Special Notice N00014-18-SN-0001
Special Program Announcement for 2018 Office of Naval Research Research Opportunity: "CLAWS"

I. INTRODUCTION

This announcement describes a research thrust, entitled "CLAWS," to be launched under the N00014-18-S-B001, Long Range Broad Agency Announcement (BAA) for Navy and Marine Corps Science and Technology which can be found at http://www.onr.navy.mil/Contracts-Grants/Funding-Opportunities/Broad-Agency-Announcements.aspx. The research opportunity described in this announcement specifically falls under numbered paragraph A of the Ocean Battlespace Sensing S&T Department (Code 32). The submission of proposals, their evaluation and the placement of research contracts will be carried out as described in that BAA.

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 proposals.

II. TOPIC DESCRIPTION

The CLAWS Innovative Naval Prototype (INP) effort will develop autonomy and supporting technologies required to enable the survivability of Large and Extra Large Unmanned Underwater Vehicles (L&XL UUV) to complete functional assignments. In accordance with the Navy's UUV Family of Systems, Large UUVs are defined as vehicles greater than 21in and less than 84in diameter, Extra Large UUVs are diameter larger than 84". The goals of this effort will be focused on vehicle autonomy for awareness, decision making, and validation of the autonomous behaviors. The L&XL UUVs will enable the extension of Navy platforms sensing capability and oceanographic collections. The creation of these technologies and

behaviors will fill critical warfighting gaps at both the strategic and tactical levels. The technology areas specific to this effort that have been identified as critical to achieving these goals are 1) Autonomy and Sensing Technologies 2) Autonomy Validation.

1.1 TECHNOLOGY AREA 1: Autonomy and Sensing Technologies

The Office of Naval Research (ONR) is interested in receiving proposals for autonomy and sensing technologies to integrate into and test on L&XL UUV systems.

The effort will be broken out into base and option periods, noted as the proof of concept phase and autonomy demonstration phases. The objectives for each phase are described below. A full technical and cost proposal for the proof of concept phase and a description of the technical approach for the autonomy demonstration option are being requested at this time. ONR will initially select for award only proof of concept proposals.

The focus of the CLAWS effort is to be environmentally adaptive. The efforts will include autonomy definition and development, supporting hardware, at sea demonstration and validation. The deliverables will be the functional autonomous behaviors, supporting documentation, the sensor(s), reach back approaches, and sensing requirements for the L&XL UUVs to operate in coastal, open-ocean, and complex littoral environments. The requested L&XL UUV autonomous functions will include data collection, exfiltration, and sensor/system delivery for oceanographic data collection.

The hierarchy of the autonomous behaviors is consistent with decision making from oceanographic models and in situ, in stride ocean sampling leading to improved route planning, efficiency, and task execution. The L&XL UUVs will require in situ decision making for orienting, collecting, and acting on optimal data sets across open ocean, coastal, and complex littoral environments. Open ocean environments are defined as environments that have minimal amounts of traffic and or restraining features that limit the L&XL UUV navigation, communications, or operational depth of the vehicle. Coastal environments will be defined as the coastal ocean regions where the L&XL UUV will encounter extreme tidal variations, high currents, unmapped bottoms, plateaus, changes in salinity, and high variations in bottom contours. Note the previous items are listed as examples but are not limited to these cited considerations. A complex littoral environment will likely be any coastal environment the vehicle will be operating in with high obstacles densities per square mile and when the L&XL UUV is left for unattended/autonomous operations. A complex littoral environment will limit communication, navigational updates, and data transfer opportunities. It will be characterized by many types of noisy and mobile activities all of which may be a threat to the well-being of the L&XL UUV. The UUV may expect to encounter deep draft commercial merchant traffic, fishing activities of all types, marine mammals, geophysical prospecting, nets and bottom trawls which will need to be avoided. The aim of this effort is to ensure we sense and avoid before being seen, run over, entangled, or vandalized.

Additionally, the L&XL UUV will need to acquire ocean data of sufficient quality to inform existing predictive ocean models. The collected environmental parameters will enable an in

situ decision to be formed on: the number of samples collected/required, location(s)/orientation(s) to fully observe the phenomenon or features, and prioritizing the data fields to orient vehicle to transfer data or to hold the data until a time of less constrained operations.

Finally, depending on the required autonomous function the L&XL UUV will be required to deliver sensors to support sustained measurements and optimal sensor placement (onboard and off board). In this example connectivity with the relevant subject matter experts is critical, but will be limited. The data transfer rates with the L&XL UUV will not exceed 2.4 Kbs and will have time limitations, less than 5 minutes, for the connectivity duration. The L&XL UUV will be required to establish prioritized data matrices based on the environment and assignment. The matrices will be passed to the subject matter experts (SME)for concurrence and confirmation. It is envisioned that the SMEs will maintain the necessary communication requirements with the sensor after confirmation of deployment from the vehicle.

The objectives of the autonomy development portion of this CLAWS INP S&T program will be contracted in a base and option period.

- Autonomy Proof of Concept Base: This will be a six to twelve month base effort with funding ranging from $500,000 – $1,000,000. The base effort will document, define, and simulate the planned functional autonomous behavior(s). It will be assumed that changing environmental conditions (oceanographic, acoustic, and non-acoustic) will be represented in the simulation environment. The L&XL UUV will need to optimize location, orientation, and sensing mode to accomplish tasked assignments within the simulated environments. Simulations of the autonomous behaviors across three previous defined environments are required (coastal, open ocean, and complex littoral environments). Minimal operator assistance can be requested from the L&XL UUV over data rates not exceeding 2.4Kbs.
- Autonomy Demonstration Option: This will be a two to three year effort based on the accomplishments of the base period. The option will focus on the development of L&XL UUV autonomy software and hardware for long task durations greater than 45 days that can operate with minimal human interaction in specified areas (coastal, open ocean, and complex littoral environments). Decision making based on local environment (oceanographic, acoustic, and non-acoustic) is required to effectively complete tasked assignments. Obstacle avoidance, detection, identification, and characterization include all potential impediments to operations including natural and manmade stimuli. Once outside the notional communications limited areas, operator assistance can be requested from the L&XL UUV when the assignment requires. The data transfer rates will not exceed 2.4 Kbs and will have time limitations for the connectivity duration. Year 1 will continue to focus on development, implementation, and integration. Years 2 and 3 will focus on at sea experimentation, refinement, and validation. About ninety at sea days per year is expected to meet necessary requirements.

The CLAWS program will conduct simulations in the base period and at sea testing during the option period of this technical focus area. The proposal must define the language in which the algorithms will be coded, the simulation method for developing and testing the

algorithms, definition of sensors to be used, definition of the hardware that the algorithms will run, performance of the proposed autonomy, all interfaces to and from the algorithms and sensors, and the notional validation approach. MATLAB code is adequate for the base effort. The option period can be used to code the system into real time implementation.

Proposals can describe a complete system concept or specialized autonomy components that focus on one or more of the categories listed below. In all cases, proposals must provide a detailed scope of work for the development of the core technologies, including a description of the algorithm, development, laboratory implementation, embedded implementation using hardware in the loop, at-sea experimentation, validation approach, and power, volume, and weight estimates.

1.1.1 Background

ONR seeks full technical proposals for the development of vehicle autonomy technologies capable of the performance characteristics to operate for extended periods of time in coastal, open ocean, and complex littoral environments. Initial user feedback has identified technical gaps for autonomous behavior challenges. The initial user feedback list is identified below for example purposes and all other behaviors and functions deemed necessary should be proposed.

1) Environmental Awareness (oceanographic, acoustic, and non-acoustic) –
   - Develop local environmental attributes for informed task modification and execution
   - Drive and orient vehicle to minimize issue/mishaps
   - Orient vehicle to optimize system/sensor location and data collection
   - Decide when user interaction is required to complete tasking based on sampled environment
   - Develop near field interactions of vehicle with off board systems and features

2) Detect, Characterize, Identify, and Act –
   - Built from sense and avoid, route optimization, and statistical evaluation efforts
   - Drives vehicle based on behavior from the characterization of specific sensed attributes
   - Develops a data attributes metrics based on task priority and sensor pedigree
   - Optimizes approach, ingress, egress, and avoid behaviors for giving tasking and changing oceanographic, acoustic, and non-acoustic conditions
   - Efficiency of performing tasked effort

3) Task Execution –
   - Autonomous task scheduling based on in-situ decision making
   - Communicates (within system) relevant sensor attributes based on self-awareness
   - Relevant data transfers (internal and external) = passing minimum number of bits from sensor through system architecture
   - Receive relevant task objective updates based on collected data and attributes
   - Update task execution based on mastery of local environment with inputs from

external authority

4) Payload Delivery – Environmental sensor placement/deployment provided for reference payload sizes only. References are notional only and do not constitute a specific recommendation or solution.
   - "A" size – buoy
   - SOLO full size profiling Float
   - REMUS 600 or equivalent
   - Bluefin 21 or equivalent
   - EM-APEX floats
   - OBS sensors and mounting systems

Unexpected challenges may arise during autonomous operations, so the autonomy should be flexible to account for unknowns.

1.1.2 Program Plan

Autonomy Proof of Concept Base:

This will be a six to twelve month base effort with funding ranging from $500,000 – $1,000,000. The base effort will document, define, and simulate the planned functional autonomous behavior(s). It will be assumed that changing environmental conditions (oceanographic, acoustic, and non-acoustic) will be represented in the simulation environment. The L&XL UUV will need to optimize location, orientation, and sensing mode to accomplish tasked assignments within the simulated environments. Simulations of the autonomous behaviors across three previous defined environments are required (coastal, open ocean, and complex littoral environments). Minimal operator assistance can be requested from the L&XL UUV over data rates not exceeding 2.4Kbs.

During the base period, performers will work to develop the algorithms and hardware to meet the thresholds defined below in Table A1 and perform the objectives in autonomy proof of concept base period. If private funds have been used to develop technologies or concepts related to the proposed design, the U.S. Government requires, at a minimum, Government Purpose Rights in the technical data and computer software developed under the contract.

A full scale Government-operated UUV prototype may be provided as Government furnished property or as Government furnished information for autonomy testing and integration during the option in the autonomy demonstration portion.

TABLE A1: AUTONOMY ENVIRONMENTAL METRICS. All hardware shall meet the following environmental metrics:

Specification	Metric
OPERATING CONDITIONS	

Neutrally buoyant in Salinity	25 parts per thousand (ppt)
Water Temperature	-1.1°C to 35.0°C (30°F to 95°F)
Air Temperature	-28.9°C to 50°C (-20°F to 122°F)
Temperature Shock	-28.9°C to 50°C (-20°F to 122°F)
Shipboard Shock	MIL-S-901D (Grade B) while secured to transportation pallet
Shipboard Vibration	MIL-STD-167-1
Humidity	0-100 % relative humidity
Salt Fog	Marine Environment
Fungus	Avoid Materials that promote fungal growth

Icing/Freezing Rain	Operate where icing may occur from sea splash/spray
Electromagnetic Environment	MIL-STD-461F (RE101, RE102, RS101, RS103, CE101 and CE102)
Depth	Operate up to 1,000′
Non-Operating Conditions	
Transportation Altitude	0 to 12,192 M(0-40,000 ft) (pressurized or non-pressurized)
Transportation & Storage Temperature	-40.0°C to 108.9°C (-40°F to 160°F)
Transportation Shock & Vibration	Withstand ground, air, rail, ship transport (MIL-STD-1366E guidance)
Storage	Operate where icing may occur from sea splash/spray

Autonomy Proof of Concept Base Deliverables:

- Monthly progress and financial reports
- Algorithm description document
  - Open architecture plan
  - Measurement and analysis plan
  - Interface control document (including space, power, and volume of any added hardware)
  - Preliminary system design
  - Test and validation approach
  - Technical data package, including (but not limited to) detailed block diagram of the autonomy approach, detailed algorithm descriptions, technology readiness levels for each hardware component and software subsystems, 3D models of all hardware being proposed, and key findings from proof of concept execution
  - Test and simulation software to validate autonomy algorithms
  - Technical lessons learned from effort
- Autonomy demonstration option documentation
  - Overview and execution plan, including steps to enhance the technology to meet

the objective metrics, interim testing periods, and a prioritized list of risks.
  - Technical and cost proposal delivered 30 days before the end of the base period of performance.
  - Initial cost analysis, including up front, life cycle, and total ownership costs.
- Demonstration of base effort using test and simulation software for a 30+ day assignment.

Autonomy Demonstration Option:

The autonomy demonstration option period is anticipated to be a 24-36-month performance period whereby the proposed hardware is expected to meet or exceed the criteria listed in Table A2 below. The period of performance will depend on the state of technology being proposed and estimated time required to bring the research to fruition.

The option will focus on the development of L&XL UUV autonomy software and hardware for long task durations greater than 45 days that can operate with minimal human interaction in specified areas (coastal, open ocean, and complex littoral environments). Decision making based on local environment (oceanographic, acoustic, and non-acoustic) is required to effectively complete tasked assignments. Obstacle avoidance, detection, identification, and characterization include all potential impediments to operations including natural and manmade stimuli. Once outside the notional communications limited areas, operator assistance can be requested from the L&XL UUV when the assignment requires. The data transfer rates will not exceed 2.4 Kbs and will have time limitations for the connectivity duration. Year 1 will continue focus on development, implementation, and integration. Years 2 and 3 will focus on at sea experimentation, refinement, and validation. About ninety at sea days per year is expected to meet necessary requirements.

TABLE A2: AUTONOMY PHASE II ENVIRONMENTAL METRICS. All hardware shall meet the following environmental metrics:

Specification	Metric
OPERATING CONDITIONS	
Neutrally Buoyant in Salinity	25 parts per thousand (ppt)
Water Temperature	-1.1°C to 35.0°C (30°F to 95°F)
Air Temperature	-28.9°C to 50°C (-20°F to 122°F)
Temperature Shock	-28.9°C to 50°C (-20°F to 122°F)
Shipboard Shock	MIL-S-901D (Grade B) while secured to transportation pallet
Shipboard Vibration	MIL-STD-167-1
Humidity	0-100 % relative humidity
Salt Fog	Marine Environment
Fungus	Avoid Materials that promote fungal growth

Icing/Freezing Rain	Operate where icing may occur from sea splash/spray
Electromagnetic Environment	MIL-STD-461F (RE101, RE102, RS101, RS103, CE101 and CE102)
Depth	Operate up to 1000 feet
Non-Operating Conditions	
Transportation Altitude	0 to 12,192 M(0-40,000 ft) (pressurized or non-pressurized)
Transportation & Storage Temperature	-40.0°C to 108.9°C (-40°F to 160°F)
Transportation Shock & Vibration	Withstand ground, air, rail, ship transport (MIL-STD-1366E guidance)
Storage	Operate where icing may occur from sea splash/spray

Autonomy demonstration projects will be expected to conduct integrated full-scale testing at a Technology Readiness Level of 6 or greater within the option period of performance. Offerors must demonstrate that their proposed autonomy and sensing technology has the potential to meet a full task profile without operator assistance. The proposal must provide annual technology development spirals for both simulation testing and UUV integration. A full scale Government-operated L&XL UUV prototype can be used for autonomy testing during the option period, or the contractor can propose to develop and build or use its own vehicle for evaluation purposes. If the contractors request access to the Government UUV, the proposal must include a schedule of time requested for their technology testing.

Autonomy Demonstration Option Deliverables:

- Monthly progress and financial reports
- Algorithm description document
  - Open architecture plan
  - Measurement and analysis plan
  - Interface control document (including space, power, and volume of any added hardware)
  - Preliminary system design
  - Test and validation approach
  - Technical data package, including (but not limited to) detailed block diagram of the autonomy approach, detailed algorithm descriptions, technology readiness levels for each hardware component and software subsystems, 3D models of all hardware being proposed, and key findings from proof of concept execution.
  - Test and simulation software to validate autonomy algorithms.
- Program reviews
  - Design concept review(s)
  - Test readiness review
- Autonomy demonstration option documentation
  - Test reports
  - Technical lessons learned

  - Technical findings and future recommendations
  - Data analysis and archives
  - Updated cost analysis, including up front, life cycle, and total ownership costs.
- Final report, including (but not limited to) detailed block diagram of updated technology, test results from any and all endurance testing, relevant 2-D or 3-D models and drawings of the new technology, technology readiness levels for each hardware component and software subsystems, and key findings from Phase II execution, recommendations necessary to further mature the technology, and component risks that need further development/ testing of components that are not fully matured to TRL 6.
- All supporting hardware, software, and equipment developed under this contract
- Demonstration of base effort on a UUV for a 45+ day task.

1.2 TECHNOLOGY AREA 2: Autonomy Validation

ONR is interested in receiving proposals for autonomy validation this includes approaches, software, and associated hardware.

The autonomy validation effort will be broken out into a base and option period, noted as the base validation proof of concept and the autonomy validation option. The objectives for the base and option periods are described below. A full technical and cost proposal for the proof of concept phase and a description of the technical approach for the autonomy demonstration are being requested at this time. ONR will initially select for award only proof of concept proposals.

The focus of the CLAWS autonomy validation effort is to build operator trust for vehicle operations across the planned operational environments. The efforts will include the necessary elements to build operator trust through each phase of intended system operations from mission planning through post vehicle recovery. The deliverables will be the functional validation approach/method, supporting documentation, the sensor(s), and sensing requirements to validate autonomous behaviors for the L&XL UUV to operate in coastal, open ocean, and complex littoral environments. The requested L&XL UUV autonomy validation approaches will include but not limited to transit, data collection, exfiltration, and sensor/system delivery for oceanographic data collection.

The objectives of the autonomy validation technical area of this CLAWS INP will be contracted in a two phased approach for a base and option period:

- Autonomy validation proof of concept base period: This will be a six to twelve month base effort with funding ranging from $500,000 – $1,000,000. The base effort will document, define, and simulate approaches to characterize performance factors and dependencies required for validation in changing environmental conditions (oceanographic, acoustic, and non-acoustic) and will be represented in the simulation environment. Potential validation approaches to consider as examples will help the operators gain trust through system interactions, mission planning, demonstrations, data exfiltration, and command on control of the vehicle. Simulations of the

validation approach are requested across three previous defined environments (coastal, open ocean, and complex littoral environments).

- Autonomy validation demonstration option period: This will be a two to three year effort based on the accomplishments in the base period. The option will focus on validating the approaches identified in the base period. Year 1 emphasis is placed on the measurements, analysis, and execution necessary to prove the approach and decision making in coastal, open ocean, and complex littoral environments supporting focus areas in environmental awareness, task execution, payload delivery, and detection, characterize, identify, and act areas identified in the autonomy efforts. Years 2 and 3 will focus on quantifiable validation approaches.

The CLAWS program will conduct simulations only in base period and will evaluate the requirements for necessary tests during the remaining option period. The proposal must define the language in which the validation approach will be coded, the simulation method for developing and testing the algorithms, definition of sensors to be used, definition of the hardware that the algorithms will run, performance of the proposed autonomy, all interfaces to and from the algorithms and sensors, and the notional validation approach. MATLAB code is adequate for the base effort. The option can be used to code the system into real time implementation.

Proposals can describe a complete system concept or specialized components that focus on one or more of the categories listed. In all cases, proposals must provide a detailed scope of work for the development of the core technologies, including a description of the approach, development, laboratory implementation, embedded implementation using hardware in the loop, at-sea experimentation, and validation approach.

1.2.1 Background

ONR seeks full technical proposals for the development of vehicle autonomy validation approaches. The approaches need to show how we can build operator trust to extend vehicle operations and minimize the interactions between the operator and the vehicle. This requires validation of in situ decision making on the vehicle and representative/informed operational forecasting for the operator. Initial user feedback has identified many technical gaps in approaches for autonomy validation. A limited list is cited below as reference questions for examples; all other elements deemed necessary to support the goal should be proposed:

- What method(s) are best suited for statistical modeling of autonomous functions and behaviors to achieve assigned tasks
- Can we predict behavior based on the performance factors and dependencies
- Can we forecast obstacles or impediments that effect our user vehicle interactions. Aka surface ships or fishing fleet on both vehicle and command center
- What/when/how is the ideal validation test to perform for each behavior
- Do we know the assumptions that require success or failure in the giving conditions
- Can we characterize and evaluate autonomous task scheduling based on in situ decision making

1.2.2 Program Plan

Autonomy Validation proof of Concept Base:

Autonomy validation proof of concept base period: This will be a six to twelve month base effort with funding ranging from $500,000 – $1,000,000. The base effort will document, define, and simulate approaches to characterize performance factors and dependencies required for validation in changing environmental conditions (oceanographic, acoustic, and non-acoustic) and will be represented in the simulation environment. Potential validation approaches to consider as examples will help the operators gain trust through system interactions, mission planning, demonstrations, data exfiltration, and command on control of the vehicle. Simulations of the validation approach are requested across three previous defined environments (coastal, open ocean, and complex littoral environments).

Autonomy Validation proof of Concept Base Deliverables:

- Monthly progress and financial reports
- Autonomy validation description document
  - Documented assumptions, trade spaces
  - Measurement and analysis plan
  - Preliminary system design
  - Test and validation approach
  - Technical data packages, including (but not limited to) detailed block diagram of the validation approach, performance factor descriptions and input parameters, external variable sensitivities, and key findings from proof of concept execution.
  - Test and simulation software
  - Technical lessons learned from effort
- Lessons learned documentation on proposed approach
- Autonomy validation demonstration option documentation
  - Overview and execution plan, including steps to enhance the technology to meet objectives, interim testing periods, and a prioritized list of risks associated.
  - Technical and cost proposal delivered 30 days before the end of the base period of performance.
  - Initial cost analysis, including up front, life cycle, and total ownership costs.
- Demonstration of base effort using test and simulation software

Autonomy Validation Demonstration Option:

The autonomy validation demonstration option period is anticipated to be a 24-36-month performance period. The period of performance will depend on the state of technology being proposed and estimated time required to bring the research to fruition.

The autonomy validation demonstration option will focus on validating the approaches identified in the base period. Year 1 emphasis is the measurements, analysis, and execution necessary to prove the approach and decision making in coastal, open ocean, and complex littoral environments supporting focus areas in environmental awareness, task execution, payload delivery, and detection, characterize, identify, and act areas identified in the autonomy efforts. Years 2 and 3 will focus on quantifiable validation approaches.

Autonomy validation demonstration projects will be expected to conduct testing at a TRL 6 or greater within the option period of performance. Offerors must demonstrate that their proposed validation approach has the potential to meet quantifiable objectives. The proposal must provide annual technology development spirals to represent state of advance for the efforts. A full scale Government-operated L&XL UUV prototype can be used for validation testing during the option period, or the contractor can propose to develop and build or use its own vehicle for validation purposes. If the contractors request access to the Government UUV, the proposal must include a schedule of time requested for their technology testing.

Autonomy Validation Demonstration Option Deliverables:

- Autonomy validation description document
  - Documented assumptions, trade spaces
  - Measurement and analysis plan
  - Test and validation approach
  - Test reports
  - Preliminary system design
  - Technical data packages, including (but not limited to) detailed block diagram of the validation approach, performance factor descriptions and input parameters, external variable sensitivities, and key findings from proof of concept execution.
  - Test and simulation software
  - Technical lessons learned from effort
- Autonomy validation demonstration option documentation
  - Test reports
  - Technical lessons learned
  - Technical findings and future recommendations
  - Data analysis and archives
  - Updated cost analysis, including up front, life cycle, and total ownership costs.
  - Overview and execution plan, including steps to enhance the technology to meet objectives, interim testing periods, and a prioritized list of risks associated.
  - Final cost analysis, including up front, life cycle, and total ownership costs.
- Demonstration of option effort using test and simulation software
- Quarterly program reviews such as:
  - Approach concept review(s)
  - Test readiness review
  - Execution reviews

- Technical findings and reports

III. 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 (DoN). 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 4 single-sided pages, exclusive of cover page 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 MS Office 2007.

The cover page should be labeled "White Paper for ONR 2018 Research Opportunity: CLAWS" and include the following information: title of the proposed effort, technical point of contact, telephone number, fax numbers, and e-mail address.

The 4-page body of the white paper should include the following information:

(1) Principal Investigator;
(2) Relevance of the proposed effort to the research areas described in section II;
(3) Technical objective of the proposed effort;
(4) Technical approach that will be pursued to meet the objective;
(5) A summary of recent relevant technical breakthroughs; and
(6) A funding plan showing requested funding per fiscal year.

A resume of the principal investigator, not to exceed 1 page, should also be included after the 4-page body of the white paper.

To ensure full, timely consideration for funding, white papers should be submitted **no later than 17 January 2018**. 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 **14 February 2018.**

IV. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION

Full proposals should be submitted under N00014-18-S-B001 by **16 March 2018**. Full Proposals received after that date will be considered as time and availability of funding permit.

ONR anticipates that contracts will be issued for this effort.

Full proposals for contracts should be submitted in accordance with the instructions at section IV, application and submission information, item 2.b, full proposals and item 6, submission of full proposals for contracts, cooperative agreements, and other transactions. The technical proposal/content shall be single spaced and not exceed 20 pages. The cover page, resumes, bibliographies, and table of contents are excluded in the page count. For contract proposal submission, (2) hardcopies and one (1) electronic submission on CD-ROM are requested.

ONR plans to fund three to five individual awards for each technical topic area with a value of $500,000 – $1,000,000 for the base period, using research funds. However, lower and higher cost proposals will be considered.

The period of performance for projects may be from one year from contract award to a total contract period of five years if the options are executed.

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

Funding decisions should be made by **30 April 2018**. Selected projects will have an estimated award date of **31 July 2018**.

Special Instructions for Classified Responses.

Proposals submitted under this notice are expected to be unclassified; however, classified proposals are permitted up to GENSER SECRET. If a classified proposal is submitted and selected for award, the resultant award will be unclassified.

Classified proposals shall be submitted directly to the attention of ONR's Document Control Unit at the following address and marked in the following manner:

OUTSIDE ENVELOPE

(no classification marking):

Office of Naval Research
Attn: Document Control Unit
ONR Code 43
875 North Randolph Street
Arlington, VA 22203-1995

The inner wrapper of the classified proposal shall be addressed to the attention of the cognizant Technical Point of Contact (TPOC), ONR Code 321 and marked in the following manner:

INNER ENVELOPE
(stamped with the overall classification of the material)
Program Name: CLAWS
Office of Naval Research
ATTN: Mr. Jon C. Erickson
ONR Code: 321
875 North Randolph Street
Arlington, VA 22203-1995

All response submissions will be protected from unauthorized disclosure in accordance with FAR Subpart 15.207, applicable law, and DoD/DoN regulations. Offerors are expected to appropriately mark each page of their submission that contains proprietary information.

In either case of an unclassified or classified proposal submission, it is the responsibility of the submitting individual to ensure he/she receives an email confirming receipt from the TPOC (listed below).

V. SIGNIFICANT DATES AND TIMES

Event	Date	Time
Recommended White Paper Submission Date	17 JANUARY 2018	2:00 PM Eastern Standard Time
Notification of White Paper Valuation*	14 FEBRUARY 2018	2:00 PM Eastern Standard Time
Recommended Full Proposal Submission	16 MARCH 2018	2:00 PM Eastern Standard Time
Notification of Selection: Full Proposals *	30 APRIL 2018	N/A
Awards *	31 JULY 2018	N/A

Note: * These are approximate dates**.**

VI. POINTS OF CONTACT

In addition to the points of contact listed in N00014-18-S-B001, the specific points of contact for this announcement are listed below:

All UNCLASSIFIED communications shall be submitted via e-mail. All **technical** questions of an UNCLASSIFIED nature to the Technical POC shall be sent via e-mail with a copy to the designated Business POC.

Technical Point of Contact:
Name: Mr. Jon C. Erickson
Title: Program Officer
Code: Ocean Battlespace Sensing, Code 321
Address: Office of Naval Research
875 North Randolph Street
Arlington, VA 22203-1995
Email Address: Jon.Erickson@navy.mil

Business Point of Contact:
Name: Mr. Sean M. Palmer
Title: Contracting Officer
Division: ONR Code 253
Address: Office of Naval Research
875 North Randolph Street
Arlington, VA 22203-1995
Email Address: sean.m.palmer@navy.mil

Questions of a **security** nature should be submitted to:
Security Point of Contact:
Name: Ms. Torri Woodfolk
Title: Industrial Security Specialist
Code: Security Department, Code 43
Address: Office of Naval Research
875 North Randolph Street
Arlington, VA 22203-1995
Email Address: Torri.Powell@navy.mil
(please note that the e-mail address does differ from the POC's name)

VII. ADDRESS FOR THE SUBMISSION OF WHITE PAPERS AND FULL PROPOSALS FOR CONTRACTS

White papers should be submitted electronically to the program technical point of contact, Mr. Jon C. Erickson. Files exceeding 10MB in size should not be emailed, but instead transmitted via a file transfer service, for example AMRDEC Safesite, https://safe.amrde.army.mil, or mailed on DCROM or DVD.

The DVD or CD-ROM of the full proposal including all supporting documentation should be sent to the Office of Naval Research at the following address:

Primary Point of Contact	Secondary Point of Contact
Office of Naval Research Attn: Mr. Jon C. Erickson ONR Department Code 321 875 North Randolph Street Arlington, VA 22203-1995	Office of Naval Research Attn: Dr. Dan Deitz ONR Department Code 321 875 North Randolph Street Arlington, VA 22203-1995

VIII. SUBMISSION OF QUESTIONS

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

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

- Federal Business Opportunities (FEDBIZOPPS) Webpage – https://www.fbo.gov/
- ONR Special Notice Webpage - http://www.onr.navy.mil/Contracts-Grants/Funding-Opportunities/Special-Notices.aspx

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.

Classified questions shall be handled through the ONR Security POC. Specifically, any entity wanting to ask a **classified** question shall send an **unclassified** email to the ONR Security POC with a copy to both the Technical POC and the Business POC stating that the entity would like to ask a **classified** question. **Do NOT email any classified questions**. The Security POC will contact the entity and arrange for the **classified** question to be asked through a secure method of communication.