

**Special Notice N00014-19-S-SN09-0001 Amendment**  
**Special Program Announcement for 2019 Office of Naval Research**  
**Research Opportunity:**  
**Electromagnetic Maneuver Warfare Resource Allocation Management**  
**(EMW RAM)**

**I. INTRODUCTION**

This announcement describes a research thrust, entitled “Electromagnetic Maneuver Warfare Resource Allocation Management (EMW RAM),” to be launched under the N00014-19-S-B001 Long Range Broad Agency Announcement (BAA) for Navy and Marine Corps Science and Technology, which can be found at <https://www.onr.navy.mil/en/work-with-us/funding-opportunities/announcements>.

The research opportunity described in this announcement specifically falls under the Electronic Warfare (Code 312) sub-section of the Information, Cyber and Spectrum Superiority (Code 31) area on the ONR Webpage. The submission of proposals, their evaluation, and the placement of research contracts will be carried out as described in that Broad Agency Announcement.

The purpose of this announcement is to focus the attention of the scientific and engineering communities on (1) the area to be studied, (2) the EMW RAM Industry Day for dialogue amongst those interested in this arena, (3) the planned timetable for the submission of proposals, and (4) provide instructions for requesting Government Furnished Information, “Key EMW RAM Development Information,” see section III for more information.

**II. TOPIC DESCRIPTION**

**Background and Objective**

The Office of Naval Research (ONR) Information, Cyber & Spectrum Superiority Department (Code 31) is seeking ideas on resource and task management approaches for distributed Electromagnetic Maneuver Warfare (EMW) operations for single and multiple, heterogeneous airborne platforms in supporting a Future Naval Capabilities (FNC) program. Specifically, the proposed topic will develop and implement advanced algorithms and real-time prototype code (Budget Activity 3) in the area of Electronic Warfare (EW). ONR Code 312 seeks proposals in developing and demonstrating software (SW) technologies for the next generation EW systems in own-platform and multi-platform resource & task management that enables autonomous, distributed airborne EW operations at tactical ranges and timelines. Proposals should address technology development, complete end-to-end integration, and delivery across three Research Opportunity Technical Areas (1-3) that start at Technology Readiness Level (TRL) 4/5 and finish at TRL 6 upon program completion. Solutions comprised of individual algorithms/partial SW components beginning at TRL 5+ are highly desired, but a complete, fully integrated end-to-end functional capability can begin at TRL 4 (for TRL definitions, please see <https://www.army.mil/e2/c/downloads/404585.pdf>).

The primary objective of EMW RAM is to develop own-platform and multi-platform airborne technologies for “one-on-many” and collaborative “many-on-many” manned & unmanned EW operations across all jamming ranges (i.e. from stand-off to stand-in). For prototype demonstration purposes, two versions of algorithms and real-time prototype code (SW) shall be developed, tested, and delivered. In this endeavor, utilization of Model-Based Systems Engineering (MBSE) tools and processes throughout development is highly encouraged. These two versions, or instantiations, of deliverables include:

1. The first instantiation is system-agnostic where the EMW RAM algorithms and real-time prototype code (SW) provides integrated, end-to-end functional capabilities for Technical Areas 1-3 that can be ported to various naval airborne platform and system types (e.g. fixed and/or rotary-wing, EW receiver systems and/or distributed processors, etc.) and includes manned & unmanned systems.
2. The second instantiation is the specific implementation of Government selected EMW RAM algorithms and real-time prototype code (SW) from the first instantiation deliverables into a Government designated aircraft’s systems/sub-systems, or designated surrogate hardware-in-the-loop (HWIL) components, which will be demonstrated in a relevant threat environment using stringent computational limits, size, weight, power and cooling (SWaP-C) & networking interface requirements in 2021-22.

Each SW instantiation/version is planned to be able to achieve TRL 6 by the end of 4<sup>th</sup> Quarter (4Q) Government Fiscal Year (GFY) 2022 from an initial starting point of TRL 4/5, at a minimum, at the end of GFY 2019. Therefore, it is anticipated that offerors will leverage existing technology investments for this effort.

### **Research Opportunity Technical Areas**

It is envisioned that the developed algorithms and real-time prototype code (SW) for single & multiple platforms will include the following components:

- An EW Battle Management (EWBM) framework for own-platform coordination, and multi-platform collaborative engagements;
- An advanced EW Adaptive System Management (ASM) framework for Electronic Support (ES) and Attack (EA) resource & task management between a single (own) platform’s systems/sub-systems and its EW payload(s), and across multiple platforms; and
- Own-platform Human-Machine Interface (HMI) with artificial intelligent (AI) decision aids (engineering-level only, no display development).

This Special Notice seeks to identify solutions for three core Technical Areas (TAs):

### **Technical Area 1 (TA1): EW Battle Management (EWBM) Framework**

#### *Introduction:*

Present day EW operations rely on manual battlefield planning that utilizes legacy networks for EW commands, which provides limited multi-ship controls and awareness, minimum situation effectiveness sharing among strike operations, and limited radio frequency (RF) spectrum control

and avoidance. Additionally, legacy EW teaming is: restricted to homogeneous manned EW platforms with limited numbers that are manually coordinated; constrained by linkages between manned & unmanned airborne platforms/systems; and manned mission set & jam strategies are based on pre-planned operations.

*Objective:*

Specific technical objectives under TA1 are listed in the Government Furnished Information document that is referenced in Section III.

**Technical Area 2 (TA2): Advanced EW Adaptive System Management (ASM)**

*Introduction:*

Current EW operations rely on pre-mission tune/dwell schedules for various receivers that have limited ability to adapt based on real-time tactical need. Additionally, conflicts arise between on-board systems as ES and EA resources compete for shared apertures, or the aircrew suffers loss of valuable engagement information when receivers are blanked because of jamming. The goal of advanced EW ASM is to develop an autonomous, adaptive resource & task management capability for optimizing ES & EA functions based on tactical needs for on-board single (own) platform systems and between multiple platforms.

*Objective:*

Specific technical objectives under TA2 are listed in the Government Furnished Information document that is referenced in Section III.

**Technical Area 3 (TA3): Teaming Interface between Aircrew & Machines**

*Introduction:*

Currently, aircrews face continuously large workloads in order to maintain system effectiveness during high tempo, complex non-kinetic engagements. Additionally, the warfighter relies on manual calculations for jamming effectiveness while semi-auto jamming adjustments are required to compensate for changes in the environment.

*Objective:*

Specific technical objectives under TA3 are listed in the Government Furnished Information document that is referenced in Section III.

**Criteria / Evaluation Factors**

Proposed efforts should highlight the benefits and limitations of their technical approach, and the anticipated challenges with implementing their solution from a Naval Relevance perspective. In evaluating proposals, the Government anticipates evaluating Naval Relevance and contribution to mission more favorably to the extent that algorithm/real-time prototype code (SW) development & implementation will not be limited by data rights restrictions. Therefore, ONR desires Government Purpose Rights (GPR) at a minimum for all deliverables.

Naval Relevancy will also take into consideration the extent to which the proposed technical deliverables and intellectual property (IP) rights will potentially affect the Government's ability to transition the software and the program's objective of developing an open, flexible, and assured architecture. The evaluation will consider the extent to which the Proposer's description of adaptive/cognitive/AI behavior isolation, open architecture approach, and data rights claims demonstrates an approach likely to facilitate third-party integration and verification, minimize regression testing of future upgrades or modernization, and enable software portability to multiple platform types.

Proposed solutions and architectures are encouraged to leverage an iterative design approach (e.g. agile SW development process), and will be evaluated for their technical maturity and suitability for distributed naval airborne EW operations in contested and/or denied electromagnetic (EM) environments. A key objective is to meet desired warfighting performance while minimizing the impact and cost for integrating these new capabilities into naval airborne platforms/systems.

ONR will favorably consider solutions that implement a SW architecture with open interfaces that is layered and modular and leverages Industry SW/coding standards and practices. The solution architecture should demonstrate open interface extensibility for future growth relevant to single and multiple platform integrated functionality. Performers will need to discuss how their particular technical solution/approach will incorporate cyber protection and resiliency standards, but this effort will not focus on, or develop, cyber protection or information assurance tools. However, performers with access to such tools and able to demonstrate that their architecture/framework/real-time prototype code is US Navy CYBERSAFE compliant will be favorably considered.

Additionally, offerors are encouraged to enhance the Naval Relevancy of their approaches through the use of on-platform & cross-platform data messages developed and/or implemented under this effort that are open (i.e. non-proprietary), and proposed architectures/frameworks that enable incorporation of Third Party applications/SW module upgrades without large-scale redesign of the architecture and/or requiring the performer to provide integration support services.

Finally, because this Special Notice is focused on rapid SW development, there will be minimal advanced development tasks performed under this effort for individual algorithms/SW components, meaning TRL 2/3 to 4 development activities will be evaluated as being technically immature. If an offeror requires advanced development tasks as part of its solution, a risk assessment & mitigation plan needs to be provided in their technical approach that clearly articulates how the performer will be able to achieve TRL 6 in a 3-year development window when starting from TRL 2/3.

### **International S&T Development Cooperation**

If selected for an award, it is incumbent upon the performer to have the ability to exchange defense-related items with members of a foreign government as soon as possible after contract award while adhering to US International Traffic in Arms Regulations (ITAR), Export Administration Regulations (EAR), and other applicable Export Control laws. A performer's technical approach should include details on how this information exchange will be implemented at a corporate level,

and the intended timeline for execution. Upon award, the following Defense Federal Acquisition Regulation Supplement (DFARS) clause will be included in all performer contracts: 252.225-7048, Export-Controlled Items. Additional information regarding the foreign government entity is provided in the Government Furnished Information document that is referenced in Section III.

### **Testing & Evaluation of S&T Deliverables**

A performer's technical approach shall include a proposed Testing & Evaluation (T&E) plan for demonstrating TA 1-3 developed capabilities, and a completely integrated end-to-end functionality. The T&E plan should include a statistical modeling & simulation (M&S) assessment (e.g. Monte Carlo) conducted in a timely manner (e.g., >50K runs in hours-to-days, not weeks-to-months). The M&S assessment is for analyzing all EWBM framework and AI decision aids algorithms/prototype code (SW) for single & multiple platforms based on US Government provided Use Cases/scenarios for one-on-many & many-on-many engagements, which includes statistical variability in environmental conditions, and threat performance characteristics and behaviors. During S&T developmental testing, performers are strongly encouraged to leverage available US & foreign-partner Government facilities while final prototype demonstrations to achieve TRL 6 shall be conducted at a designated US Government facility/laboratory.

### **III. DISTRIBUTION OF GOVERNMENT FURNISHED INFORMATION**

Prior to submitting a proposal, potential offerors are highly encouraged to review a Government Furnished Information (GFI) document entitled, "Key EMW RAM Development Information," which is available beginning July 31, 2019. The main GFI document is UNCLASSIFIED//FOUO material, but contains a separate classified annex at the SECRET level.

The request to obtain GFI material shall be made on company letterhead and shall include: company name, company CAGE Code, company classified mailing address, a current DoD contract number along with the Government point-of-contact for that contract, and the contact information for your Joint Certification Program POC. ONR will use this information to verify eligibility to receive & store classified information.

The request shall be sent to Mr. Stephen Hughes at [stephen.t.hughes@navy.mil](mailto:stephen.t.hughes@navy.mil) with a copy to Dr. Daniel Green at [daniel.s.green2@navy.mil](mailto:daniel.s.green2@navy.mil).

The deadline for requesting GFI material is August 16, 2019 at 3:00 PM Eastern. The GFI material shall be destroyed by October 1, 2019, with notification of the destruction of the material sent to Mr. Hughes and a copy to Dr. Green.

### **IV. INDUSTRY DAY**

The ONR EMW RAM S&T Manager will hold a classified information meeting at the SECRET//REL USA/Foreign Government level for potential offerors on Tuesday, August 6, 2019. The purpose of this meeting is to provide a better understanding of the scope of the ONR EMW RAM FNC Program and the objectives of this Special Notice. The briefing will be held in the Bobby Junker Executive Conference Center (BJECC) on the 14<sup>th</sup> floor at the Office of Naval

Research, 875 N. Randolph Street, Arlington, VA 22203. Check-in is from 08:00 – 08:45 AM. Briefing & Questions is from 08:45 AM – 01:00 PM.

**ADVANCED REGISTRATION IS REQUIRED, WALK-IN REGISTRATION WILL NOT BE PERMITTED**

All attendees are required to register by 5:00 PM Eastern on Wednesday, July 31, 2019. Please see the below registration website:

<https://www.onlineregistrationcenter.com/EMWRAMindustryday>

There is a limit of five (5) attendees per business unit per company. If requested attendance exceeds capacity, it may be necessary to limit attendance and individuals will be notified.

Hard copy printouts of classified briefing material **WILL NOT** be provided during the Industry Day. Classified note taking is **NOT** permitted. Only unclassified questions from the Industry Day will be posted.

**V. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION**

Full proposals should be submitted under N00014-19-S-B001 by **1:00 PM Eastern on September 12, 2019**. Full Proposals received after that date will be considered as time and availability of funding permit.

ONR anticipates that only contracts will be issued for this effort.

Full proposals for contracts should be submitted in accordance with the Long Range BAA instructions in 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 not exceed 30 single-sided pages encompassing all three Technical Areas (TAs). If an offeror is not proposing a complete, fully integrated end-to-end functional solution across all three TAs, then it is incumbent upon the performer to indicate how their proposed solution for one or two TAs will be integrated with the non-proposed TA(s), which may be developed by another performer. For each TA not proposed, the page limit shall be reduced by 5 single-sided pages. For example, if an Offeror is only proposing a solution for one TA, then the Technical Proposal/Content shall not exceed 20 single-sided pages, etc.

The cover page, résumés of the Principal Investigator (PI) and Program Manager (if different than the PI), bibliographies, acronyms list, and tables of contents (including figures & tables) are excluded from the page count. The technical proposal/content shall be formatted in 12-point Times New Roman font with margins not less than one inch and single-spaced. Proposals shall be in Adobe PDF format (preferred), or in Microsoft Word format compatible with MS Office 2016.

The cover page should be labeled “Proposal for ONR 2019 Research Opportunity: “Electromagnetic Maneuver Warfare Resource Allocation Management (EMW RAM)” and

include the following information: title of the proposed effort; programmatic, technical, and contracting Points-of-Contact (POCs) with their respective telephone numbers and e-mail addresses.

The body of the Technical Proposal/Content shall include the following information:

1. Name of the Principal Investigator and Program Manager (if different than the PI);
2. Executive Summary at the Unclassified//FOUO level (2 pages maximum);
3. Naval Relevance of the proposed effort to the research areas described in Section II;
4. Technical objective(s) of the proposed effort based on the research areas described in Section II;
5. Technical approach that will be pursued in meeting the objective(s), which includes:
  - i. A risk assessment & mitigation plan of the approach from the initial TRL starting point to TRL 6;
  - ii. A program management & tasking/development plan with testable performance metrics and milestones for achieving the stated objective(s) at TRL 6 by program completion;
  - iii. A Test & Evaluation (T&E) plan with TRL achievement dates/points – the T&E plan should include a M&S capabilities assessment of the developed technologies using statistical techniques against US Government provided Use Cases/scenarios.

The program management and technology development plans should be phased accordingly:

- a. Phase 1: Architecture Study for incorporating the performer's solution into the Government's designated airborne platform/systems by 2Q GFY20 (additional details are available in the GFI document).
  - b. Phase 2: Single Platform development & delivery of prototype code for fully integrated, end-to-end functionality of TAs 1-3 by 4Q GFY21 (additional details are available in the GFI document).
  - c. Phase 3: Multiple Platform development & delivery of prototype code for fully integrated, end-to-end functionality of TAs 1-3 by 4Q GFY22 (additional details are available in the GFI document).
- Phases 1 & 2 will execute concurrently while Phase 3 is anticipated to begin in 1Q GFY21.
6. A summary of recent relevant technical breakthroughs, which includes clearly identifying any intellectual property (IP) that the performer intends on leveraging and the critical nature of that technology in achieving the technical objective(s)/approach (3 pages maximum);
  7. A funding & expenditures plan per Government Fiscal Year beginning in 1Q GFY20 through 4Q GFY22 that achieves the technical objective(s) at TRL 6. This is a high-level (roll-up) spend plan, and is in addition to the Cost Proposal (2 pages maximum).

A résumé of the Principal Investigator and Program Manager (if different than the PI), not to exceed 2 pages each, should be included after the body of the Technical Proposal. For contract proposal submission, all submissions should be submitted electronically per section VIII unless submitting a classified proposal. Classified submissions can be sent electronically, or mailed following proper Security handling procedures for transmitting classified information.

ONR plans on allocating \$20-25M for efforts related to the Technical Areas in this Special Notice. The period of performance for contracts will be one to four (1-4) years aligned with the GFY beginning 1Q GFY20. Proposed multiple-year efforts are requested to be structured with a base effort of 12 months, followed by option years pursuant to program reviews on a quarterly, or semi-annual basis. The fourth (4<sup>th</sup>) year option is for technology transition support services that may include concluding final demonstration/testing event(s) because of scheduling delays, post-test analysis & peer review activities, and/or final reporting, but will not be used for technology development. It is anticipated that multiple awards may be made for Technical Areas 1-3 based on the quality of the proposed efforts.

Although ONR expects the above described program plan to be executed, ONR reserves the right to make changes according to program priorities and funding availability.

Selected proposers are anticipated to be notified by October 11, 2019. Selected projects will have an estimated award date of January 2020.

**VI. SIGNIFICANT DATES AND TIMES**

<b>Event</b>	<b>Date</b>	<b>Time</b>
Industry Day	08/06/2019	8:00 AM Eastern
First Day Performers May Request GFI	07/31/2019	
Last Day Performers May Request GFI	08/16/2019	3:00 PM Eastern
Full Proposal Submission Date	09/12/2019	1:00 PM Eastern
Notification of Selection: Full Proposals *	10/11/2019	
Awards *	January 2020	

Note: \* These are approximate dates.

**VII. POINTS-OF-CONTACT**

In addition to the points-of-contact listed in the Long Range BAA, the specific points-of-contact for this announcement are listed below:

Technical Points-of-Contact:

Dr. Daniel Green, Electronic Warfare Program Manager, [daniel.s.green2@navy.mil](mailto:daniel.s.green2@navy.mil)

Please copy (CC):

Shane Stein, Technical Contractor Support, [charles.s.stein.ctr@navy.mil](mailto:charles.s.stein.ctr@navy.mil)

Business Point-of-Contact:

Stephen Hughes, Contracting Officer, [stephen.t.hughes@navy.mil](mailto:stephen.t.hughes@navy.mil)

## VIII. ADDRESS FOR THE SUBMISSION OF FULL PROPOSALS FOR CONTRACTS

### **Unclassified Full Proposals:**

Unclassified full proposals should be submitted electronically to [onr.ncr.312.list.fct@navy.mil](mailto:onr.ncr.312.list.fct@navy.mil) by 1:00 PM Eastern on September 12, 2019. Files exceeding 10MB in size should not be emailed, but instead transmitted via a secure file transfer service, for example AMRDEC SAFE, <https://safe.amrdec.army.mil/safe/>, or ARL SAFE, <https://safe.arl.army.mil/>, which the latter will require you to contact the ONR TPOC and request a drop off service.

### **Classified Full Proposals:**

Classified proposals may be sent electronically using an approved classified Government network (e.g. SIPR) to Dr. Daniel Green at [daniel.s.green2@navy.smil.mil](mailto:daniel.s.green2@navy.smil.mil), and copy Shane Stein at [shane.stein.ctr@navy.smil.mil](mailto:shane.stein.ctr@navy.smil.mil), by 1:00 PM Eastern on September 12, 2019.

Classified proposals can also be mailed to 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 N. Randolph ST  
Arlington, VA 22203-1995”

#### **INNER ENVELOPE – (stamped with the overall classification of the material):**

“Program Name:  
Office of Naval Research  
ATTN: Dr. Daniel Green  
ONR Code 31  
875 N. Randolph ST  
Arlington, VA 22203-1995”

It is incumbent upon the offeror to properly portion mark each section/paragraph, table, figure, etc. in accordance with the Security Classification Guide (SCG) used, and properly referenced on the cover page. Use of NOFORN information is highly discouraged.

Electronic versions of proposals on CDs/DVDs are preferred over hard copy printouts if possible. Classified proposal submissions need to be received prior to the submission deadline, and therefore, please plan accordingly if mailing documents. Additionally, please provide a notification email to the Technical Point-of-Contact if you are mailing a classified package.

## IX. SUBMISSION OF QUESTIONS

Any unclassified questions regarding this announcement must be provided to the Technical Points of Contact and/or the Business Point of Contact listed in section VII. All unclassified questions shall be submitted in writing by electronic mail. Classified questions will be handled on a case-by-case basis, and may require access to a classified Government network (e.g. SIPR) or approved COMSEC equipment. If written classified questions are necessary, please submit in accordance with the same process as submitting classified full proposals listed in section VIII. Please be aware that there may be a significant time delay in responding to written classified questions, and offerors should plan accordingly.

Answers to unclassified (non-FOUO) questions submitted in response to this Special Notice may be addressed in the form of an Amendment posted to the following web pages:

- Federal Business Opportunities (FEDBIZOPPS) Webpage – <https://www.fbo.gov/>
- ONR Special Notice Webpage - <https://www.onr.navy.mil/en/work-with-us/funding-opportunities/announcements>.

All questions regarding **Full Proposals** should be submitted NLT two weeks before the date recommended for receipt of Full Proposals. Questions after this date may not be answered.