, disseminate, and query information as close to the point of collection as possible while reducing bandwidth requirements. There is a significant need to reduce the cognitive burden associated with operating multiple electronic systems in support of Special Operations Forces (SOF) missions. This includes the need for hands-free operation of Unmanned Aerial Systems (UAS) and sensors in areas of limited connectivity and logistical support.

OVERALL OBJECTIVE:

The objective of this Statement of Objectives (SOO) is to reduce the operator cognitive and control workloads in the operation of Unmanned Aerial Systems (UAS) and respective sensor payloads organic to SOF operations. The solution shall include natural language processing of speech-to-text that does not require scripted commands or reach back to second order data processing. Voice commands shall be conveyed to the system via robust audio processing, preferably via SOF organic Push To Talk (PTT) radio microphones, that can operate effectively amidst significant background noise and electromagnetic congested environments. Data processing shall utilize small form factor COTS components integrated on the aerial platform or the ground control system (and/or an Android Tactical Assault Kit (ATAK) application) and not require connectivity or backhaul to fixed site servers. The system shall be capable of multi-command ingest, on the fly command changes, and autonomous course of action generation to catalyze mission planning and execution.

REQUIREMENTS:

GENERAL: The Contractor shall deliver software integrated into a UAS for evaluation by users at three intervals throughout the program. The Contractor shall deliver compiled software at the conclusion of the program incorporating knowledge and learning from prior user interactions. The Contractor shall also deliver sufficient documentation of the software to identify interfaces, minimum hardware requirements, and operator instructions. The Contractor shall deliver four (4) Artificial Intelligence-Driven Voice Control at the Edge

(ADViCE) prototype kits for follow-on testing and evaluation. Each kit shall include software license integrated on necessary hardware to integrate with control device and protective cases to transport all kit items. The Prototype Operator/Maintenance Manual shall describe procedures for placing the system into service, relevant field maintenance, and troubleshooting procedures.

DETAILED REQUIREMENTS:

The Contractor shall design, develop, fabricate, test, demonstrate, and deliver four (4) ADViCE kits that satisfy the following specific system attributes:

Attribute	Description	Threshold	Objective	Notes
Power Supply	Battery type	Existing power supply on ground control and UAS	O = T	No proprietary batteries
Power Consumption	Duration of operating time between battery change or charge at maximum output power	No more than 20% reduction of battery	Zero reduction of battery lifetime during use	Operating time in reference to the voice control system, not the UAS
Operating Conditions	Scenarios under which system shall accurately relay UAS control	Diverse natural or manmade terrestrial environments, including significant background noise associated with military operations (gun shots, artillery, vehicles, etc. - to be refined during user evaluation feedback)	Threshold, plus natural or manmade subterranean (subT) environments, including significant background noise associated with military operations (gun shots, artillery, vehicles, etc. - to be refined during user evaluation feedback)	Objective includes subT-to-subT and subT-to-terrestrial scenarios
User interface	System interface for end users in the field	Integration to UAS control system or common robotic controller	Threshold, plus ATAK integrated	
Controller integration	End User Device system to integrate with for UAS and sensor control	Single UAS Ground Control Station of Pixhawk SUAS	Common Robotic Controller (i.e. Tomahawk Kinesis, etc.)	Precise controller can be specified at kick off meeting.

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Attribute	Description	Threshold	Objective	Notes
Autonomous Behaviors	Capacity of actions which the system will autonomously execute	At least twenty independent behaviors	One hundred independent behaviors	Behaviors can be presented by the developer and/or outlined during user evaluation feedback sessions.
Platform	UAS platform to integrate for voice control	NDAA compliant small UAS (e.g. DIU Blue UAS)	Two or more platforms within EOTACS family of systems	
Sensor(s)	Payload sensors to integrate for voice control	Control of organic UAS sensor functions	Sensor control commands in multiple coordinate frames of reference (Ex. "surveil area North of point Alpha")	
Organic Processing	Edge processing with no server reach back	Offline speech to text, natural language processing	O = T	
Command Verification	Ability to operator with provide feedback on commands received	Confirm receipt, relay misunderstood input, suggest missing or incorrect input via text response, graphical identification of commanded UAS	Threshold, via audible response	Notification settings shall be customizable per individual operator
Dynamic Commands	Ability to send multiple commands simultaneously	Multiple command ingest	Threshold, plus ability to modify commands on the fly	
System latency	Time required to process speech and autonomously begin UAS/sensor commands	<3 seconds	<0.1 second	
Zeroing function	Ability to remotely clear control of UAS	Ability to clear voice control software link	O=T	Need to be able to eliminate from the network a UAS that has been compromised or lost.

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Attribute	Description	Threshold	Objective	Notes
Network infrastructure	Connection and communication mechanism between solution and UAS	Common cabling to tactical/UAS radio, microphone, controller, etc.	O = T	Integration to UAS common controller may direct inherent cabling.
TRL	Technology Readiness Level.	TRL 6*	TRL 7**	
Environmental Standards	Applicable standards	Designed for compliance with Military Standards 810G, "Department of Defense Test Method Standard: Environmental Engineering Considerations and Laboratory Tests".	Tested for Military Standard 810G compliance	MIL- STD- 810G is available at: https://www.atec.army.mil/publications

* Technology Readiness Level 6: 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."

** Technology Readiness Level 7: defined as "System prototyping demonstration in an operational environment (ground or space): System prototyping demonstration in operational environment. System is at or near scale of the operational system, with most functions available for demonstration and test. Well integrated with collateral and ancillary systems. Limited documentation available."

UNIQUE ITEM IDENTIFICATION: The Contractor shall include the DoD unique item identifications or a DoD recognized unique identification equivalent for the prototypes delivered. This includes a description and cost breakout as applicable. Information on unique item identifier types is at http://www.acq.osd.mil/dpap/UID/uid_types.html. The guide is at <http://www.acq.osd.mil/dpap/UID/guides.htm>. This is in accordance with DFARS 252.211-7003.

SHIP TO ADDRESS: The Contractor shall deliver all prototypes systems delivered under this contract to the following address:

US Army Special Operations Command (DoDAAC: W81RUC)
 Attn: Joshua W. Fox
 2929 Desert Storm Dr.
 Fort Bragg, NC 28310
 (910) 396-0561

SHIPPING COSTS: The Contractor shall pay all costs to ship all product deliverables to and from the validation testing /demonstration sites and to the final delivery location.

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

1. Kick-Off/System Requirements Review (CDRL A001)
2. Quarterly Progress (and Backlog) Reports (CDRL A002)
3. Financial Status Report (CDRL A003)
4. Developmental Test Plan for User Evaluation Session (CDRL A004)
5. Consolidated User Evaluation Report (CDRL A005)
6. Business Plans (CDRL A006)
7. Final Technical Report (CDRL A007)
8. Contractor Acquired Property (CDRL A008)
9. Prototype Operation/Maintenance Manual (CDRL A009)

USER EVALUATION FEEDBACK SESSIONS AND FINAL DEMONSTRATION: The Contractor shall conduct three (3) user evaluation feedback sessions to validate that the prototype system meets or exceeds all the requirements specified in this Statement of Objective (See CDRL A004 and CDRL A005). These sessions shall take place on a quarterly bases throughout the period of performance. The user evaluation feedback sessions shall take place in vicinity of Fort Bragg, North Carolina. Additionally, the contractor will conduct an end of project demonstration to confirm system attributes of this Statement of Objectives were met in the delivered prototype kits.

ENVIRONMENTAL AND SAFETY: The Contractor's prototype devices developed under this Statement of Objectives will be safe for use and shall be designed to meet environmental and safety standards as specified in the Attribute Tables.

GOVERNMENT FURNISHED PROPERTY (GFP) / GOVERNMENT FURNISHED PROPERTY (GFE) / GOVERNMENT FURNISHED INFORMATION (GFI): The Government does not intend to provide the Contractor any GFP, GFE or GFI. However, the Contractor may request 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 and identify risk reduction strategies if Government is unable to the provide requested items.

PERIOD OF PERFORMANCE: The maximum Period of Performance for this Phase II effort is eighteen (18) months. The Contractor can propose a lessor Period of Performance if a lessor Period of Performance does not jeopardize the Contractor's successful completion of the requirements specified in this Statement of Objectives.

MEETINGS AND REVIEWS: The Contractor shall support the following meetings and reviews.

A. Kick-Off Meeting/System Requirements Review: This meeting shall be conducted at Fort Bragg, North Carolina 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 Meeting / System Requirements Review Meeting (See CDRL A001).
2. An initial Program Management Plan / Financial Status Report for accomplishing all objectives specified in this Statement of Objectives. (See CDRLs A002 and A003).
3. Initial Conceptual Design Drawings no less than seven (7) calendar days prior to the Phase II Kick-Off/System Requirements Review Meeting (See CDRL A001).

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B. User Evaluation Feedback Sessions: Three (3) sessions shall be conducted at Fort Bragg, North Carolina on a quarterly bases after kick off meeting. The Contractor shall provide the Government:

1. A developmental test plan for user evaluation feedback session, including user evaluation form. (See CDRL A004)

C. Phase II Close-Out Meeting: The Phase II Close-Out Meeting shall be conducted via teleconference 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
2. An update of the progress to date. (See CDRL A002)
3. Consolidated User Feedback Report (see CDRL A005)
4. Resolution to any Contractor/Government issues or concerns.

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.

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: Fort Bragg, North Carolina; one (1) overnight, no more than three (3) Contractor representatives.
- B. User Evaluation Sessions (3) and Final Demonstration: In vicinity of Fort Bragg, North Carolina, two (2) overnights, no more than three (3) Contractor representatives.
- C. Close-Out Meeting: In vicinity of Fort Bragg, North Carolina, two (2) overnights, no more than three (3) Contractor representatives.