Amendment 0001

Solicitation Number ONRBAA11-024

"Broad Agency Announcement (BAA) for Detection of Surface and Near-Surface Drifting/Oscillating Mines"

16 JUN 11

The purpose of Amendment 0001 is to amend the BAA and respond to questions submitted prior to 16 JUN 11.
Questions received after that date and before the deadline for submissions of questions will be addressed in a subsequent amendment.

BAA 11-024 is hereby amended as follows:

1. Section I, paragraph 6 entitled "Research Opportunity Description" has been revised as follows—changes highlighted in bold:

The Office of Naval Research (ONR) is seeking white papers describing innovative technology solutions leading to wide-area detection, classification, localization and tracking of surface and near-surface drifting / oscillating mines and prediction of mine drift from direct environmental observations and ocean models to support tactical planning. Surface and near-surface drifting mines include: mines designed to drift on the ocean surface; mines designed to drift and oscillate near the ocean surface within a preset depth range; improvised explosive devices intentionally cast adrift to harass maritime traffic; and moored mines intentionally or unintentionally separated from a tether.

There are two distinct but strongly connected products that work together to enable effective planning and conduct of mine countermeasures (MCM) operations in drifting mine environments. They are: (1) Compact Modular Sensor / Processing Suite (CMSS), and; (2) Mine Drift Tactical Decision Aid (TDA). It is likely that mature hardware solutions already exist and that the required innovation will come from the optimization of a sensor suite, the development of real-time target recognition algorithms, and techniques to characterize the environment in real-time onboard the platform.

1. Compact Modular Sensor and Processing Suite (CMSS)

The Compact Modular Sensor and Processing Suite (CMSS) is a wide-area search, multi-mission, platform-independent sensor package to provide real-time, **day/night** detection, classification, and localization of surface and near-surface drifting / oscillating mines through the fusion of compact sensors, advanced algorithms, and real-time onboard processing technologies. The deliverable will be a sensor package with improved algorithms integrated with data processing for real-time detection, classification, localization, and tracking from a tactical unmanned airborne vehicle (TUAV). The classification must be onboard the TUAV in real-time to allow for immediate neutralization of the target by a separate system (not addressed in this BAA). The sensor suite must also provide in-situ information about the environment to be used with the Mine Drift TDA to predict drift trajectories. Possible sensors include, but are not limited to, Synthetic Aperture Radar (SAR), Real Aperture Radar (RAR), and Electro-Optic Sensors.

2. Mine Drift Prediction Tactical Decision Aid (TDA)

The Mine Drift Tactical Decision Aid (TDA) will enable MCM planning operations in areas threatened by near-surface drifting mines. It will: (1) predict drift trajectories using real-time environmental and target observations from CMSS, oceanographic model data, and other sources to provide intelligent preparation of the environment before operations commence and situational awareness during operations; (2) provide tools to allow optimal deployment of the CMSS for search and/or environmental information gathering; and (3) provide tools to generate a ship maneuver plan which minimizes risk of engaging drifting threats. The final product will be a set of modular software components integrated into the existing mine warfare command and control environment.

Tasks:

Offerors can choose to propose solutions that address the entire problem or select aspects of the problem that best match their experience and capabilities. To facilitate this, ONR has broken down the problem into separate tasks. Offerors choosing to propose a solution to the entire problem must provide a separate white paper for each task.

(1) Wide-Area Detection, Classification, Localization, and Tracking of Surface Drifting Mines

In this task, a test-bed with one or more sensors will be optimally configured and flight tested to demonstrate wide-area detection, classification, localization and tracking of surface drifting mines as well as the collection of data to be used to characterize the ocean environment. The emphasis is on targets that are on or close to the ocean surface but not submerged under the ocean surface enough to require the use of sensors designed to penetrate a substantial amount of water. **A reasonable water depth for targets on or close to the ocean surface would be 0 to 3 feet.**

The data collected will be used for the development and evaluation of target recognition algorithms and characterization of the ocean environment. The data will be delivered in a Government specified format for distribution to performers working on the development of target recognition algorithms (Task 3) or characterization of the ocean environment (Task 4). The contractor(s) will participate in the flight test and data collection. The Government anticipates data collection to occur within 12 to 15 months after contract award.

(2) Detection, Classification, Localization, and Tracking of Near-Surface Drifting and/or Oscillating Mines

In this task, a test-bed with one or more sensors will be optimally configured and flight tested to demonstrate detection, classification, localization and tracking of near-surface drifting and oscillating mines as well as the collection of data to be used to characterize the ocean environment. The emphasis is on targets that are submerged below the ocean surface enough to require the use of sensors that can penetrate a substantial amount of water. **The maximum water depth would be 40 feet.** The data collected will be used for the development and evaluation of target recognition algorithms and characterization of the environment. The data will be delivered in a Government specified format for distribution to offerors working on target recognition algorithms (Task 3) or characterization of the environment (Task 4). The offeror will participate in the flight test and data collection. The Government

anticipates data collection to occur within 15 to 24 months after contract award.

(3) Target Recognition Algorithm Development

This task will develop two sets of detection & classification algorithms; one set for surface mines (i.e., with a surface expression) and one for submerged mines (up to the working depths of the sensors). White papers may address only one or both of these algorithm sets. A single algorithm set addressing both surface and submerged mines is also acceptable. The data sets emerging from Task 1 and Task 2 will not be available immediately; therefore contractors are encouraged to use existing data sets containing relevant targets to begin the demonstration of proposed algorithms before newly collected data sets are made available. Offerors must have access to existing data sets or demonstrate the ability to acquire existing data sets. The sensor details will depend on Task 1 & Task 2, but sensing modalities may include synthetic aperture radar, passive electro-optic, and active electro-optic. Additional consideration should be given to exploiting information including but not limited to thermal, polarimetry, and multispectral. Algorithms should accept raw data and produce data products according to a Government specified format. They should be modular such that they can be demonstrated in both post-mission software architecture and deployed in an embedded, real-time, power constrained TUAV. The primary challenge in algorithm design for this application stems from the extreme variability in environmental conditions. Therefore, in order to be considered competitive, the white papers must provide enough information to demonstrate that the proposed algorithms have sufficient ability to adapt to these variations. Further, offerors are encouraged to consider the use of performance estimation models to both estimate/report expected and in situ performance as well as optimally adapt the detection and classification process to the particular environment encountered. **The deliverable includes a description of the algorithms and detailed explanation of the results.** The Government anticipates data sets to be available within 2 - 3 months after completion of each data collection flight test as described in Task 1, Task 2, and Task 4.

(4) Characterization of the Ocean Environment

In this task, a test-bed with one or more sensors will be optimally configured and flight tested to enable observation of environmental phenomena relevant to the Detection, Classification, Localization, and Tracking of surface drifting mines and near-surface drifting and oscillating mines. The observations should be suitable for determining directional surface gravity wave spectra, surface currents, and indicators of optical properties of the water column, at a minimum. It is expected that sensing approaches to Tasks 1 and Task 2 and data collected during those tasks may also be suitable for environmental characterization; however, additional sensors may be necessary or desired to collect the information needed to characterize the environment.

(5) Mine Drift Prediction Tactical Decision Aid (TDA)

This task will integrate environmental data generated in Task 1, Task 2, and Task 4 as well as other sources (which may include in situ drifting sensors, output from NAVO models, intelligence products, among others) to produce an optimal forecast of mine drift, dispersion and probability of detection. A hierarchy of oceanographic models should be considered to address data availability, since data available for assimilation into forecasting models may be abundant, sparse or non-existent. Mine drift forecasts will be integrated into a set of planning tools to enable preparation of the battlespace before operations and situational awareness during operations. At a minimum, TDA planning tools should provide the capability to plan efficacious deployment of CMSS, and the capability to plan ship maneuvers. The deliverable is a stand-alone software service compatible with MIW C2 (e.g., MEDAL-EA, EPMA and NSAM).

The Government anticipates integrating a final test bed configuration for the purpose of simultaneously collecting data with the sensors demonstrated in Task 1, Task 2, and Task 4. Offerors should submit separate white papers for each task of interest. Offerors addressing two or more tasks may also submit a separate overview document describing synergies between tasks.
White papers should propose solutions which are suitable for deployment from a tactical unmanned airborne vehicle (TUAV) flying at a minimum altitude of 3000 feet and at a minimum velocity of 75 knots. **The target platform is the Firescout MQ-8B. It is reasonable to assume that there will be a 28 VDC power source capable of supplying 2.5 KW of power.** Target detection and classification shall be conducted in real-time onboard the TUAV to enable immediate neutralization of the target by a separate system. Proposed solutions must be able to demonstrate: (1) a high probability of detection, low number of false contacts, and classification onboard the platform to a level sufficient to classify the target with a high level of confidence; and (2) characterization of the environment in real-time onboard the platform. The technology solutions must be demonstrated at a technology readiness level (TRL) of 6.

After down-selecting white papers, full proposals may be requested from selected candidates. The maturity level of any hardware proposals addressing this BAA should be sufficient to support early Government supported testing. Testing will be over realistic target fields and will provide data sets to Task 3, and Task 5 performers. The ONR will require that all data sets collected be provided to the Government in a format suitable for distribution to additional performers to develop data handling and processing techniques, real-time algorithms and onboard classification techniques, and data fusion techniques.

2. Section IV, APPLICATION AND SUBMISSION INFORMATION, paragraph 2.a., delete the following bullet:

- **Other Requirements:** Quad Chart – A quad chart will be included in the white paper. (See attachment).

3. Section IV, APPLICATION AND SUBMISSION INFORMATION, paragraph 2.a., add the following bullet:

- **Budget:** A rough order of magnitude budget should be included in the white paper. Budget should include cost of proposed work by Government Fiscal Year.

Questions and Answers are provided as follows:

1. What are the specific gaps to be addressed by this BAA?

Answer: The technology areas of interest are described in the BAA Paragraph 6, Section I (General Information) refers.

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2. What is the target TUAV platform?

Answer: See Part (B) below.

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3. What is the water depth associated with Task 1?

Answer: See Part (B) below.

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4. Task 2 describes sensors "that can penetrate a substantial amount of water" Can you define substantial?

Answer: See Part (B) below.

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5. You state that the government anticipates integrating a final test bed. Are you only looking for sensor and software components, or will there be opportunities for contractors to participate in the integration of these technologies?

Answer: Under this BAA there will be opportunities for contractors to participate in the final integration. This will be dependent on the final sensors/software selected for integration.

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6. We would like to have an opportunity to call you to better understand your mission and requirements. Can we set-up a phone call?

Answer: All correspondence at this point has to be in writing and will be posted on the BAA site for others to read.

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7. Is a day/night capability preferred?

Answer: See Part (B) below.

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8. What are the considerations for all-weather operation?

Answer: The ability to detect targets in all weather conditions is an important consideration but is not a priority since some weather conditions prevent the aircraft from even flying.

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9. Is there any interest in exploiting existing ship radars for organic standoff detection of floating mines?

Answer: This is not being requested with this BAA.

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10. I assume the TUAV for Navy applications is Firescout (3000', 75 knots). Is there a minimum swath width requirement?

Answer: There is no minimum swath width requirement but a large swath width is desired to increase the search rate.

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11. How do the overall BAA requirements (TRL 6 sensor package/real-time results/compatibility with TUAV) flow down into the individual tasks, in particular with respect to a deliverable sensor package?

Answer: The deliverables for Task 1, Task 2, and Task 4 are the sensors and the data. The sensors will be tested in a realistic operational environment to collect meaningful data. The Government team will review the data and select the most appropriate individual sensors for integration into the final CMSS configuration. The CMSS configuration must be capable of being integrated onto the Firescout TUAV.

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12. What is the deliverable for Task 3?

Answer: See Part (B) below.

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13. Will data from relevant government programs be available as GFI?

Answer: The government team may provide data, as appropriate, to allow contractors to begin early development of algorithms.

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14. Under which task are the environmental estimation algorithms (wave spectra, currents, optical properties) developed and demonstrated?

Answer: Task 4.

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15. The government will be providing the test ranges and relevant targets. Will the government also be providing the relevant ground truth (water clarity, directional wave spectra, and local currents)?

Answer: Yes. The government team will attempt to collect and provide ground truth information.

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16. The BAA states that the government anticipates integrating a final test-bed for simultaneous collection (Tasks 1, 2, 4). As an alternative, we anticipate that we can integrate a single system that can simultaneously address all these requirements, thus eliminating the need for an additional integration step. Would you be receptive to this approach?

Answer: Contractors do have the option to respond to all of the tasks. If the combination of the tasks proposed result in a configuration that is consistent with the end goals of the program then the government may be receptive to this approach.

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17. Will the government be providing the test-bed aircraft? If so, what platform do you have in mind? As an alternative, we have a great deal of experience integrating systems (our own as well as others) onto a variety of airborne platforms for open ocean field experiments. Do you have any interest in the contractor leasing the aircraft, integrating the systems, and conducting the flight operations?

Answer: This will be handled by the government team.

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18. The BAA encourages submission of a separate overview document describing synergies between tasks. What is the page limit and mechanism for submission of this additional information?

Answer: There isn't a format for this document. If a contractor chooses to write a separate document it should be submitted with the white papers. Another option is to provide a paragraph in each white paper explaining the synergies.

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19. What is the value for search rate (square nautical miles per hour) associated with the term "wide area search"?

Answer: The expression "wide-area search" is used to describe the possible contribution of onboard radar for surface targets as contrasted with typical Electro Optic system search rates.

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20. What are the values for the ocean water optical properties (c, K, and beta-pi, or Jerlov water type)?

Answer: The scenario involves the deployment of CMSS to detect surface and near-surface drifting/oscillating mines in deep ocean water. Therefore, a range of optical properties should be used to reflect the expected real-world variability.

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21. What is the nominal mine diameter and reflectance?

Answer: The targets will vary.

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22. What probability of detection and false alarm rate are desired?

Answer: The goal is a high probability of detection with a very low false alarm rate.

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23. What are the requirements (in terms of size, weight and power) for the CMSS sensor package?

Answer: Size: 2.5 cubic feet; weight: 300 lbs; power: 2.5 KW. The entire package must operate on a Firescout TUAV.

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24. What "multi-mission" capability is sought? Does this include passive sensing missions currently handled by the BRITE Star II?

Answer: None. No.

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25. At what point in the CMSS program is TRL-6 to be demonstrated?

Answer: During the final integration test.

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26. What specific UAVs are under consideration for deployment of the CMSS?

Answer: The Firescout is the TUAV under consideration. Smaller platforms may be considered depending upon the final CMSS configuration.

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27. Execution of the Operational Utility Assessment Plan could benefit from the use of Navy personnel and facilities. Will it be possible to use other Navy assets and personnel during the CMSS program?

Answer: If unique facilities exist within the government and are needed for CMSS testing then they can be made available.

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28. A CMSS solution for Task 1 and Task 2 may incorporate mature, synergistic hardware elements that are operated in a new manner. Is it possible to collect early useful data using government facilities?

Answer: Yes.

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29. Is it permissible for figures within White Papers to contain Times New Roman text with a font size less than 12 point?

Answer: Yes. It must be readable.

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30. If a single technical approach can be offered for both Task 1 and Task 2, is it necessary to provide two separate White Papers?

Answer: Yes.

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31. What are, if any, the guidelines regarding power sources and ampacities available from the TUAV for use by CMSS? While designing to the lowest possible power requirement is desirable, certain sensor performance trades may be necessary depending upon the capabilities of the TUAV.

Answer: A reasonable assumption would be a 28 VDC power source capable of supplying 2.5 KW of power.

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32. Will the TUAV be re-purposed from a wide-area search mode to a loitering mode to facilitate tracking of a target once detected and classified? While the BAA references a separate system for neutralization, it does not indicate the desired level of complementary activity between the systems to facilitate neutralization.

Answer: The TUAV flight profile will be dependent upon the final capabilities of the CMSS package.

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33. Does ONR have a preferential performance estimation model or tool that will be used to compare all submitted concepts on a consistent basis, and if so, what is that model or tool?

Answer: No.

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34. The Defense Acquisition Guidebook defines [Hardware] TRL6 is a "representative model or prototype system tested in a relevant environment. Examples include testing a prototype in a high fidelity laboratory environment or in simulated operational environment" while TRL7 is "demonstration of an actual system prototype in an operational environment (e.g., in an aircraft, in a vehicle, or in space). Examples include testing the prototype in a test bed aircraft." Will the anticipated final test bed configuration for simultaneous data collection with the Task 1, 2 and 4 sensors be a [TRL6] high fidelity laboratory (or simulated) environment or a [TRL7] TUAV in the operational environment?

Answer: TRL-6

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35. The BAA references a quad chart attachment for inclusion in the white paper but the attachment appears to be missing. Would ONR kindly provide the referenced quad chart and/or the requirements for its content?

Answer: The requirement for a quad chart has been eliminated. See Part B.

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36. Are cost data required or desirable in the white papers? If so, what level of fidelity? While detail is provided for requested proposals, the BAA is silent regarding inclusion of costs in the whitepaper.

Answer: No, cost data is not required; however a high level estimate is required. See Part B.

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37. Are the budgetary figures provided in the BAA inclusive of the costs to provide a test aircraft and associated flight operations expenses, or are sensor test flights to be considered Government Furnished Services? In either case, has an airborne platform been identified to support flight tests, and if so, what is the envisioned test platform?

Answer: The government will provide a test aircraft and test ranges. The government anticipates using a manned helicopter for all testing.

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38. What are the environmental requirements (and similar, e.g. EMI, power, etc.) for the airborne sensor components?

Answer: The components must be flight worthy and be capable of being integrated into a TUAV at a later time**.**

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39. We are planning to propose solutions that address the entire problem. My question is can we submit all white papers (one for each task) under a single wrapper/ cover sheet?

Answer: No. There should be a separate wrapper / cover sheet for each white paper.

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