

NSWCDD BAA N00178-26-0001 PRE-RELEASE

INTRODUCTION:

During the pre-release period, topics are published with the NEEC Directors names, phone numbers, and/or email addresses. Colleges & Universities are encouraged to communicate directly with the NEEC Directors to ask technical questions to improve their understanding of a particular topic's requirements.

Once the formal Notice of Funding Opportunity is posted, direct communication between applicants and NEEC directors is no longer permitted. However, proposers may still submit written questions about the BAA topics to the NEEC Director with the Business POC on copy.

Based on expected changes for grants management, the posting date for the associated Notice of Funding Opportunity is currently unknown.

GENERAL INFORMATION

A. Agency Name:

Naval Surface Warfare Center Dahlgren Division
6149 Welsh Road
Dahlgren, VA 22448

B. Research Opportunity Title

Naval Engineering Education Consortium (NEEC) Broad Agency Announcement for Fiscal Year 2026

C. Program Name

Naval Engineering Education Consortium (NEEC)

D. Funding Opportunity Number

N00178-26-0001

E. Anticipated Response Date:

Full Submission Due: 15 October 2025 Eastern Daylight Time 11:59 pm

F. Research Opportunity Description

This BAA is open only to colleges and universities.

On behalf of the Naval Sea Systems Command (NAVSEA) Warfare Centers,

NSWC DD is soliciting research of interest in support of the NEEC. The topics of interest are listed below:

NSWC Carderock (CD)

Technical POC: John Barkyoumb

NSWC CD is interested in receiving proposals directed toward projects involving undergraduate or combined graduate student efforts that support the professional development/growth of students across the technical disciplines within Ship and Submarine Design and supporting technologies. The expectation is that awardees will work closely with the appropriate experts at NSWC CD throughout the entire effort. Considerations will be given to proposals in either of the following categories:

CD-01 Naval Architecture and Ship Design

NSWC Carderock seeks proposals for projects focusing on all aspects of Naval Architecture and Ship Design. This should include research that advances science and engineering supporting the performance of traditional and non-traditional platforms, design, and assessment capabilities. Capstone or Senior research topics or other projects for demonstrating progress on preparing the next generation of engineers focused on Naval Problems will be considered. Undergraduate or graduate research and teams of students are encouraged.

CD-02 Robotics and Autonomous Systems

NSWC Carderock seeks proposals in Robotics and Autonomous Systems that enhance science and engineering education that pushes the boundaries of capabilities in the ocean environment. Examples of areas of research are autonomy in unmanned systems, autonomous maneuvering and control, low-cost situational awareness, and low-observable autonomous systems. Robotic systems that enhance naval platform operations such as manned systems such as damage control, operating in hazardous environments, signature control, and maintenance of naval systems. Other technology areas will be evaluated on a case-by-case basis. Capstone or Senior research topics or other projects for demonstrating progress on preparing the next generation of engineers focused on Naval Problems will be considered. Undergraduate or graduate research and teams of students are encouraged.

NSWC Corona (CO)

Technical POC: Karon Myles

CO-01 TBD

CO-02 TBD

NSWC Crane (CR)

Technical POC: Bryan Woosley

The intent is to award ~\$145K for each topic per year for a total award period of 3 years

(~\$435K total per award).

CR-01 Large Language Models Applied to Autonomous Systems

Natural language processing (NLP) offers a powerful approach to converting complex, structured data into human-readable text, enabling Large Language Models (LLMs) to analyze and interpret information that would otherwise be difficult to comprehend. This is especially true in the Electromagnetic (EM) Spectrum. EM Spectrum Operations (EMSO) requires humans to interpret data to understand the EM environment and interpret its meaning. Navy information exchange protocols generate detailed, technical data optimized for machine communication. To be used effectively by LLMs, this data must be translated into a text-based form with preprocessing steps such as noise filtering and specialized tokenization.

Leveraging LLMs to interpret this data presents a significant opportunity to automate the generation of insightful, human readable reports. This allows humans to quickly understand the complicated implications of observations of the environment. This effort focuses on a realized approach. Distributed simulations of autonomous systems are generated by participants to generate a complicated scenario using the MQTT (Message Queueing Telemetry Transport) protocol, an Internet-of-Things information messaging method. Large Language Models are used to identify events within the simulated data and translate it into human understandable text. Autonomous systems can be in any domain: aerial, marine, or submarine. Enhanced situational awareness and decision-making for users across diverse operational settings is the ultimate objective.

CR-02 Bio-inspired Phase Changing Materials (PCM) for Signal and Emissivity Management

Develop innovative, biologically-derived and/or -inspired solutions, for infrared (IR) and radio frequency (RF) techniques that enhance stealth, survivability, and operational effectiveness of autonomous cyber-physical systems in contested environments to include emission and signature control. Neuromorphic architecture, brain-inspired computer processing, as an enabling technology for various mission areas should also be considered.

Background – Autonomous cyber-physical systems, including intelligent unmanned systems (UxS), operate in complex environments where detection by adversarial IR and RF sensors pose significant risk. Biological systems, such as cephalopods with adaptive camouflage or insects with low-observable RF signatures, offer inspiration for novel concealment and deception strategies. By mimicking these natural mechanisms, autonomous platforms could achieve enhanced stealth, evade detection/discrimination, and execute deceptive maneuvers to counter advanced sensor technologies.

Scope – Proposals are sought that address one or more of the following:

1. Development of adaptive materials, surface modifications, or coatings that (a) dynamically modulate apparent IR emissivity to decrease object discrimination against background environment and/or (b) minimize, maximize or modulate microwave scattering
2. Techniques to manipulate thermal and RF signatures from power sources, engines, electronic and communications components, etc., particularly for moving platforms
3. Solutions for real-time signature modulation and manipulation for purposes of obscuration by

matching dynamic environmental and/or weather conditions

4. Solutions that change overall electromagnetic emissions and signatures from UxS platforms

Expected Outcomes

1. Prototype materials, coatings, or systems demonstrating IR and/or RF concealment behavior derived from natural biology

2. Simulation or experimental demonstration validating performance in realistic optical scenarios

3. A clear path to integrating with autonomous cyber-physical systems, including considerations for robustness, cost, and manufacturability

NSWC Dahlgren (DD)
Technical POC: Caleb Strepka

DD-01 Electromagnetic Interference for Advanced Sensor Systems

The Navy is interested in research pertaining to electromagnetic interference (EMI) impacting and/or generated by advanced sensor systems, particularly active electronic scanned arrays (AESA) and/or digital arrays. Focused research topics may include statistical and predictive methods needed to characterize EMI in non-deterministic advanced sensor systems; the handling of large data sets and the application of artificial intelligence (AI) or radio frequency machine learning (RFML) in processing and/or identifying the effects of EMI; and digital calibration and/or testing methods for advanced sensor systems in the presence of a spectrally dense environment.

DD-02 Developing advanced naval sensor systems and intelligent sensor networks to optimize maritime surveillance and enhance maritime domain awareness.

This research area aims to enhance naval sensor and radar technology, improving maritime domain awareness and decision-making for warfighters through advanced sensor netting, fusion, and target identification. Artificial Intelligence/Machine Learning (AI/ML) techniques are central to this effort. Focus areas include developing robust sensor fusion algorithms that integrate diverse modalities (radar, EW, EO/IR) for accurate target tracking in challenging conditions, leveraging AI/ML for improved track initialization and maintenance. Proposals also seek intelligent AI/ML solutions for dynamic sensor netting and resource management, optimizing information gain with minimal resource consumption. Finally, automated multi-modal target identification and classification are crucial, requiring advanced ML architectures and Explainable AI (XAI) for system transparency and trustworthiness.

DD-03 AI/ML in Cyber

The rapid development and adoption of Machine Learning (ML) face significant challenges across its lifecycle, including data management, complex deployments, and scalability. From a cyber resilience and cyber survivability perspective, AI/ML applications are needed to model complexity and dynamic behavior of the cyber domain, its attack surface and associated engineering activities to accurately identify, prioritize, and manage operational risks in near real-time. MLOps streamlines the entire machine learning model lifecycle, enables continuous monitoring, automates retraining, and improves collaboration for efficient and effective cyber

engineering, test, and evaluation activities.

Proposals should seek to design, train, test, and deploy a MLOps infrastructure to automate data ingest, processing, and analytics to perform inference analyses and identify key indicators of risks within a system or systems of systems. Supported use cases include but not limited to natural language processing, classification, regression, adaptive and reinforcement learning using diverse government-owned datasets (e.g., SBOM, CVEs, pcap, engineering documents, after event reports, etc.).

DD-04 Large Metasurface Optic Characterization Testbed

The US Navy has an increasing need for high power handling, high survivability optics for High Energy Laser (HEL) weapon systems. Novel optical materials, optical coatings, and optical interface surface treatments (meta-surfaces) which increase survivability, laser induced damage threshold (LIDT), transmittance, and bandwidth throughput are of particular interest. Utility is further driven by size, shape, and uniformity requirements. In order to assess these novel and robust HEL optics, a multi-faceted characterization testbed is required which incorporates unique analyses appropriate for non-traditional coatings and meta surface treatments.

DD-05 Hypersonic Materials and coupled fluid-thermal-structural interaction M&S

The Navy seeks research in four key hypersonic technology areas:

Heat Flux Prediction: Development of computationally efficient methods to predict heat flux on complex geometric features (base/wake regions, control surface gaps, cavities, steps) using novel computational models, fast approximation techniques, ground test validation data, or AI/ML-informed simulations for full-vehicle flight models.

Navigation/Communication: Material and algorithmic solutions for hypersonic environments, including affordable high-temperature antenna/seeker window manufacturing, multi-source navigation with sensor fusion, and multi-agent autonomy—with algorithms optimized for embedded hardware in small munitions and materials scalable to large production.

Sensors: High-frequency, fast-responding sensors capable of withstanding extreme hypersonic conditions, including multi-axial strain sensors (10 microstrain resolution), non-intrusive ablation gauges (1 mm resolution), accelerometers surviving >50 Kgee (10 g resolution), and static pressure sensors (>1 MHz, 0.01 atm resolution) operating at 2000°F and 10+ kHz frequencies.

Thermal Protection Systems (TPS): Affordable mass production improvements for TPS materials focusing on enhanced performance, reduced costs/production time, improved machinability, increased production rates, lower scrap rates, better inspection techniques, and repair/replacement methods through modeling, testing, instrumentation, or demonstration.

NSWC Indian Head (IH)
Technical POC: Trevor Hedman

IH-01: Energetic materials that offer disruptive advances in performance. Desired technologies include innovative formulations, synthesis methods, processing methods and/or novel

compounds that enable longer range rocket motors or increased warhead performance. Development and characterization of fundamental shock wave, shock wave propagation and shock effects at different temperatures. Dissipative and dispersive effects have to be understood to describe impulse and energy flux at scale up or larger distances given the knowledge of the shock profile. Also considered are synthetic methods and/or novel compounds that enable faster, cheaper, or more efficient scale up and production. Solutions should not be a detriment to the current state-of-the art sensitivity to enable their safe handling, processing, and storage. Preference will be given to energetic material concepts whose ingredients are domestically sourced, of practical cost, and readily scaled to support future demonstrations and prototyping. It is expected the NEEC university partner will collaborate with NSWC IHD scientists/engineers and that the proposal will describe how the grant deliverables will be transitioned to the Navy.

IH-02: Artificial Intelligence solutions that improve the performance of munitions and other energetic systems.

Desired technologies include classical AI/ML models, Deep Learning, Large Language Models and/or Generative AI that enable longer range, faster speed, or increased warhead performance. Also considered are AI/ML tools that enable faster, cheaper, or more efficient system development, simulation, testing, and/or production, and such tools can focus on applications from the component level to the system level. It is expected the NEEC university partner will collaborate with Naval Surface Warfare Center Indian Head Division (NSWC IHD) scientists/engineers and that the proposal will describe how the grant deliverables will be transitioned to the Navy.

NSWC Panama City (PC)

Technical POC: Matt Bays

NSWC PC is interested in projects with a level-of-effort equivalent to one graduate student and supporting part-time research undergraduate(s). Awards are approximately \$125,000/year.

PC-01 Adaptive tuning for underwater sensors in unknown environments

Novel methods to intelligently tune stationary sensors to maximize sensing performance in unknown environments. Methods should focus on acoustic, pressure, seismic, and/or magnetic sensors. Methods can include machine learning and novel filtering techniques to allow intelligent sensors to identify and isolate a priori unknown background environmental effects from desired signals. Investigations involving both modeling / simulation, system design, and/or experimentation will be considered.

PC-02 Generative AI for Robotics & Autonomous Systems Design

Investigate use of state-of-the-art generative AI ecosystems to revolutionize the development of physical systems through advanced simulation tools, synthetic data generation, and scalable deployment frameworks for unmanned systems applications. Research efforts should focus on integrating these technologies into robotics, autonomous vehicles, or other systems requiring high-fidelity 3D environments and robust training datasets within maritime applications. Proposals should investigate methodologies for how these technologies can accelerate iterative design cycles, improve model accuracy in real-world scenarios, and reduce reliance on costly

physical prototyping.

PC-03 Operator informed Sliding Scale Autonomy for Manned, Unmanned Teaming (MUMT)

Research leveraging information provided by unmanned system operators and those who interact with unmanned systems to better understand the levels of autonomy which improve human and machine performance. Research to inform the development of autonomy for both surface and underwater systems would be operator focused, investigating various factors to be determined through developer observation and interaction (environmental, fatigue, intel, number of resources in area, operator skill set). Leveraging insights into human-machine performance, example sliding scale autonomy behaviors should then be implemented on open architecture systems for variable time domain factors such as trust or sea state to address findings on performance shortfalls.

NSWC Philadelphia (PD)

Technical POC: Steve Mastro

The grant should be scoped to a \$150K effort per year.

PD-01 Constructal Approach to Heat Exchanger Design

Heat exchangers play a critical role in naval vessels, serving as essential components for managing thermal loads across various shipboard systems. These devices are solely responsible for maintaining optimal operating temperatures, therefore the reliability and efficiency of heat exchangers directly impact a ship's operational readiness and performance. This NEEC grant seeks to improve heat exchanger efficiency through a redesign inspired by constructal theory. Constructal theory explains the phenomenon that a system will evolve to provide greater access to the currents that flow through it. These systems most commonly consist of a major flow path with other minor flow paths that branch off, and smaller paths branching off those.

NSWCPD requests proposals that will investigate alternative, constructal theory-based designs of heat exchangers. The performance of the designs should be evaluated numerically prior to fabrication of a prototype. The prototype designs should incorporate innovative solutions and emerging technologies, such as artificial intelligence for its analytical abilities and additive manufacturing for its unique fabrication capabilities. The proposed design should then be further explored with respect to heat exchanger design for cryogenic applications.

The purpose of the NEEC grant is to both engage with a university researcher to address a current Navy technology need, and to create an opportunity for students to participate in a research effort. The proposal should detail how students will be engaged in the effort and how they will receive hands-on experience.

PD-02 Dynamic Stress Testing and Security Testing for Industrial Control Systems:

Industrial Control Systems (ICS) automate critical functions in manufacturing, shipboard machinery plants, and critical infrastructure. Ensuring the reliability and safety of software in an ICS is paramount, as code defects or inconsistencies can lead to operational disruptions,

cybersecurity risks, increased maintenance costs, and delay or impact the ability to implement software fixes or enhancements. While Dynamic Application Security Testing (DAST) is a valuable tool with numerous Commercial-Off-The-Shelf (COTS) solutions that enable black-box, dynamic security testing of a system, such tools are often tailored toward web applications and web services and are less useful for legacy applications that utilize standalone Human-Machine Interfaces (HMIs), typical of distributed ICS's. Protocol fuzzing tools that analyze industrial control protocols mitigate this issue by testing the system at the network layer, but do not provide a comprehensive approach to all inputs and outputs of the ICS.

NSWCPD requests proposals that will enable ICS DAST through automated enforcement of security testing of legacy applications at the HMI layer of the ICS. We request that a tool be developed or refined that is capable of dynamically testing the security of inputs and outputs of a running HMI application through attack vectors such as Structured Query Language (SQL) injection, privilege escalation, path traversal, stress testing, and fuzzing. We request that the tool be extensible so that additional rules, test patterns, and other emerging requirements can be integrated into the tool. We request that this project support legacy HMI systems running on MS Windows and Linux. We request the tool be capable of running on a MS Windows and Linux system.

The purpose of the NEEC grant is to both engage with a university researcher to address a current technology need and to create an opportunity for students to participate in a research effort. The proposal should detail how students will be engaged in the effort and how they will receive hands-on experience.

PD-03 LLM/NLP-Assisted PLC Code Scanner

Programmable Logic Controllers (PLCs) are the backbone of modern industrial control systems (ICS), in manufacturing, shipboard machinery plants, and critical infrastructure. Ensuring the reliability and safety of PLC software is paramount, as code defects or inconsistencies can lead to operational disruptions, cybersecurity risks, increased maintenance costs, and delay or impact the ability to implement software fixes or enhancements. While tools like SonarQube can be utilized to perform static code on software written in languages such as C++ to address these concerns no such tool exists for PLC code. Furthermore, there is no universally established standard that could be referenced by a static analysis tool, and many industries have alternative or competing code standards that they are unwilling to shift from, including the Navy.

NSWCPD requests proposals that will enable PLC code static analysis and vulnerability scanning through automated enforcement of vendor-specific coding standards. We request that a tool be developed that will be capable of dynamically reading in a set of 10-20 "good" examples, perform dynamic processing of those examples, and generate a standardized "template" from which it will compare future analysis. We request that there is an ability to manually edit the template to correct any potential issues or add in a feature manually that didn't exist in the previous examples. We request that this project supports PLCs from major vendors and their development environments (Rockwell Automation Studio 5000 and Siemens TIA Portal). Proposals can include the development of unique tools specific to each vendor to reduce complexity. The prototype designs should incorporate innovative solutions and emerging

technologies, such as artificial intelligence for its analytical abilities and natural-language processing to make it easier for the template to be modified by an administrator.

The purpose of the NEEC grant is to both engage with a university researcher to address a current technology need, and to create an opportunity for students to participate in a research effort. The proposal should detail how students will be engaged in the effort and how they will receive hands-on experience.

NSWC Port Hueneme (PH)

Technical POC: Armen Kvryan

PH-01 Establishing Geographically Diverse Environmental Test Sites for Material and System Exposure

This research topic seeks to explore the development and deployment of experimental test sites across varied atmospheric and geographical conditions—such as coastal, arid, arctic, and tropical environments—for the long-term exposure and evaluation of naval materials, coatings, and system components. The goal is to understand the effects of real-world environmental stressors on performance, durability, and degradation, informing the design and sustainment of future naval platforms. Proposals should outline methodologies for site selection, monitoring, data collection, and integration into Navy materials qualification and lifecycle models.

PH-02 Additively Manufactured Low Observable (LO) Materials for Naval Applications

This topic focuses on advancing the understanding and development of additively manufactured materials and composites with low observable (LO) characteristics for use in maritime environments. Research should investigate novel material formulations, manufacturing techniques, structural integrity, and radar signature performance, with an emphasis on scalability and integration into current and next-generation Navy platforms. Collaboration across materials science, additive manufacturing, and electromagnetic modeling disciplines is encouraged to develop solutions that maintain LO effectiveness while meeting naval operational and environmental demands.

PH-03 AI/ML-Driven Predictive Maintenance Optimization for Fleet Sustainment

This topic calls for the development of artificial intelligence and machine learning tools to reduce maintenance burden and increase fleet readiness through predictive analytics and optimized maintenance scheduling. Research should explore models that leverage sensor data, historical maintenance records, and operational patterns to anticipate failures, recommend intervention timelines, and allocate resources more efficiently. Solutions must be explainable, cyber-resilient, and integrable with Navy maintenance management systems, with special consideration for minimizing unplanned downtime and extending platform service life.

PH-04 AI/ML-Based Detection and Classification of Unmanned Aerial Systems (UAS/UAV)

This area supports the development of AI/ML algorithms for detecting, classifying, and tracking

small unmanned aerial systems (UAS/UAV) in complex naval environments, including littoral zones, shipboard operations, and contested airspace. Proposals should focus on fusing multiple sensor modalities (e.g., radar, EO/IR, RF emissions) and applying advanced machine learning techniques to improve detection accuracy, reduce false positives, and support real-time threat assessment. Emphasis on adversarial robustness, edge computing deployment, and tactical applicability is highly encouraged.

NUWC Keyport (KP)
Technical POC: Samuel De Lano

The grant should be scoped to a \$150K effort per year.

KP-01 The ability to create undersea wireless networks to support a wide range of operations requires the development of small, low frequency antennas. Novel antennas capable of producing 20 kHz to 200 kHz in small form factors are desirable. These antennas should be capable of undersea operation and require low power to operate.

NUWC Newport (NP)
Technical POC: Elizabeth Magliula

No topics this year.

Joint Hypersonic Transition Office (JHTO)
Technical POC: Annie Bullock
Annie.e.bullock.civ@us.navy.mil

JHTO-01 The Joint Hypersonics Transition Office is seeking proposals for faculty-led research initiatives designed to strengthen national hypersonic capabilities and develop a highly skilled workforce pipeline across Government, Labs, and Industry. Projects should prioritize substantial undergraduate research involvement and the development of essential skills in key areas related to systems engineering, modeling & simulation, and/or ground and flight testing. Projects should focus on developing novel methodologies for managing the complexity of hypersonic and high-end aerospace systems, creating and validating high-fidelity models and simulations (including CFD, structural analysis, and thermal management), and designing innovative ground and flight test methods to validate hypersonic and high-end aerospace technologies and modeling assumptions, with an emphasis on novel instrumentation and data acquisition. Proposals should include a travel allowance to support student travel to share and present their work.

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