

BAA Call N00014-23-S-C004
Special Program Announcement for Office of Naval Research
Research Opportunity:
Shipboard Emergency Response

I. INTRODUCTION

This announcement describes the technology areas, entitled “Stress Response” and “Basic Physiological Sciences” under the N00014-23-S-C004, Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology, which can be found at <https://www.nre.navy.mil/work-with-us/funding-opportunities/announcements>. The submission of proposals, their evaluation and the placement of research grants and contracts will be carried out as described in the above Long Range Broad Agency Announcement.

The purpose of this announcement is to focus attention of the scientific community on (1) the areas of interest, including advancements in shipboard damage control and mass casualty at sea survivability and rescue (2) encourage dialogue amongst those interested in this arena, and (3) the planned timetable for the submission of white papers and full proposals.

II. TOPIC DESCRIPTIONS

The proposed topic will explore and exploit the fundamental and applied human physiology and human factors focused research efforts that are relevant to contemporary and projected US Navy and US Marine Corps operational capability gaps. Therefore projects would be funded under Budget Activities 1 & 2 (as defined in the DoD Financial Management Regulation Vol. 2B, Ch. 5). Further, the overall S&T efforts will be conducted at the Technology Readiness Level (TRL) 1-5 stage.

Topic 1. Enhanced shipboard damage control capabilities

Background: Due to the heightened risk for engagement at sea with near-peer adversaries, shipboard combat-related emergencies and subsequent damage control responses may be a defining feature of future US Navy operations. The goal of this focus area is to understand and mitigate the negative physiological effects of damage control activities on sailors. Damage control activities contain shipboard damage; manage consequences; recover capabilities; and sustain the ship’s combat effort. Damage control activities commonly include firefighting; flood control; structural support/repairs; combat system repair; ordnance clearance; and causality care. The activities are largely performed by sailors trained in various damage control functions and conducted in the extremely hazardous conditions present in damaged shipboard spaces. Hazards may include extreme heat, fire, smoke, toxic compounds, chemical/biological agents, or radiation. There is currently a lack of innovative modernized solutions to this problem space, including limited understanding of the unique physiological/cognitive stressors experienced by

shipboard damage control crews and a complete lack of any capability to track shipboard personnel location/health status for real-time communication back to command and control nodes.

Key damage control equipment currently available to shipboard crews consists largely of standard firefighting ensembles, self-contained breathing apparatus (SCBA), Naval Firefighting Thermal Imagers (NFTIs), and various hand tools. Systems utilized aboard ships during damage control activities for communication between damage control teams and shipboard command and control nodes consists primarily of verbal communication and sound power telephone circuits augmented by short range radios and ship's intercoms. Tracking of damage, personnel, and damage control progress is currently conducted by command and control node personnel by hand annotation of whiteboard schematics of shipboard spaces in response to input through standard communication and integrated environmental sensing systems.

Currently there is no capability to monitor and/or mitigate the **key** physiological/cognitive stressors experienced by shipboard personnel conducting damage control activities; conduct automated real-time tracking of damage control personnel locations/movements, health status of personnel, and environmental hazards encountered by personnel; and limited capability to perform effective damage control in low-visibility smoke-filled spaces.

Objective: The Office of Naval Research (ONR) is interested in receiving proposals that are specifically aimed at gaining an improved fundamental understanding of the physiological/cognitive stressors associated with and/or unique to shipboard damage control; fundamental and **limited** applied development of technologies/interventions that improve efficiency of shipboard damage control activities; fundamental and **limited** applied development of technologies/interventions that improve survivability of sailors engaged in shipboard damage control activities and ultimately ship recoverability following the sustainment of damage.

Gaining an improved fundamental understanding of the physiological/cognitive stressors unique to shipboard damage control activities may include research efforts focused on addressing the following **example** questions:

- How do high levels of physical exertion in extreme heat conditions, similar to that experienced by shipboard firefighters, impact cardiovascular function and risk of cardiac events?
- What are the modulatory impacts of smoke/particulate exposure on cardiovascular outcomes in shipboard firefighters?
- How do high levels of physical exertion and acute psychological stress in extreme heat conditions, similar to that experienced by shipboard firefighters, impact cognitive performance during damage control activities and longer-term stress-associated impairments in occupational performance?

- How might rapid shift in ambient temperature, similar to that which would be experienced by damage control crews in fire containing spaces that are rapidly flooded with seawater, impact physiological/cognitive function and occupational performance?

Technology, training, and/or procedural interventions that improve or prolong the ability of sailors to safely and effectively function under conditions/stressors unique to shipboard damage control activities may have a direct impact on ship recoverability. Fundamental and applied research efforts focused on the development of such countermeasure may include the following examples:

- Advancements in CBA platforms or firefighting ensembles that detect and/or mitigate heat stress and comorbid conditions.
- Advancements in training/conditioning systems that enable enhanced performance of damage control teams during damage control activities.
- Development of platforms capable of real-time sensing/monitoring of environmental hazards coupled with sailor health status and location within shipboard spaces and capable of communicating actionable data streams to shipboard emergency response command nodes, such as the DC Central and/or bridge. Such platforms would enable more efficient allocation of personnel resources during DC scenarios by command, and should be capable of integration with current related NAVSEA development efforts like the Advanced Damage Control System.
- Development of heads up displays or augmented reality platforms that identify hazards within visibility-limited shipboard spaces during damage control activities and/or facilitate damage control crew movements through shipboard spaces.
- Development of training tools and validated cognitive test batteries that can be administered underway to shipboard personnel to assess and mitigate acute psychological stress during damage control activities and assess the cumulative (chronic) effects of such stress on the occupational performance of sailors.

General technology requirements: Importantly for technologies/interventions that are designed as wearable platforms, preference will be given to systems that are capable of being integrated into currently in utilized sailors' uniform items or damage control PPE items. By extension, such platforms may require sensors that do not necessitate contact with skin and *will* necessitate sufficiently high ruggedization of platform components to withstand extreme conditions inherent to shipboard damage control activities. Further, platforms that transmit wearer data to shipboard emergency response command nodes must be capable of integrating into modern shipboard internal transmission/communication systems and meet all security/safety requirements.

Importantly, ONR is interested in engaging with proposals for ***any*** fundamental and applied research effort that targets problem sets associated with any essential component of shipboard damage control activities. Proposals that do not aim to address any component of mass casualty at sea scenarios will be considered non-responsive.

Topic 2. Improved mass casualty at sea survivability

Background: Due to the heightened risk for engagement at sea with near-peer adversaries, shipboard combat-related emergencies and subsequent mass casualty at sea scenarios may be a defining feature of future US Navy operations. A multitude of physiological and cognitive stressors may be experienced by sailors in such scenarios compounded by the dearth of available countermeasures against these stressors. Sailors adrift at sea for extended periods of time may be exposed to cold or heat stress depending on the region of the world and local water and atmospheric temperatures. Rapid unexpected immersion in cold water may present the added complication of a cold shock response resulting in hyperventilation and drowning. Further, rapid removal of cold water and re-warming may illicit a shock-like response as well, often referred to as “search and rescue collapse.” Hydration and food restriction may be compounding stressors to sailors adrift for multiple days or more, along with complications from injuries sustained prior to entering water. Finally, the negative psychological effects of being adrift in the open ocean for extended periods may be profound. Without direct knowledge or reassurance that search and rescue units will arrive and rescue a given sailor, a diminished will to survive may set in resulting in the unnecessary loss of life and Navy manpower.

Survival equipment/provisions and distress signaling equipment are currently available as part as of most shipboard emergency survival kits. Relevant personal protective equipment available to individual sailors adrift at sea consists of the clothing attire with which they entered the water; life preservers; small amounts of food/water; and distress signaling kits that include flares, dyes, whistles, hand mirrors, reflective tape, and man overboard indicators (MOBIs) with select kits. Currently there is no capability to comprehensive monitor and manage the effects of long term immersion in cold water, dehydration, or food restriction in sailors adrift at sea. Further, there is no availability capability for long-range long-life automated communication of sailor location and health status to search and rescue units.

Objective: The Office of Naval Research (ONR) is interested in receiving proposals specifically aimed at gaining an improved fundamental understanding of the physiological/cognitive stressors associated with and/or unique to long term immersion in seawater across the range of water temperatures; fundamental and *limited* applied development of technologies/interventions that improve survivability of large numbers of sailors adrift at sea for extended periods of time (up to or exceeding 5 days); and fundamental and *limited* applied development of technologies/interventions that improve efficiency search and rescue operations for large numbers of sailors adrift over wide areas of sea (up to 15 NM/day) following mass casualty at sea events.

Gaining an improved fundamental understanding of the physiological/cognitive stressors unique to long term immersion in seawater across the range of water temperatures may include research efforts focused on addressing the following example questions:

- How does rapid unexpected immersion in cold water, similar to that experienced by personnel following abandon ship orders, lead to cold shock response and impact cardiorespiratory function and risk of drowning?

- How does rapid rewarming following long term immersion in cold water, similar to that experienced by personnel rescued by search and rescue units, lead to “search and rescue collapse” and impact cardiorespiratory function and risk of death?
- How do high levels of physical exertion, dehydration, and/or food restriction experienced by sailors adrift at sea for extended periods of time impact risk of search and rescue collapse associated death?
- How might the acute psychological stress experienced by sailors adrift at sea for extended periods of time impact cognitive function and survival as well as longer-term stress-associated impairments in occupational performance?

Technology, training, and/or procedural interventions that improve survivability of large numbers of sailors adrift at sea for extended periods of time and efficiency search and rescue operations for large numbers of sailors adrift over wide areas of sea may enhance recovery of personnel following mass casualty at sea events. Fundamental and applied research efforts focused on the development of such countermeasure may include the following examples:

- Advancements in personal floatation devices that detect and/or mitigate immersion-associated physiological stressors and comorbid conditions.
- Advancements in training/conditioning systems that enable improved survivability of sailors adrift at sea.
- Development of platforms capable of real-time sensing/monitoring of sailor health status and location at sea coupled with environmental hazards and capable of communicating actionable data streams to search and rescue units, such as the nearest US Navy vessels, US Coast Guard vessels, and/or civilian vessels. Such platforms would enable more efficient allocation of resources during search and rescue operations, and should be capable of integration with current maritime emergency communication networks/frequencies.
- Development of training tools and validated cognitive test batteries that can be administered underway to shipboard personnel to assess and mitigate acute psychological stress during mass casualty at sea scenarios and assess the cumulative (chronic) effects of such stress on the occupational performance of sailors.

General technology requirements: Importantly for technologies/interventions that are designed as wearable platforms, preference will be given to any that are capable of being integrated into currently utilized sailors’ uniform items or man overboard PPE items. By extension, such platforms may require sensors that do not necessitate contact with skin and *will* necessitate sufficiently high ruggedization of platform components to withstand extreme conditions inherent to immersion in seawater for extended periods of time. Further, platforms that transmit wearer data to search and rescue units must be capable of integrating into current maritime emergency communication networks/frequencies. Finally, preference may be given to any proposal to

develop a platform capable of providing at least limited communication capability to individual sailors.

Importantly, ONR is interested in engaging with proposals for *any* fundamental and applied research effort that targets problem sets associated with any essential component of mass casualty at sea scenarios. Proposals that do not aim to address any component of mass casualty at sea scenarios will be considered non-responsive.

III. Workshops, industry days, webinars

ONR will not hold any workshops, industry days, or webinars related to this BAA Call.

IV. WHITE PAPER SUBMISSION

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

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

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

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

The Cover Page can be found at <https://www.nre.navy.mil/work-with-us/how-to-apply/submit-contract-proposal> for contract submissions and at <https://www.nre.navy.mil/work-with-us/how-to-apply/submit-grant-application> for grant submissions.

The ***no more than*** 5-page body of the white paper should include the principal investigator's plan to address a specific problem set(s) associated with a topic(s) described in Topic Description section above by providing the following information:

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

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

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

To ensure full, timely consideration for funding, white papers should be submitted **no later than (NLT) 5 DEC 2022 1600 EST**. White papers received after that date will be considered as time and availability of funding permit.

The planned date for completing the review of white papers is **19 DEC 2022**.

V. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION

Full proposals should be submitted under N00014-23-S-B001 **NLT 01 FEB 2023 1600 EST**. Full Proposals received after that date will be considered as time and availability of funding permit.

ONR anticipates that both grants and contracts will be issued for this effort. The principal investigator's plan to address a specific problem set(s) associated with a topic(s) described in Topic Description section above by providing the following reviewable information:

- **Technical Concept** - A description of the technology innovation and technical risk areas.
- **Future Naval Relevance (where applicable)** – A description of potential Naval relevance and contributions of the effort to the agency's specific mission.

- **Operational Naval Concept (where applicable)** – A description of the project objectives, the concept of operation for the new capabilities to be delivered, and the expected operational performance improvements.
- **Operational Utility Assessment Plan (where applicable)** – A plan for demonstrating and evaluating the operational effectiveness of the Offeror's proposed products or processes in field experiments and/or tests in a simulated environment.
- Detailed budget estimate for the proposed period of performance.

Full proposals for contracts should be submitted in accordance with the Appendix 2 of the N00014-23-S-B001. Full proposals for grants should be submitted via Grants.gov in accordance with Appendix 1 of N00014-23-S-B001. All proposals will be internally within ONR reviewed by a panel of subject matter experts who will provide feedback to the Program Officer on the reviewable criteria outlined above.

The period of performance for projects may be from **1 – 2 years** with a total award value of no more than **\$300K** per year.

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

Funding decisions should be made **NLT 31 JAN 2023**. Selected projects will have an estimated award date of **NLT 01 MAY 2023**.

VI. SIGNIFICANT DATES AND TIMES

Event	Date	Time
Recommended White Paper Submission Date*	NLT 5 DEC 2022	1600 EST
Notification of White Paper Valuation*	NLT 19 DEC 2022	1600 EST
Recommended Full Proposal Submission	NLT 01 FEB 2023	1600 EST
Notification of Selection: Full Proposals *	NLT 15 FEB 2023	1600 EST
Awards *	NLT 01 MAY 2023	1600 EST

Note: * These are approximate dates.

VII. Small Business Subcontracting

As indicated in ONR Broad Agency Announcements large businesses and non-profit organizations must submit a subcontracting plan along with their research proposal. While large businesses and non-profits are responsible for making these subcontracting arrangements, ONR will help facilitate prime contractor/small business contracting connections by posting to the ONR external website contact information of small businesses that have indicated their subcontracting interests and technological niche for prime contractor consideration for this

program. This is not an endorsement, but an effort by ONR to help bring these parties together to provide superior solutions.

If you are a small business, and your company is interested in subcontracting activities with large businesses and/or non-profits considering your technology for this program, please provide the following information by email, to the ONR Small Business Director at ellen.simonoff.civ@us.navy.mil with the subject line, “BAA Call N00014-23-S-C004.” Provide this information:

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

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

VIII. POINTS OF CONTACT

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

Technical Points of Contact:

Name: LT Richard G. Morgan

Title: Program Officer

Email: richard.g.morgan3.mil@us.navy.mil

Phone: 703-915-8784

Business Point of Contact/Contracting Officer:

Name: Charles S. Weiner

Title: Contracting Officer

Email: charles.s.weiner.civ@us.navy.mil

VIII. SUBMISSION OF QUESTIONS

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

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

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

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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.