

**TASK ORDER STATEMENT OF WORK****NRL Contract: N0017323Dxxxx****Task Order: N0017323Fxxxx****“Scientific and Engineering Support for Advanced Electronic Warfare”****4 February 2022****1 Introduction**

The Advanced Techniques Branch (Code 5750) of the Tactical Electronic Warfare Division (TEWD) of the Naval Research Laboratory (NRL) conducts research, development, test, and evaluation (RDT&E) of advanced threats, missile modeling, decoys, electronic warfare (EW) technologies, ship signatures, and other concepts and technologies for the protection of United States (US) Navy and Marine Corps platforms (surface, subsurface, aircraft, & ground vehicles). Through multiple ongoing programs, TEWD is developing modeling and simulation (M&S) tools, conducting analysis of simulation results, and developing advanced Electronic Warfare (EW) concepts to support the evaluation of EW systems and techniques.

**2 Scope**

The Contractor shall investigate current and innovative techniques to assess and improve the susceptibility of U.S. Navy assets in maritime environments with various background conditions, including at sea, littoral, shallow water, air, and terrain backgrounds. The scope of work under this task order includes the development, modification, validation/verification, application, and/or maintenance of multiple computer simulations, NRL all digital simulators, simulation environment, software development, and physics based analysis tools. It also includes using those simulations in studies and analyzing/interpreting the results for the evaluation of EW techniques and technologies. The scope also includes laboratory and field experiment design, planning, preparation, execution, data analysis, and report documentation.

The contractor shall support NRL with research, design, development, engineering, systems integration, analysis, modeling and simulation, and documentation necessary to support the following EW Simulation programs:

- Obscurants Modeling for Naval Applications
- Tactical Command, Control, and Communication(C3) Countermeasures
- Effectiveness of Navy Electronic Warfare Systems (ENEWS) Program
- AN/SLQ-32 Shipboard Electronic Warfare System Program, Engineering Support
- Navy Engineering Logistics Office (NELO) Tasking
- Signature-Based EW Analysis
- Multispectral EO/IR Countermeasures Against Advanced Threats
- Rapid Response Offboard Capabilities
- Leveraging Low Cost Sensors for Unmanned Aerial Vehicle (UAV) Control
- Threat Engineering Characterization Package (TECP)
- Shipboard Electronic Warfare System
- Navy Enterprise Modeling
- Shipboard Electronic Attack System
- Advanced Offboard Electronic Warfare Effort (AOEW)
- Naval Aircraft Self Protection (NASP)
- Liquid Crystal for Non-Mechanical Beam Steering in the Mid and Long Wavelength Infrared
- Naval Combatant Susceptibility & Hit Point Studies

- DDG1000 Ship Signature & EW Assessment
- Shipboard EO/IR Closed Loop Self Protection
- Near Infrared Optical Augmentation (NIRO) Technology
- Joint Stand-Off Weapon (JSOW) Block III Infrared Analysis
- Multi-System Canadian Electronic Warfare (EW) Operational Test 2007

These interrelated efforts support the same mission and must be coordinated with the Government.

### **3 Technical Requirements**

Efforts within this section are to be accomplished on both classified and unclassified computer networks, and may require Contractor personnel to have access to Alternative Compensatory Control Measure (ACCM) controlled information, as well as access to information up to and including Top Secret (TS) and Sensitive Compartmented Information (SCI) classification levels.

#### **3.1 Threat Engineering Support**

The Contractor shall provide needed expertise, guidance, planning, and development of representations of existing and emergent threats and threat technologies. Tasks include:

- Determining threat performance characteristics and bounds for emergent threats
- Determining threat capabilities for emergent technical developments
- Developing mathematical representations and models of existing and emerging threats, systems, subsystems, and components

#### **3.2 RF/EO/IR Propagation and Analysis**

The Contractor shall provide needed expertise with electromagnetic propagation and the RF/EO/IR signatures of naval ships. This shall be based on a strong understanding of RF and EO/IR physics when applied to all digital implementations and may include studies of materials and ship systems in the laboratory and the field. Tasks include:

- Modeling propagation in maritime environments
- Analyzing propagation in the presence of obscuring materials
- Modeling RF systems in maritime environments
- Studying the RF/EO/IR signatures of naval ships
- Develop and improve models and simulation codes to predict the RF signature of ships
- Develop and improve models and simulation codes to predict the EO/IR signature of ships
- Integrating ship signature models in all digital simulations
- Evaluating the impact of ship signature on various countermeasure techniques
- Recommending aspects of ship signatures which should be the focus of reduction efforts
- Developing techniques to reduce naval ship signatures

#### **3.3 Electronic Warfare (EW) Modeling and Simulation (M&S) Development**

The Contractor shall design, develop, maintain, and improve computer-based modeling and simulation capabilities as an analysis tool for emergent technologies and a validation tool for operational technologies including threat missiles, RF/EO/IR/Laser sensors, EW systems, obscurants, and U.S. Navy ships. The Contractor will integrate developed models into federated testbed architectures, develop high performance computing methods to speed up the M&S codes to meet specific testbed imposed runtime requirements, and evaluate the trade-off between speed and fidelity. The Contractor shall also support and

maintain the testbeds which interface models of various systems into a federated architecture. Tasks include:

- Designing, developing, and maintaining digital models of new and existing threats, EW systems, and subsystems
- Writing and updating software using physics based simulation techniques
- Integrating developed models into NextGen CRUISE Missiles (NGCM) for use in federated testbed architectures
- Developing methods to speed up the M&S codes to meet specific runtime requirements
- Performing Verification and Validation (V&V) studies and experiments to determine the accuracy and validity of the modeling and simulation codes
- Supporting and maintaining the testbeds which interface models of various systems
- Testbed-level Verification and Validation (V&V) by executing simulation runs, conducting data analysis, and making component level changes to the federate in response to any errors identified during the testbed-level V&V process
- Software maintenance including updates to fix reported bugs and interface issues. Proper software maintenance and rework is a critical part of maintaining models of modern missiles that are deployed in testbed environments

### **3.4 EW Modeling and Simulation Studies and Analysis**

The Contractor shall conduct studies and analyses to support threat assessment, countermeasure effectiveness, requirements development, design trade-offs, concept of operations, technology exploration, system performance, ship installations, and force layouts. Tasks include:

- Performing studies to determine the effectiveness of decoy and countermeasure techniques against anti-ship missiles
- Performing studies to determine vulnerabilities of US assets to emergent technologies
- Evaluating various countermeasure techniques against known and postulated threats
- Conduct studies to determine the effectiveness of decoy and laser countermeasure techniques against anti-ship EO/IR missiles. Review and design new or improved countermeasure or low observable techniques
- Performing analysis of study results

### **3.5 Hardware-in-the-Loop and Signal-Processor-in-the-Loop Development and Studies**

The Contractor shall design, develop, and maintain closed loop test platforms, which can be used to evaluate RF/EO/IR hardware and signal processors. This often involves a combination of hardware and real time simulations to provide optical and/or electromagnetic stimulation to the unit under evaluation. The Contractor shall operate these test platforms to determine the operational characteristics, capabilities, and limitations of RF/EO/IR hardware and signal processors.

### **3.6 Systems Engineering**

The Contractor shall apply systems engineering principles and practices to support the design, analysis, development, and procurement of new EW systems and prototypes. Tasking includes:

- Assisting in concept exploration, design, and evaluation of new EW systems/subsystems
- Conducting requirements definition studies and analysis of mission needs to specify system/subsystem objectives and key performance parameters.
- Conducting studies and analyses to support requirements development, design trade-offs, concept

- of operations, and technology exploration
- Defining and maintaining system requirements to include operation, maintenance, allocation, tracking, and verification of systems requirements
- Supporting the development of the system description from defined requirements
- Evaluating the capability of system designs to satisfy system performance objectives
- Selecting resources, providing appropriate designs/drawings/specifications, ordering materials for system test and development as needed, overseeing production, and executing assembly, integration, and test

### **3.7 Laser Technologies**

The Contractor shall design and develop innovative laser techniques and prototypes related to EO/IR laser countermeasure applications, surveillance systems, directed energy systems, and laser measurement sensors and systems. The Contractor will subsequently support the transition to the warfighter, to reduce threats in air, maritime, cyberspace and land-based environments. Tasks include:

- Developing and evaluating primary and alternative designs of laser sources through laboratory measurements, sensor effects testing, and performance analysis
- Modeling and simulation relevant to laser usage including relevant health and safety restrictions, optical usage, electrical and thermal modeling for the use of lasers in DoD RDT&E
- Developing prototype EO/IR/laser sensors and systems to be used in concept development, requirements assessments, system design, systems engineering, environmental considerations, systems integration, prototype testing, and systems functional demonstration
- Develop hardware including electrical or mechanical fixtures to interface the system or test equipment to land, ship, or airborne platforms, and develop software or firmware to run the systems
- Supporting laser technology risk reduction for DoD applications including lifetimes, cost models (manufacturing technology), and device integration (thermal and electrical) including safety, health, and environmental limitations in relevant laser testing and operation

### **3.8 Field Testing**

The Contractor shall support on-site and off-site laboratory and field tests in a variety of geographic locations on land and at sea on U.S. Navy ships within the Continental United States (CONUS) or Outside Continental United States (OCONUS) to evaluate the performance of various systems, subsystems, and equipment. Tasks include:

- Producing test objectives, plans, procedures, and reports
- Defining resources, equipment and outside support required for testing
- Predicting test outcomes using computer simulation (only for select tests as directed)
- Designing, developing, procuring, calibrating, operating, and maintaining complex devices and systems, calibration facilities, instrumentation, data acquisition systems, and processing systems.
- Designing and developing closed loop test platforms which can be used to evaluate RF/EO/IR hardware and signal processors. This often involves a combination of hardware and real time simulations to provide optical and/or electromagnetic stimulation to the unit under evaluation
- Interfacing, when required, with test site security, safety, and facility personnel to ensure adherence to all required test site procedures
- Executing tests and collecting data
- Performing detailed data reduction and data analysis

### **3.9 High Performance Computing**

The Contractor shall design, develop, test, operate, and maintain the high-performance computing capabilities and infrastructure necessary for NRL Code 5750 to support technical and program tasks. The systems, processes, and procedures shall be documented and made compliant with all Code 5750 procedures, NRL IA, and security regulations. Tasks include:

- Designing, developing, testing, and operating high-performance computing capabilities necessary to operate specific modeling and simulation codes and to execute M&S studies and analyses
- Supporting the computer engineering requirements for technical and program tasks, including the development and coding of software for various technical projects
- Maintaining Windows and Linux development environments
- Supporting the information technology and information assurance that are required on both classified and unclassified networks; including scientific applications at workstations, server capacity maintenance, systems and data integrity/maintenance/backup and all associated security maintenance of classified projects

### **3.10 Administrative and Program Support**

The Contractor shall provide administrative and program support. Tasks include:

- Evaluating and tracking technical, schedule, and cost risks
- Drafting technical briefings, reports, and documentation and coordinating with the Contracting Officer's Representative (COR) or Government's technical team for review, comment, and approval processes
- Providing program support to determine the latest DoD guidance and direction on managing Research & Development, and Engineering Development programs and projects

### **3.11 Fleet Support and Training**

The Contractor shall provide fleet support and training to aid the transition, improvement, and maintenance of EW capabilities and systems to US Navy ships, and other sea, land, and air assets. Tasks include:

- Planning, coordinating and establishing immersive training opportunities
- Integrating experimentation and S&T capabilities into training activities and exercises
- Fleet support for the transition of new EW systems and assets
- Fleet support for the maintenance and improvement of existing EW assets

## **4 Security Requirements**

To execute performance of this SOW, collateral SECRET, NATO SECRET, TOP SECRET, and TS/SCI clearances will be required for technical personnel. Administrative support personnel will need Collateral SECRET clearances. Interim-SECRET clearances are allowed on a temporary basis for new-hires.

Contractor personnel assigned to this contract who require TS/SCI access must have a favorably adjudicated DoD Tier 5 investigation; a final TS security clearance, with eligibility of SCI prior to submission. Contractor personnel assigned to this contract who require TS access must have a favorably adjudicated DoD Tier 5 investigation; a final TS security clearance prior to submission. Contractor personnel, who require access to Secret information, must have a favorably completed Tier 3

investigation and a final Secret clearance prior to submission.

Contractors issued a DoD interim-SECRET security clearance may ONLY work on unclassified tasks as outlined in the SOW. Unclassified IA or IT positions are NOT authorized with a DoD issued interim secret clearance.

Contract Facility Security Officers (FSOs), and/or NRL CORs, are required to report immediately to Code 1230 any derogatory information regarding a contractor holding an interim-SECRET clearance, either on-site or off-site. FSOs and NRL CORs shall also notify Code 1230 when a contractor's interim or final clearance has been declined or revoked.

For Contractors working on unclassified task orders and performing at the locations listed in block 13 of the DD 254, a favorably completed suitability determination and a submitted T3 investigation is required prior to the start of work. Individual installation access restrictions may apply.

All Contractors (including subcontractors) identified in the SOW shall supplement their current security practices by requiring any personnel involved in executing the contract to complete Government-sponsored and administered Operations Security (OPSEC) training, OPSE-1301 and any OPSEC guidance that may pertain to the project.

Interim-SECRET clearances are allowed on a temporary basis for new-hires with written approval by the relevant program sponsor(s) and NRL Code 1200. Contractors issued a DoD interim Secret security clearance may only work on specific projects covered by SOW Sections 3. Unclassified IA or IT positions are NOT authorized with a DoD issued interim secret clearance. Contractors with an Interim-SECRET clearance must be escorted at all times in classified spaces.

Contractors with an Interim-SECRET clearances are prohibited from having any access to the following types of classified information:

- Communications Security (COMSEC)
- Special Compartmented Information (SCI)
- Special Access Program (SAP) Information
- North Atlantic Treaty Organization (NATO) Information
- Critical Nuclear Weapons Design Information (CNWDI)
- Restricted Data (RD) (and Formerly Restricted Data)
- Naval-Nuclear Propulsion Information (NNPI)
- Foreign Government Information (FGI)

## **5 Travel**

As required, this task order may involve limited amounts of travel (a) within the US, (b) travel outside the US to friendly countries (e.g., Australia, Ireland, Japan, UK), or (c) aboard US Navy ships and/or US military bases. The Contractor may attend and participate in technical meetings and technical program reviews. For example these might include meetings (a) internal to the Government customer (e.g. within NRL), (b) between Government customer and their sponsors (e.g. ONR, OPNAV, OSD), (c) between Government customer and their end-user (e.g. NAVWAR, PACFLT, PACOM), (d) between/among military services (e.g. OSD JTEN), (e) standards-related meetings (e.g. IEEE, IETF), and/or (f) other technical meetings, workshops (e.g. Multi-Service Networks), conferences (e.g. IEEE MILCOM), and symposia. Detailed travel requirements are currently unknown.

## **6 Place of Performance**

The primary place of performance is on-site at NRL. Additionally, work may be performed at other Government facilities and Contractor sites. Presentations, technical interchange meetings, and support activities may require TDY to remote locations. Performance of this task may also require travel to system test execution sites.

## **7 Deliverables**

- The Contractor shall prepare and deliver Contractor On-Site Labor Reports on a monthly basis in accordance with Contract Data Requirement List (CDRL) A001 of the Base Contract.
- The Contractor shall prepare and deliver Financial Status Reports on a monthly basis in accordance with CDRL A002 of the Base Contract.
- The Contractor shall prepare and deliver Task Progress Reports on a monthly basis in accordance with CDRL A003 of the Base Contract.
- The Contractor shall prepare and deliver Technical Reports and Presentation Materials in accordance with CDRL A004 of the Base Contract.
- The Contractor shall prepare and deliver Software/Hardware Design Description in accordance with CDRL A005 of the Base Contract.
- The Contractor shall prepare and deliver Contractors Management Plan in accordance with CDRL A006 of the Base Contract.

## **8 Technical Point of Contact**

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