PMW 750 C4I Testing, Integration, and Installation
PERFORMANCE WORK STATEMENT (PWS)

1.0 INTRODUCTION Program Executive Office for Command, Control, Communications, Computers, and Intelligence (PEO C4I) is responsible for Maritime Platform Engineering, Integration, and Production Execution requirements. This contract will encompass logistics, integration, engineering, procurement, fabrication, assembly, test, inspection, and installation of integrated C4I and related capabilities aboard new construction ships, to include Refueling Complex Overhaul (RCOH) ships. These capabilities shall include recent additions to the ship communications. The scope also includes industrial work required to finish out and deliver select completed ship spaces, and coordinate installation of additional unanticipated interior communications systems. The Contractor shall improve platform performance and reduce total costs to the Government by implementing a "total systems engineering management approach" to shipboard C4I integrated systems design, production, testing, and shipboard integration support, as described in this Contract Performance Work Statement (PWS).

1.1 **Background -** This contract will support various Navy and other United States Government shipbuilding programs. These programs require integrated C4I capabilities to provide robust communications for operations, maritime, and flight safety. These programs also require integrated information from various communications links and sensors. The integrated capabilities will provide a given command or ship an extension of the tactical horizon, and provide threat indications and warnings. These capabilities will also provide tactical threat analysis and the capability to target the indicated threat entities. The integrated capability is made up of distributed systems that provide network capabilities, communications, command and control, intelligence, non-tactical data, and interior communications systems. The latest-generation systems and systems upgrades requiring greatly increased numbers of racks and Local Area Network (LAN) drops, additional antennas, and associated cabling and below decks control hardware, will be required. The System of Systems (SoS) Test and Integration Facility (TIF) Complex is located at SPAWAR Systems Center–Atlantic (SSC–LANT) in Charleston, SC.

1.2 **Scope -** This contract is to provide support for the following anticipated shipbuilding programs: carriers, large and small deck amphibious, combatants, auxiliary, and special mission ships. Specific tasking will be identified in each Task Order.

1.2.1 Places of Performance The principal place of performance of the contract is Charleston, SC, and the anticipated shipyards are in: Mobile, AL; San Diego, CA; Bath, ME, Pascagoula, MS; Dahlgren, Newport News, and Norfolk, VA.

1.2.2 Facilities The Contractor shall maintain sufficient facilities for the performance of this contract within a 25-mile radius of the SSC–LANT TIF Complex in Charleston, SC, and at designated shipyard locations as required and approved by the Government. The Contractor's permanent support facility shall be ready for use no later than sixty (60) days after contract award. The facility must be capable of meeting security requirements for storage and safeguarding of classified information up to the SECRET level. The Contractor shall perform platform TIF integration at the Government TIF Complex. The Contractor shall provide/lease vehicles, and shall provide/lease office, and/or storage space to support normal operations and emergency evacuation for Program personnel and material near shipyard facilities.

1.2.3 Industrial/Warehousing Facility The Government will provide industrial/warehousing space in North Charleston, SC, to accommodate storage of the electronic equipment and material required in performance of this contract. In the event that Government warehousing space has been exceeded or is unavailable, the Contractor shall have the ability to store equipment within a 25-mile radius of the TIF Complex and/or shipyard locations. The Contractor shall provide/lease office and/or storage space at designated shipyard locations as required and approved by the Government to support normal operations and emergency evacuation for Program personnel and material near shipyard facilities. Additional warehouse space may be required due to the recent change from traditional delivery to the shipbuilder's warehouse to just-in-time delivery directly to the ship.

1.2.4 Tasking Specific tasking may include but is not limited to:

- Communications Security
- Configuration Management
- Crew Support and Familiarization
- Installation, and Platform Familiarization
- Design Engineering
- Platform Execution Plan
- Facilities
- Human Systems Integration (HSI)
- Industrial/Warehousing Facility
- Integrated C4I Test Development & Support
- Integration Engineering
- Management Plan
- Manufacturing, Production, and Fabrication Process Development/Maintenance
- Manufacturing Engineering; Manufacturing Readiness
- Material Management
- Packaging, Handling, Storage, and Transportation
- Platform C4I Testing
- Platform Logistics Support
- Platform Ship Compartment Build-up Integration and Test within the TIF Complex
- Platform Systems Engineering
- Post Trials Discrepancy Correction
- Product Testing & Support
- Production/Integration
- Quality Control and Quality Assurance
- Rack Integration/Assembly
- Resource Planning
- Shipyard/Shipboard Installation/Support
- Shipboard Industrial Work
- Shipboard Equipment Installation
- Systems Engineering
- Systems Packing and Transportation
- Trials Support

2.0 APPLICABLE DOCUMENTS Reference documents are identified in the applicable technical and management requirement statements. The latest revision in force at the time of Task Order (TO) award will be applicable. The Contractor may identify and propose alternative commercial specifications and standards where applicable at the time of execution. The Government will review and approve prior to acceptance and implementation.

Document Title	PWS Location	Location
DODAF (SV)-1 Department of Defense Architecture Framework Internal System View	3.1.5	http://dodcio.defense.gov/TodayinCIO/DoDArchitectureFramework/dodaf20_sv1.aspx
ABS NVR American Bureau of Shipbuilding Naval Vessel Rule	3.2.1 3.2.5.5 3.2.5.6 3.2.5.7	http://www.eagle.org/eagleExternalPortalWEB/appmanager/absEagle/absEagleDesktop?_nfpb=true&_pageLabel=abs_eagle_portal_main_home_page
ASME Y14.5 American Society of Mechanical Engineers Standard Y14.5 Dimensioning and Tolerancing Standard	3.2.5.2 3.2.6	http://www.asme.org/shop/

Document Title	PWS Location	Location
MIL-D-23140D Drawings, Installation Control, for Electronic Equipment	3.2.5.4 3.2.5.6	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=16057&method=basic
DoD-STD-2003-4 Department of Defense Standard Practice: Electric Plant Installation Standard Methods for Surface Ships and Submarines (Cableways)	3.2.5.5	http://www.everyspec.com/DoD/DoD-STD/DOD-STD-2003-4_6133/
NSTISSAM TEMPEST/2-95A Red/Black Installation Guidance	3.2.5.5 3.2.6.4	http://cryptome.org/nsa-foia-app2.htm
IA PUB-5239-31 Information Assurance Shipboard Red/Black Installation Publication	3.2.5.5 3.2.6.4	http://www.responseboatproject.net/rbmcontract/sections/Section_J/References/DoN_IA_PUB-5239-31.pdf
DoD-STD-2003-3 Department of Defense Standard Practice: Electric Plant Installation Standard Methods for Surface Ships And Submarines (Penetrations)	3.2.5.5	http://www.everyspec.com/DoD/DoD-STD/DOD-STD-2003_3_6142/
MIL-STD-2003A DoD Standard Practice: Electric Plant Installation Standard Methods for Surface Ships and Submarines	3.2.5.6 3.2.6.6	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=37217&method=basic
S9086-KC-STM-010/CH-300R6 Naval Ships' Technical Manual	3.2.5.7	http://www.epubbud.com/read.php?g=PSNJQAFH&tocp=1
MIL-STD-1399C Interface Standard For Shipboard Systems	3.2.5.7	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=36807&method=basic
IEEE Std 45 Institute of Electrical and Electronics Engineers (IEEE) Recommended Practice for Electric Installations on Shipboard	3.2.5.7	http://www.ieee.org/index.html
MIL-STD-882E DoD Standard Practice for System Safety	3.2.6.4	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=36027&method=basic
DoD-STD-2106 (NAVY) Development of Shipboard Industrial Test Procedures	3.2.6.7 3.4.2	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=37257&method=basic
DoD Instruction 5000.02 Operation of the Defense Acquisition System	3.2.12	http://www.dtic.mil/whs/directives/corres/pdf/500002p.pdf
Defense Acquisition Guidebook, Chapter 6 – Humans Systems Integration (HSI)	3.2.12	https://acc.dau.mil/CommunityBrowser.aspx?id=510172
MIL-STD-46855A Human Engineering Requirements for Military Systems, Equipment, and Facilities	3.2.12.1	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=113938&method=basic
ASTM F1337 Standard Practice for Human Engineering Program Requirements for Ships and Marine Systems, Equipment, and Facilities	3.2.12.1	http://www.astm.org/Standards/F1337.htm
ASTM F1166 Standard Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities	3.2.12.1	http://www.astm.org/Standards/F1166.htm
MIL-STD-1472G DoD Design Criteria Standard, Human Engineering	3.2.12.1	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=36903&method=basic
NAVSEA Standard Items	3.2.12.2	http://www.navsea.navy.mil/CNRMC/SERMC/SSRAC1/nsi/15nsi/15.htm

Document Title	PWS Location	Location
29 CFR Part 1915 Occupational Safety and Health Standards for Shipyard Equpment	3.2.12.2	www.OSHA.gov
MIL-STD-2003-1A Electric Plant Installation, Standards Methods for Surface Ships and Submarines (Cables)	3.2.12.2	http://assist.daps.dla.mil/quicksearch/
MIL-STD-2003-2A Electric Plant Installation, Standards Methods for Surface Ships and Submarines (Equipment)	3.2.12.2	http://assist.daps.dla.mil/quicksearch/
MIL-STD-2003-5A Electric Plant Installation, Standards Methods for Surface Ships and Submarines (Connectors)	3.2.12.2	http://assist.daps.dla.mil/quicksearch/
COMLTFORCOMINST 4790.3 Joint Fleet Maintenance Manual	3.2.12.2	http://www.submepp.navy.mil/jfmm/documents%5C00_ifmm.pdf or try http://www.fas.org/nuke/guide/usa/doctrine/navy/jfmm/FORWARD.htm
SECNAVINST 5100.16 B Navy Gas Free Certification/Recertification	3.2.12.2	http://doni.daps.dla.mil/Directives/0500%20General%20Management%20Security%20and%20Safety%20Services/05-100%20Safety%20and%Occupational%20Health%20Services/5100.16B.pdf
NAVSEA S9AA0-AB-GSO-1010 General Specs for Overhaul of surface ships (GSO)	3.2.12.2	https://nll2/ahf.nmci.navy.mil/web/order/ Stock Number 0910LP1026971
SPAWARINST 4720.5 SPAWAR Installation Requirements Drawings Standard	3.2.12.2	SPAWAR 4.2
SE000-00-EIM-100 Electronics Installation and Maintenance Book, General	3.2.12.2	https:nll.ahf.nmci.navy.mil/web/order/detail.cfm?stock_number=0910LP0039770 See also http://www.uscg.mil/Petaluma/TPF/ET_SMS/documents/GENERAL_HANDBOOK.PDF
NAVSEA S9074.AQ-GIB-010/248 Requirements for Welding and Brazing Procedure and Performance Qualifications	3.2.12.2	https://nll2ahf.nmci.navy.mil/web/order/ Stock Number 0910LP5702600 Note: Available from TDMIS web site once access is obtained.
MIL-HDBK-454B General Guidelines for Electronic Equipment	3.2.12.2	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=115984&method=basic
MIL-STD-1310H Shipboard Bonding, Grounding, and other Techniques for Electromagnetic Compatibility, Electromagnetic Pulse (EMP) Mitigation, and Safety	3.2.12.2	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=36209&method=basic
MIL-S-901 Shock Tests. H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for	3.2.12.3	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=2640&method=basic
MIL-STD-167-1A Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited) (02587)	3.2.12.3	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=35544&method=basic

Document Title	PWS Location	Location
MIL-STD-188-125-1 High-Altitude Electromagnetic Pulse (HEMP) Protection for Ground-Based C41 Facilities Performing Critical, Time-Urgent Missions Part 1 Fixed Facilities	3.2.12.3	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=204459&method=basic
MIL-STD-188-125-2 High-Altitude Electromagnetic Pulse (HEMP) Protection for Ground-Based C4I Facilities Performing Critical, Time-Urgent Missions - Part 2 - Transportable Systems	3.2.12.3	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=205747&method=basic
MIL-HDBK-61A Configuration Management Guidance	3.3.6	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=202239&method=basic
NAVSEA S9095-AD-TRQ-010/TSTP Total Ship Test Program Manual	3.4.3	https://acc.dau.mil/adl/en-US/384902/file/51842/Total%20Ship%20Test%20Program%20Manual.pdf
SPAWARSYSCENLANTINST 2280.1 Communications Security Material System (COMSEC) and Electronic Key Management System (EKMS) Material and Equipment Guidance	3.5.2.h	https://wiki.spawar.navy.mil/confluence/download/attachments/28738039/2280.1.pdf
SECNAVINST 5510.30 Department of the Navy (DON) Personnel Security Program (PSP) Instructions	3.5.2.h	http://www.ncis.navy.mil/securitypolicy/Personnel/SECNAVINST/SECNAVINST%205510.30B.pdf
NAVSEA Technical Specification (TS) 9090.310E Alterations to Ships Accomplished by Alteration Installation Teams	3.5.7 4.2.1 4.2.2	http://www.navsea.navy.mil/Organization/TS9090-310E_%20Apr09.pdf
ISO 9000 International Standards Organization	4.2	http://www.iso.org/iso/home.htm
GEIA-STD-0007 Logistics Product Data	4.3.1	http://quicksearch.dla.mil/quicksearch_query.cfm?method=basic
DoDI 4161.02 Accountability and Management of Government Contract Property	4.4	http://www.dtic.mil/whs/directives/corres/pdf/416102p.pdf
DoDI 5000.64 Accountability and Management of DoD Equipment and Other Accountable Property	4.4	http://www.dtic.mil/whs/directives/corres/pdf/500064p.pdf
MIL-STD-2073-1(E)1 DoD Standard Practice for Military Packaging	4.5.1	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=37232&method=basic
MIL-PRF-55585G Electronics Equipment and Parts: Packaging of	4.5.1	http://quicksearch.dla.mil/docimages/A/0000/0002/9885/000000087686_000000110886_AIVSUXURJZ.PDF?CFID=1557810&CFTOKEN=39753250&jsessionid=5830a612e3468695a94c6d7a1f772c505221
MIL-STD-129 Military Marking for Shipment and Storage	4.5.1	http://quicksearch.dla.mil/basic_profile.cfm?ident_number=35520&method=basic

3.0 TECHNICAL REQUIREMENTS

3.1 **Systems Engineering -** The Contractor shall provide Systems Engineering to include systems engineering management, design, and specifications management.

3.1.1 Systems Engineering Management Plan (SEMP) The Contractor SEMP shall be available to the Government upon request, and the Contractor shall notify the Government when updates have been made.

3.1.2 Verification Methods for Requirements The Contractor shall assign verification methods to each allocated requirement, including Analysis, Inspection, Similarity, Demonstration, and Test.

3.1.3 C4I SoS Product Breakdown Structure The Contractor shall synthesize a Product Breakdown Structure (PBS) that defines the hardware-based hierarchy of the C4I SoS including internal communications systems. The PBS shall define the C4I SoS top-down breakdown by Extended Shipboard Work Breakdown Structure (ESWBS) code, subsystems, Programs of Record (PORs, e.g., Government-provided, fully integrated racks), and nomenclature equipment, including new equipment required by the addition of new capabilities. The PBS provides the Government and Contractor the hardware-based structure and parts hierarchy necessary to establish configuration identification and control of the C4I SoS. The PBS also provides the Government and Contractor a convenient graphical breakdown view of the C4I SoS against which work can be organized. (Contract Data Requirements List [CDRL] A004)

3.1.4 Specifications The Contractor shall create a specifications tree that defines the relationships among the specifications required for the project and references the platform's Work Breakdown Structure (WBS). The Contractor shall create Performance, System, Subsystem, Configuration Item Performance, and Configuration Item Procurement specifications as required. (CDRL A004)

3.1.5 Functional Interface Diagram (FID) When not provided by the Government as Government Furnished Information (GFI), the Contractor shall create a FID derived from the platform's Department of Defense Architecture Framework (DoDAF) Internal System View (SV)-1. The FID shall show the systems comprising the C4I SoS and the interfaces connecting them, and shall be organized in a Government-provided FID format. (CDRL A005)

3.1.6 Specialty Engineering The Contractor shall perform specialty engineering studies as required. These studies may include: Reliability, Maintainability, and Availability (RMA) assessments, Environmental Electromagnetic Effects (E3) assessments, modelling and simulation testing, engineering design recommendations, feasibility studies, white papers, and systems safety and hazards assessments. (CDRL A016)

3.2 **Design Engineering –** Using GFI, (e.g., Installation Requirements Drawings [IRDs], Installation Control Drawings [ICDs], architecture views, ship specifications, FIDs), the Contractor shall provide engineering and technical support services in the area of C4I Platform design to include performing engineering analyses and evaluations to generate an optimal and achievable platform system configuration baseline (CDRL A004). The Contractor shall translate the requirements identified, defined, decomposed, and allocated by the systems engineering process into documents and drawings that provide technical direction and specifications to procure, fabricate, assemble, integrate, and install the C4I SoS, internal communications systems, and any new capabilities and equipment necessitated by additional requirements aboard the designated platform.

3.2.1 Design Requirements Baseline The primary mechanism used to control design activities shall be the Design Requirements (DR) Baseline. The DR Baseline shall be accessible to personnel conducting design engineering activities and to the Government. The DR Baseline shall list associated ICDs, IRDs, ship contract and guidance drawings, shipbuilding specification change notices, ship and system specifications or equivalent American Bureau of Shipbuilding Naval Vessel Rules (ABS NVR), operations and maintenance manuals, Systems User Guides (SUGs), System Administrators Guides (SAGs), Engineering Direction Memoranda (EDM), and other design inputs and their revisions in effect, authorized for use in design development. The Contractor shall maintain the DR Baseline using the configuration management processes described in paragraph 3.3.

3.2.2 Impact Assessment (IA) – The Contractor shall prepare and submit IAs with recommendations and guidance concerning Government-proposed changes or tasking that is beyond the original scope of the TO. The IAs shall provide a quantified assessment of expected impacts to design documents, drawings, data, cost, schedule, and performance, as well as detailed implementation procedures and an implementation timeframe. (CDRL A016)

3.2.3 Design Decision Matrix The Contractor shall deliver a design decision matrix to support integration efforts, including relevant source data, and shall be maintained throughout the scope of this PWS. The design decision matrix shall include a listing of design decisions, the date on which they were made, and the identity of the

individual entering the data. The design decision matrix shall be used to maintain Space, Weight, and Power (SWAP) /Heating, Ventilation, and Air Conditioning (HVAC) data, and these data shall be maintained and organized at the compartment, envelope, cabinet, and equipment levels of indenture. Values for the following design budget parameters shall be maintained: weight, center of gravity, dimensions (including sway space), heat to air, heat to water (if applicable), air flow rate, temperature rise, whether a direct ventilation return is required, the number of electrical leads per cabinet/equipment, the type of power per cabinet/equipment, the load per phase, the in-rush load, the power panel characteristics and loads, fusible link values, and breaker sizes. The SWAP/HVAC data shall also include design budget and actual values of data provided for inter-compartment cables and cableways. The design decision matrix shall be flexible and expandable to incorporate needed additional design parameters. The design decision matrix shall provide a summary report of margins available in both absolute values and percentages for each contractual design budget value. The design decision matrix shall be used to compare against values established by the shipbuilder and to identify potential issues. (CDRL A016)

3.2.3.1 Design Inputs The Contractor shall populate the design decision matrix with parametric data obtained from ICDs or IRDs, contract specifications, and other technical data sources for the systems and equipment comprising the C4I SoS and any additional required internal communications systems and any new capabilities and equipment necessitated by additional requirements. Data populated in the design decision matrix shall be based upon source documentation that has been formally authorized for use as design inputs. Because the Contractor will sometimes have to work with and base early GFI contractual deliverables upon immature design inputs prior to preliminary ICDs/IRDs being issued, the Contractor shall work directly with the technical design agents for those systems to ensure that the preliminary design data available are accurate, consistent, and reasonable and that the system's design will be compatible with planned integration approaches on a given ship program. The Contractor shall review and provide reports (CDRL A016) documenting comments and recommendations on ICDs/IRDs and other documents used as design inputs. The Contractor shall annotate and redline ICDs/IRDs and other documents used for design inputs to correct discrepancies and provide clarifications before issuing them for design use.

3.2.4 Preliminary and Contract Design Support The Contractor shall provide technical support to shipbuilding programs prior to release of a Request for Proposal (RFP) for shipbuilding detail design, construction, a test and trials contract, or preliminary design contracts. This support shall encompass aspects of ship design development preceding release of the shipbuilding RFP, including developing schedule, content, and format requirements for developing preliminary arrangement models at the ship, compartment, and work area levels; parametric estimates of SWAP/HVAC characteristics of the C4I SoS or any other required internal communications systems and any new capabilities and equipment necessitated by additional requirements; review, mark-up, and input to specifications to be used in the RFP; development of preliminary equipment lists derived from Systems Engineering input; providing input to contract drawings; and developing project-specific documents.

3.2.5 C4I SoS GFI The Contractor shall develop and provide documents, drawings, and data required to support concurrent detail design and construction of the ship, to include what infrastructure shall remain in place or be removed for select C4I and other compartment spaces. The Contractor shall define, develop, review, update, and deliver revised GFI necessary for the Shipbuilder to use in design and construction of C4I and other spaces, and in the effective integration of the C4I SoS and subsystems and any new capabilities and equipment necessitated by additional requirements into the platform. (CDRL A016)

3.2.5.1 Product Specifications The Contractor shall develop, review, update, and deliver new and/or existing drafts of GFI product specifications that define the detailed content and format of GFI products based upon definitions previously negotiated and documented in project-specific documents and the platform's Schedule C. These specifications shall reflect the basic design budget and turnkey execution approach that have been established for that ship or ship class.

3.2.5.2 GFI Products The Contractor shall develop draft GFI products described in paragraphs 3.2.5.3 to 3.2.6.6 in accordance with (IAW) the GFI Product Specifications, ASME Y14.5: Dimensioning and Tolerancing Standard, and approval authority requirements.

3.2.5.3 Arrangement Design The Contractor shall develop, review, update, and deliver existing arrangement drawings that depict the relevant aspects of arrangement design or re-design required by the shipbuilder at various times during detail design and construction. These deliverables shall include: arrangement drawings of

key C4I and other compartment spaces depicting arrangement of space envelopes, including modifications made to accommodate any new capabilities and equipment necessitated by additional requirements; fully integrated Government Furnished Equipment (GFE); Contractor Furnished Equipment (CFE); Outfitting and Furnishing (O&F) items; and the incorporation of cableway reservations, ventilation ducting, and other key structural obstructions. These products shall consider information from official shipbuilder drawings such as general arrangement, compartment and access, and scantling drawings. (CDRL A014)

3.2.5.4 Foundation Design The Contractor shall develop, review, update, and deliver GFI products that provide Outline and Mounting (O&M) drawings for each individually mountable item. The O&M drawing shall identify the physical outline, weight, center of gravity, mounting interfaces, flatness requirements, and material characteristics of each individually mountable item. The O&M drawings shall comply with MIL-D-23140D: Drawings, Installation Control, for Electronic Equipment, or the relevant IRDs/ ICDs, less any detail not required to specify the O&M configuration. (CDRL A014)

3.2.5.5 Platform Cableway Design The Contractor shall develop, review, update, and deliver GFI products that specify requirements for cableways through which cabling associated with C4I SoS or other required internal communications systems equipment must be pulled and installed. These requirements shall be specified for both local and main cableways and shall indicate the routing plan for systems' cabling into and out of the cableways. Cableway design shall comply with the requirements of Section 304 of the respective shipbuilding specifications, or equivalent ABS NVR. General cableway design shall also comply with DoD-STD-2003-4: Electric Plant Installation Standard Methods for Surface Ships and Submarines (Cableways), Section 4 of 5 Sections. Cableway design shall comply with NSTISSAM TEMPEST/2-95A: Red/Black Installation Guidance and IA PUB 5239-31: Information Assurance Shipboard Red/Black Installation. Penetrations shall comply with DoD-STD-2003-3. (CDRL A014)

3.2.5.6 Platform Connectivity Design The Contractor shall ensure interoperability of interfaces between internal and external systems. The Contractor shall develop and provide GFI products that specify the connectivity of the C4I SoS. The connectivity design shall be based upon inputs from: the approved FID; C4I SoS system or equipment ICD/IRD Cable Block Diagrams (CBDs); C4I SoS system or equipment Cable Run Sheets (CRSs); and shipbuilding contract system drawings. Connectivity GFI products shall include Inter-Compartment Cable Lists (ICL), CBDs, and CRSs. Format and content of CBDs and CRSs shall comply with MIL-D-23140D: Drawings, Installation Control, for Electronic Equipment; IRD/ICD; or requirements of the applicable shipbuilding contract, whichever has precedence. The Contractor may propose alternate formats of these products to save costs and implement those formats if approved by the Government and the respective NAVSEA Ship Program Manager (SPM) and shipbuilder. Cables and connectors shall be constructed per MIL-STD-2003A. Cables and connector hardware shall comply with Section 302 of the respective shipbuilding specifications or equivalent ABS NVR. (CDRL A014)

3.2.5.7 Power Distribution Design The Contractor shall develop, review, update, and deliver power distribution GFI products for the C4I SoS or other required internal communications systems, as well as any new capabilities and equipment necessitated by additional requirements. These products shall consist of single-line distribution drawings that specify power leads and associated sources for the communications systems. The power distribution design shall be based upon the power requirements of the systems' equipment, the shipbuilder's single line power distribution drawings showing distribution from load centers to distribution panels, and Sections 300, 314, and 324 of the respective shipbuilding specifications or equivalent ABS NVR. General power distribution guidance shall be from S9086-KC-STM-010/CH-300R6: Naval Ships' Technical Manual, Chapter 300 Electric Plant General; MIL-STD-1399C: Interface Standard For Shipboard Systems, Section 300A, Electric Power, Alternating Current (Metric); IEEE Std 45: IEEE Recommended Practice for Electric Installations on Shipboard; or equivalent commercial specifications. (CDRL A014)

3.2.5.8 Cooling Design The Contractor shall develop, review, update, and deliver GFI products that specify the heat dissipation characteristics of C4I SoS and other internal communications equipment, as well as any new capabilities and equipment necessitated by additional requirements. In conjunction with Arrangement of Envelopes and O&M drawings, these products shall specify the locations and dimensions of forced air exhausts or cooling water interfaces, cooling medium flow rates and quality levels, the magnitude of heat to be dissipated, and whether a direct ventilation return is required for each forced air exhaust. (CDRL A014)

3.2.5.9 Topside Design The Contractor shall develop, review, update, and deliver Outline and Installation (O&I) drawings as GFI for antennas and other C4I SoS and other communications equipment that is mounted topside. These drawings shall consist of the O&I drawings from the respective antenna system ICDs/IRDs and shall be redlined as required to delete superfluous information not pertinent to the installation or variant being installed. In cases in which O&I drawings for antenna or other topside equipment do not exist, the Contractor shall develop the drawings. (CDRL A014)

3.2.5.10 Top-Down Breakdown (TDBD) The Contractor shall develop, review, update, and deliver GFI that specifies the TDBD of the C4I SoS and other communications equipment, both internal and external. The TDBD data shall provide an indentured listing of items comprising the C4I SoS and other communications equipment. The Contractor shall provide the TDBD in formats and sort orders that provide the basis for functional grouping, material identification, tracking, receipt, and shipboard location as required by each individual shipbuilder. (CDRL A013)

3.2.5.11 As-Built Drawings The Contractor shall develop, review, update, and deliver As-Built drawings of the C4I SoS and other communications equipment, both internal and external, to be used as selected record drawings. These drawings shall consist of O&I drawings obtained from the ICDs/IRDs for POR systems, O&I drawings developed by the Contractor for non-POR (including Contractor-provided, Contractor-integrated) cabinets and method mounted items, Cable Block Diagrams by system, Cable Run Sheets, and Compartment Arrangement of Equipment drawings for each key C4I space and other compartment spaces. The Contractor shall develop and deliver As-Built drawings as specified in the ship specifications. The format and content of these drawings may be identical to previously submitted detailed GFI products or they may be reformatted to better suit use by the ship's force depending upon each program's requirements. (CDRL A014)

3.2.6 TIF Design Products The Contractor shall develop and provide documents, drawings, and data required to fully integrate subsystems of the C4I SoS, internal communications systems, any new capabilities and equipment necessitated by additional requirements, and those documents required to support concurrent detail design and construction of the ship. The Contractor shall design full-scale, individual platform TIFs for C4I equipment and select non-C4I communications systems. Individual platform TIFs are defined as "mock-ups" of the platform-specific shipboard environment and are components of the overall TIF as delineated below. Products shall conform to ASME Y14.5: Dimensioning and Tolerancing Standard (CDRL A005).

3.2.6.1 Overall Facility Design The Contractor shall develop, maintain, and deliver Government-approved plans and drawings in the approved format that specify the overall configuration and use of the production, integration, test, and storage facilities to which they have been assigned. These products shall address arrangement of individual platform TIFs, material storage areas, material flow, office areas, and other areas to be used by the Contractor within the facility. These products shall also specify facility power distribution from facility power skids to the distribution panels within each individual platform TIF. The Government will approve and compile all plans and drawings and maintain an overall configuration plan for the TIF to include overall TIF layout, power distribution, antenna location, and network and phone drops. (CDRL A005)

3.2.6.2 Individual Platform TIF Arrangement Design The Contactor shall develop, review, update, and deliver platform TIF layout drawings that specify the configurations of the walls, accesses, flooring, cableways, O&F items, CFE, and non-POR GFE to be mocked up in the platform TIF. The structural configurations and features of the individual compartments and accesses shall replicate those of the ship design to the highest degree practical within cost constraints. The arrangement configuration shall be based upon the same ship drawings upon which the arrangement GFI drawings are based. The Contractor shall validate the shipbuilder's design to support the integration of the C4I suite as originally designed, as well as required internal communications systems and any new capabilities and equipment necessitated by additional requirements. The Contractor shall develop power distribution drawings that specify the configurations of power distribution to distribution panels within the individual platform TIFs. (CDRL A005)

3.2.6.3 TIF Cableway Design The Contractor shall develop, review, update, and deliver detailed cableway plans and cable routing for each cable that will be built and delivered to the ship for installation. The cable routing shall determine the required cable length and remain within the constraints of the ship's cableway structure and the

parameters specified in GFI. Cableway design shall also include TIF- specific cables that will not be delivered, such as inter-compartment cables that would be built and installed by the shipbuilder, but are necessary for testing of the C4I SoS and internal communications systems within the platform TIF. (CDRL A005)

3.2.6.4 Cabinet Integration Design The Contractor shall develop, review, update, and deliver designs and issue drawings for production use that specify the configuration of C4I SoS cabinets and other select cabinets that are not part of POR systems. These Contractor-developed cabinet designs may include components from POR systems as well as non-POR systems. Examples of cabinet designs may include systems such as Tactical Variant Switch (TVS), Crypto, Extra-High Frequency TDMA Interface Processor (EHF TIP), and others needed to support the integration of a C4I or select non-C4I suite of equipment onto a particular ship. New capabilities and equipment necessitated by additional requirements may also include larger system footprints that shall be incorporated into the design. Cabinet integration designs shall comply with Human Systems Integration (HSI) requirements to include MIL-STD-882E: Department of Defense (DoD) Standard Practice for System Safety. Cabinet integration designs shall also comply with requirements of NSTISSAM TEMPEST/2-95A: Red/Black Installation Guidance; and IA PUB 5239-31: Information Assurance Shipboard Red/Black Installation. (CDRL A014)

3.2.6.5 TIF Connectivity Design The Contractor shall develop, review, update, and deliver the TIF Build packages (cable block diagrams, cable running sheets, Work Instructions, and O&I drawings) to detail the connectivity requirements of the various subsystems to be integrated at the platform TIF. The products shall provide sufficient detail to support production, fabrication, and integration of associated components, and will show any changes made during the integration efforts to the connectivity requirements of those subsystems. The Contractor shall notify the Government of any required changes and obtain written approval from the Government prior to incorporating them into the drawings. The Contractor shall incorporate all approved red-line changes into the final drawing packages. (CDRL A014)

3.2.6.6 Miscellaneous Hardware Design The Contractor shall develop, review, update, and deliver fabrication detail drawings for any component that must be custom fabricated. Such items may include mounting adapters, custom rack installation kits, connector panels, component enclosures, or cable running sheets for outsourced cable assemblies. Cables and connectors shall be designed and built IAW MIL-STD-2003A. (CDRL A014)

3.2.6.7 POR Equipment at the TIF Complex The Contractor shall perform visual inspection for damage prior to acceptance of POR or major non-POR equipment at the TIF Complex. Additionally, the Contractor shall apply appropriate power and perform Pre-Installation Test and Check Out (PITCO) to the maximum extent possible on systems delivered to the TIF Complex within ten (10) working days of receipt and prior to storage. Tests should be performed IAW DoD-STD-2106 (NAVY) Receipt Inspection (Stage 1), and Installation Inspections and Tests (Stage 2) or as noted in individual product specifications. Items with discrepancies shall be identified to the Government Project Lead (PL) to determine further action.

3.2.7 Bills of Material The Contractor shall develop, review, update, and deliver Bills of Material (BOMs) that support and track required purchasing and production/integration for each C4I SoS, other internal communications systems, and new capabilities and equipment necessitated by additional requirements, the BOMs may include Open Purchase Material, Controlled Cryptographic Item (CCI) Material, items purchased via Military Interdepartmental Purchase Request (MIPR), National Stock Number (NSN) materials, and items used for mounting of CCI materials. (CDRL A009)

3.2.8 Engineering Change Documents: The Contractor shall review engineering change documents (e.g., Preliminary Engineering Change Proposals (PECPs), Engineering Change Proposals (ECPs), Engineering Change Requests (ECRs), Ship Change Documents (SCDs)) submitted by Government entities or other systems integrators for potential impact on the design and integration of the C4I SoS. other internal communications systems, or any new capabilities and equipment necessitated by additional requirements. The Contractor shall develop a report detailing impacts on design, cost and schedule as part of CDRL A006 and provide the Government recommendations for the approval or rejection of each document, considering the current state of progress of design and integration activities. Upon approval of each document, the Contractor shall incorporate changes into the C4I and other systems' baselines as directed by the Government. The Contractor shall develop revisions to previously-delivered GFI and submit them to the Government for subsequent delivery. Changes to released documents shall be

incorporated in accordance with the CM procedures used by the NAVSEA SPM. The Contractor shall prepare documentation to include Engineering Change Proposals (ECPs) (CDRL A006) and Notices of Revision (NORs) (A007), resulting from either internally- or externally-driven changes to specify any changes required to the shipbuilding contract baseline, including previously delivered GFI. Upon Government approval of the changes, the Contractor shall prepare a Specification Change Notice (SCN) (CDRL A008).

3.2.9 Design Changes and Feasibility Validations The Contractor shall design changes to implement solutions, technical improvements, and mandated system upgrades as well as develop or review design change proposal documentation and feasibility validations. The Contractor shall identify capability gaps, design and develop solution alternatives, and perform feasibility studies to support the selection of the appropriate design change proposal. The Contractor shall assist the Government in reviewing other proposed changes or feasibility studies and make recommendations with respect to the potential impacts to platform integration. (CDRL A016)

3.2.10 C4I SoS and Internal Communications System Products The Contractor shall support the identification and resolution of potential and actual problems associated with the C4I SoS and other internal communications system products. Throughout the course of integration design, material receipt, platform TIF integration, and shipboard installation and testing, if deficiencies are noted with any equipment or components of the C4I SoS that have been furnished by a PEO C4I POR or a non-POR required communications system, the Contractor shall assist the Government in the reporting and resolution of these deficiencies. The Contractor shall prepare Material Discrepancy Reports (MDRs) as referenced in paragraph 4.4.2 and shall assist the Government in the further troubleshooting and resolution of these issues. If the resolution requires baseline changes, the Contractor shall submit Baseline Change Requests as described in paragraph 3.3.2.

3.2.11 Limited Life Items The Contractor shall determine which systems contain components that would be damaged by storage in an unpowered state, such as uninterruptable power supplies, and shall take measures to preserve remaining life and otherwise avoid damage to the components.

3.2.12 Human Systems Integration (HSI) The Contractor shall apply HSI principles to systems engineering tasks to optimize total system performance, minimize total ownership costs, and ensure that the non-POR systems are built to accommodate the characteristics of the user population that will operate, maintain, and support the system as required by DoD Instruction 5000.02 and the Defense Acquisition Guidebook, Chapter 6.

3.2.12.1 Human Factors The Contractor shall include Human Factors Engineering (HFE) and the guidelines of MIL-STD-46855A: Human Engineering Requirements for Military Systems, Equipment, and Facilities; ASTM F1337: Standard Practice for Human Engineering Program Requirements for Ships and Marine Systems, Equipment, and Facilities; ASTM F1166: Standard Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities; and MIL-STD-1472G: DoD Design Criteria Standard, Human Engineering, where they apply in the C4I SoS and other warfare activities' system designs. The Contractor shall take steps to ensure ergonomics, HFE, and cognitive engineering are employed during design of systems engineering to provide for effective human-machine interfaces and to meet HSI requirements. C4I SoS and internal communications system design shall minimize or eliminate system characteristics that require excessive cognitive, physical, or sensory skills; entail extensive training or workload-intensive tasks; or produce safety or health hazards for effective human-machine interfaces. HFE shall be an agenda item in engineering design reviews.

3.2.12.2 Safety and Occupational Health The contractor is solely responsible for compliance with the Occupational Safety and Health Act (OSHA) Public Law 91-596 and the resulting standards, OSHA Standard 29 CFR 1910 (general), 1915 (shipboard) and 1926 (shore) and for the protection, safety, and health of their employees and any subcontractors assigned to the respective task orders under this contract. Contractor personnel shall be familiar with and shall follow all applicable safety guidance including applicable NAVSEA Standard Items. The Contractor shall ensure that appropriate HSI and Environment, Safety and Occupational Health (ESOH) efforts are integrated across disciplines and into systems engineering to determine system design characteristics that can minimize the risks of acute or chronic illness, disability, or death or injury to operators and maintainers; and enhance job performance and productivity of the personnel who operate, maintain, or support the system. The Contractor shall analyze and report to the Government any shipboard C4I or other system ESOH hazards, including issues regarding equipment electrical safety (MIL-HDBK-454B: General Guidelines for Electronic Equipment), bonding and grounding criteria for shipboard systems (MIL-STD-1310H: Shipboard Bonding, Grounding, and other

Techniques for Electromagnetic Compatibility, Electromagnetic Pulse [EMP] Mitigation, and Safety), and Hazards of Electromagnetic Radiation to Personnel (HERP) for the C4I SoS or other systems. (CDRL A010)

3.2.12.3 Personnel Survivability The Contractor shall provide C4I and other internal communications system survivability analyses and studies to the Government and shall include relevant system survivability in the selection of equipment and in C4I SoS and other installed system design. The Contractor shall ensure that such system(s) equipment is designed to ensure crew survivability in hostile environments in accordance with MIL-S-901, MIL-STD-167-1A, and other hazardous effects such as High-Altitude Electromagnetic Pulse (HEMP) in accordance with MIL-STD-188-125 parts 1 and 2, and natural effects such as lightning. The Contractor shall generate test plans, perform modeling and simulation, and execute light, medium and heavyweight testing in accordance with MIL-S-901 for equipment that is not certified at the appropriate grade and approved by NSWC-CD. For equipment unable to be certified, the Contractor shall generate shock test discrepancy plans. (CDRL A010)

3.3 **Configuration Management (CM) –** The Contractor shall identify and utilize Configuration Management practices that are documented in an approved Configuration Management Plan (CMP) consistent with the functions and principles as listed in the PEO C4I Policy for Configuration Management, its associated Life Cycle Configuration Management Implementation Manual, and the PMW 750 Platform Integration and CMP. Participation by the Contractor's CM personnel at the Government's Configuration Control Boards (CCB) may be required.

3.3.1 Platform Configuration Identification For non-POR equipment, the Contractor shall develop and maintain Configuration Baselines (Functional, Allocated, and Product) to provide identification of configuration items such as: documentation, data, services, processes, hardware, software, and firmware. The Contractor shall prepare required functional, allocated, and product-specific configuration baselines to include a complete listing of technical documentation, physical and logical configuration items, and any change requests defining the authorized configuration of the Government equipment/system's functional and physical characteristics. The Contractor shall generate a Platform baseline report that lists the current configuration, including both POR and non-POR equipment identified for the specific platform baseline. (CDRL A004)

3.3.2 Platform Baseline Change Documentation At the direction of the Government, the Contractor shall develop change documentation to effect design changes that impact the platform baseline and its associated POR and non-POR C4I and other required C4I-related systems products through integration and implementation that have been approved by the Government. The Contractor shall prepare detailed technical data packages (TDPs) in support of Government engineering change documents (e.g., PECPs, ECPs, ECRs, SCDs, etc.) as required for the revised platform baseline and the relevant documents and/or drawings. The Contractor shall review and address comments on each draft change document, ensuring that the scope of the change is addressed appropriately and that the nature of the change is technically valid. The Contractor shall obtain the necessary Government approvals as required to authorize the change and shall post the draft and final approved change documents (CDRL A016).

3.3.3 Platform As-Built Configuration List The Contractor shall develop and maintain As-Built documentation to identify specific individual configuration items delivered under the contract. The Contractor shall remain in compliance with contractual hardware and software configuration requirements specific to each individual platform delivered under the contract. (CDRL A022)

3.3.4 Platform Configuration Status Accounting The Contractor shall establish a reliable source of configuration information to support program/project activities including program management, systems engineering, manufacturing, software maintenance, logistics support, modification, maintenance, decommissioning and disposal. The Contractor shall establish and maintain a Configuration Status Accounting (CSA) database, which represents the configuration of the Platform Baseline. Platform baselines and changes shall be documented in the Contractor's CSA database. The Contractor shall permit acceptance of commercial product information in the CSA database. (CDRL A021)

3.3.5 Platform Configuration Documentation The Contractor shall implement an internal configuration management system for the control of platform baseline configuration documentation, physical media, physical parts and software/firmware representing or comprising the platform baseline. For software, the system shall address the evolving configuration and support environments (engineering, integration, and test) used to develop, integrate, and

test the platform baseline. CM shall be defined consistently with POR hardware and software identified for the platform baseline. For TIF Task Orders, results of functional and physical configuration audits shall be accurately recorded and reported as part of the Platform TIF Completion Report (CDRL A019) For Shipboard Task Orders, results of functional and physical configuration audits shall be accurately recorded and reported as part of the Platform Shipboard Completion Report (A020)..

3.3.6 Platform Configuration Verification The Contractor shall track both the initial configuration provided by the Government of the platform baseline (including POR and non-POR items), and the incorporation of approved changes, to ensure that the item meets its performance and documented configuration requirements. The Government and Contractor shall conduct the audit jointly with the Government chairing the audit. The Contractor shall verify that: documentation reflects the "As-Built" configuration of newly developed non-POR equipment or modified POR equipment within the platform baseline; accurate form, fit, function information is provided on control documents for non-developmental or commercial off-the-shelf items; and confirm that documentation accurately represents the "As-Built" production configuration. The Contractor shall assist the Government in the development of the audits, using the guidelines contained in MIL-HDBK-61A. The Contractor shall document the results of each audit and shall correct audit discrepancies documented in the configuration audit reports. In the event the Government finds/concurs with evidence that the drawings or documents do not adequately represent the item, integration shall cease until discrepancies are corrected and the Government approves the configuration audit summary report. (CDRL A021)

3.3.7 Technical Data Package The Contractor shall maintain a configuration management system for the control of configuration documentation, physical media, and physical parts representing or comprising the Platform Baseline for every new construction or RCOH platform. The Contractor shall support the Government in the definition and delivery of the platform final TDP IAW CDRL A014. The TDP will be used to document the Platform Baseline, and shall consist, at a minimum, of a final drawing package to include: current FID, Main Cable Routing diagrams, O&M Method of Mounted Equipment, Cabinet O&I, Cable Block Diagrams (Intra- & Inter-Cabinet/Compartment), IRDs with Cable Run Sheets, Connector Panel fabrication drawings, Integrated Logistics Support (ILS) Checklist, Space Arrangement Drawings, Topside O&I Drawings, Label Plate Drawings, Work Instructions, and SWAP/HVAC allocations by compartments.

3.4 **Platform C4I and Required Systems Testing -** The Contractor shall develop, conduct, and document TIF and shipboard testing IAW the Total Ship Test Plan to ensure testing events have de-conflicted testing teams.

3.4.1 Platform Test Plans The Contractor shall provide input to a Platform Test Plan (CDRL A011) compatible with the platform's Total Ship Test Plan or other applicable specifications, such as a Shock Test Plan in accordance with NAVSEAINST 9072.2A. The Test Plan shall contain test planning and coordination documents such as an Integrated Platform Test Schedule for both TIF testing and shipboard testing, which shall be incorporated into the Integrated Master Schedule (IMS); Test Readiness Reviews (TRRs) with entrance and exit criteria in accordance with the DoD Acquisition Guidebook and other references determined by the Government; a Platform Test Index; and a Platform Test Sequence Network. When Shock Deficiency Correction Plans (SDCP) are required, the Contractor shall obtain Naval Sea Systems Command (NAVSEA) approval of the SDCP. (CDRL A011). The Contractor shall develop a Test Plan for conducting MIL-S-901 testing on all components and racks identified by the Government for submission to Naval Surface Warfare Center—Carderock Division (NSWC-CD). The Test Plan shall outline the Contractor's method for configuration control over testing documents. The Government will review and approve all test plans prior to acceptance and implementation.

3.4.2 Test Procedures The Contractor shall develop a Platform Test Procedure based on GFI provided with C4I and related systems IAW the Total Ship Test Plan. The Contractor shall develop, review, and modify Test Procedures suitable for TIF and shipboard testing (CDRL A011) in accordance with DoD-STD-2106 (NAVY): Development of Shipboard Industrial Test Procedures; Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Interoperability Test Process; or other applicable specifications. The Contractor shall notify the Government and request approval before any modification/rewrite of C4I Test Procedures (GFI) is performed prior to shipboard testing phase as scheduled on the IMS. The Contractor shall obtain the relevant reference material, research the system functions and capabilities, develop testing methods and detailed testing steps, and develop a verification record, including expected results and tolerances for each testing step, to be used to record actual results of testing. The Contractor shall execute testing IAW MIL-STD-901

for all components in accordance with the Government-approved plan at the designated testing facility. The Contractor shall perform test analysis and document test results IAW NSWC-CD requirements. The Contractor shall submit test results and recommendations for approval to NSWC-CD. At the direction of the Government, the Contractor shall fully restore any equipment that sustains damage during the course of testing. The Contractor shall validate the draft test procedures and data sheets through trials conducted with the actual equipment to be tested in the TIF and onboard the ship/craft. The Contractor shall make adjustments to the test procedures based on the findings of the validation efforts. The Government will review and approve any proposed adjustments prior to acceptance and implementation.

3.4.3 Testing Documents The Contractor shall update and maintain testing documents in accordance with change management processes described in the Platform Test Plan. (CDRL A011) The contractor shall perform test analysis and document test results. The Contractor shall accept, investigate, respond to, and take action upon external test discrepancy reports (i.e., Test Problem Report and Resolution [TPRR] forms) from a platform Total Ship Test Program, as described in NAVSEA S9095-AD-TRQ-010/TSTP: Total Ship Test Program Manual. (CDRL A016)

3.4.4 TIF Testing and System Demonstration The Contractor shall conduct equipment and system testing in the TIF Complex according to the Platform Test Plan. The Contractor shall validate the approved test procedures and data sheets through trial conduct prior to demonstration of the test procedures. The Contractor shall complete Receipt Inspection(Stage 1) within thirty days of receipt of equipment at the TIF, Installation Inspections and Tests (Stage 2), Equipment Tests (Stage 3), Intrasystem Tests (Stage 4), Intersystem Tests (Stage 5), Special Tests (Stage 6), and Trials Tests (Stage 7) to the maximum extent possible as determined by the constraints of the Platform and the TIF. For each test, the Contractor shall obtain the necessary test equipment and keying material, set-up and groom the equipment, coordinate services and test participants, and perform the test and demonstrate the system for a designated Government witness. Actual results shall be recorded in the data recording sheets of the test procedure, as well as any exceptions to the procedure or expected results (CDRL A017).

3.4.5 Shipboard Testing The Contractor shall conduct shipboard equipment and system testing according to the Platform Test Plan. The Contractor shall participate in a TRR prior to the official start of testing. For those test procedures not completed in the TIF Complex, the Contractor shall validate the draft test procedures and data sheets through trial conduct prior to demonstration of the test procedures. The Contractor shall complete Installation Inspections and Tests (Stage 2), Equipment Tests (Stage 3), Intrasystem Tests (Stage 4), Intersystem Tests (Stage 5), Special Tests (Stage 6), and Trials Tests (Stage 7) as required by the platform. For each test, the Contractor shall ensure availability and obtain the necessary test equipment and keying material, set-up and groom the equipment, coordinate services and test participants, and perform the test for a designated Government witness. Actual results shall be recorded in the data recording sheets of the test procedure, as well as any exceptions to the procedure or expected results (CDRL A017). The Contractor shall also provide support for shipboard C4I and other related systems testing and demonstrations, such as System Operational Verification Test (SOVT), operational testing, ship trials, sail-away, and readiness testing. Contractor shall coordinate testing events in all spaces to de-conflict testing teams.

3.4.6 Test Equipment The Contractor shall provide necessary and requisite General Purpose Electronic Test Equipment to complete TIF and shipboard testing. The Contractor shall oversee the storage of test equipment; maintain a current and accurate inventory; control issues and receipts; procure new test equipment; manage equipment rental, maintenance, repair, or calibration services required by testing demands; ship test equipment to and from remote installation sites that are required by the platform; and facilitate test equipment resource allocation, such as need schedules and availability forecasts. The Contractor shall submit data records and transactions for inclusion entry into the test equipment database of calibration activities. The Contractor shall assess and provide to the Government the cost benefits, if any, of purchasing or leasing advanced test equipment.

3.5 **Production/Integration –** The Contractor shall fully maintain detailed TIF, integration, and infrastructure construction schedules to complete integration and testing, integrate C4I and other communications systems at the TIF Complex and/or the shipyard, maintain the systems during testing, and prepare systems for delivery and shipboard integration/testing using approved GFI (CDRL A024). The Contractor shall coordinate all production and integration to de-conflict work teams.

3.5.1 Production Management The Contractor shall:

a. Plan and manage production and integration activities for multiple simultaneous platform integration projects;
b. Prepare schedule data for production and integration activities for inclusion into the IMS, and submit updates;
c. Prepare standard operating procedures for production and integration activities;
d. Prepare workmanship standards for minimum acceptable production quality levels; and
e. Prepare, develop, and deliver TIF implementation plans (CDRL A012) for individual platform TIFs. The plans shall identify organizations and responsibilities involved in TIF operations, association with engineering data, material management, testing milestones, and program constraints leading to delivery date and provide an overall production IMS.

3.5.2 Platform TIF The Contractor shall:

a. Integrate and test the platform C4I SoS and other required systems at the TIF facility located at SSC–LANT in Charleston, SC, based upon Government-approved drawings;
b. Develop, construct, erect, and modify as needed simulated bulkheads in the TIF Complex to accurately represent the interior dimensions aboard the ship;
c. Construct, erect, and modify as needed cableways in the TIF Complex to accurately represent the shipboard cableway paths and available volume. The Contractor shall also mock-up beams, beam penetration sizes, HVAC ducting interferences, and other applicable physical characteristics to the extent that they constrain cable routing;
d. Construct, install, and modify as needed a power distribution network inside the TIF Complex to simulate the power distribution system aboard the ship. The Contractor shall recommend and co-ordinate facility modifications with Government facility managers (Public Works);
e. Construct, install, and modify as needed simulated equipment foundations for equipment cabinets, workstations, consoles, desks, tables, fiddleboards, and other relevant shipboard structure to accurately represent the user environment inside the shipboard compartments;
f. Construct and erect antenna mounting foundations, platforms, and supports for those antennas to be tested at the TIF Complex;
g. Ensure that work accomplished in places of performance referenced in paragraph 1.2.1 above is compliant with applicable Occupational Safety and Health Administration (OSHA) regulations and has the proper provisions for a safe workspace; and
h. Remain compliant with Electronic Key Management System (EKMS)-1B, Phase 4 – Crypto Management System (CMS) Policies and Procedures for Navy EKMS, Tiers 2 & 3 process and training, and maintain proper physical security and access controls. The Contractor shall also remain in compliance with SPAWARSYSCENLANT INST 2280.1 series and SECNAVINST 5510.30 series.

3.5.3 Equipment Integration The Contractor shall:

a. Prepare and integrate C4I and other related communications equipment;
b. Fabricate/build equipment, cabling, ancillary hardware, interface units, test fixtures and other required items not available from other sources or provided by the Government;
c. Perform pre-production and production activities, including fabrication of: inter-/intra-cabinet cables, inter-/intra-compartment cables, and unique cabling in accordance with Government-approved applicable standards;
d. Build integrated assemblies, assemble components inside equipment cabinets, and build test fixtures, interface boxes, test cables, and other items required for C4I and/or other communications systems' testing;
e. Coordinate shipboard integration of all systems in all required spaces, ensuring work teams' access is authorized, timely, and de-conflicted;
f. Perform integration activities to include mounting and securing equipment, installing interconnecting hardware, installing interconnecting cabling, dressing, and stowing cables to assure sufficient length prior to final termination in accordance with applicable standards;
g. Perform Quality Control checks IAW Government-approved check procedures and work instructions as referenced in 4.2.1; and

h. Perform TIF integration activities in support of multiple platforms, such as installation of antennas and Radio Frequency (RF) switching equipment for access by multiple Platform TIFs, assembly and set up of special test fixtures of authorized cryptographic material IAW EKMS-1B.

3.5.4 Equipment in the TIF Complex and Onboard Ship/Craft The Contractor shall keep equipment/SoS maintained to the original specifications through all testing, SOVT, ship trials, and sail-away to support test and demonstration events unless directed by the Government. The Contractor shall notify the Government of recommended or discovered changes to equipment or systems specifications prior to taking any action and for guidance.

3.5.5 Preparation of Systems for Delivery The Contractor shall prepare systems and equipment for shipboard delivery, to include disassembly from the Platform TIF, removal of CCI and other equipment not amenable to long-term storage, preparation for packing, and marking IAW both Government and receiving shipyard identification numbers.

3.5.6 TIF Completion Report The Contractor shall provide a completion report at the conclusion of the Platform TIF integration and testing IAW CDRL A019 that identifies the remaining/outstanding test procedures, production items, Change Requests/Change Notices (CR/CNs), ECOs, and Test Change Proposals (TCPs). Upon completion and shipment of the TIF systems to the shipbuilder, the Contractor shall clean the TIF space and inventory all remaining material and equipment.

3.5.7 Integration, Installation, and Test Support The Contractor shall provide installation planning, installation preparation, system installation or support, technical support, evaluation reporting, trials support, and pre- and post-sea trials support at the designated installation site. The Contractor shall conform to NAVSEA TS9090.310E as required.

3.5.7.1 Installation Plan The Contractor shall develop an installation plan that includes schedule, handling guidance, equipment, and materials to be loaded and installed in the TIF and on the ship.

3.5.7.2 Installation and Testing Support The Contractor shall provide technical and engineering support for system installation and light-off, grooming of systems, and conduct of required tests.

3.5.7.3 Shipyard Liaison The Contractor shall provide support to installing activities, facilitate termination of intra-/inter-compartment cabling IAW applicable guidance documentation, specifications, and approved cable block diagrams and cable run sheets, monitor the load-out, installation, grounding, and bonding of equipment racks, and monitor the effort of connecting cables to applicable C4I and related systems and interfaces. The Contractor shall design, fabricate, and install rack foundations and sway braces and install inter-/intra-compartment cabling.

3.5.7.4 Systems Installation The contractor shall provide personnel to install both POR and non-POR C4I and related systems. On select hulls the contractor shall be prepared to install required infrastructure including but not limited to: install inter- and intra-compartment cables; reconfigure spaces as required including backing structures; and design and install HVAC, power, lighting and cableways as required to support key C4I and non-C4I space designs. The contractor shall land and bond racks, antennas, and other equipment in support of the ships' systems. The contractor shall, on select hulls, coordinate the installation of other warfare activities' equipment and/or systems and fully finish spaces to include lighting, lagging, painting, decking and other work as required to deliver a fully operable space in accordance with specifications and applicable standards.

3.5.7.5 Space Turnover Support The Contractor shall provide assistance to the Government in conducting an inspection of the C4I and other select spaces to determine their readiness for installation and to document discrepancies. The Contractor, upon acceptance of space custody IAW a Memorandum of Agreement (MOA) provided by the Government, shall provide inventory control of C4I and related systems.

3.5.7.6 Trials Support The Contractor shall provide technical, engineering, and logistics personnel in support of pre-trial, Builders Trials, Acceptance Trials, and post-trial discrepancy (i.e., trial card) correction. The Contractor shall assist in developing a Communications Plan (COMM Plan), developing and submitting the Satellite Access Request (SAR), developing a Gateway Access Request (GAR), developing the Schedule of Events (SOE), and developing a Communications Watch Bill.

3.5.7.7 Post-Sea Trials Support The Contractor shall provide technical, production, engineering, and logistics personnel in support of equipment repair after delivery of the platform to the Government.

3.5.8 Shipboard Integration Completion Report The Contractor shall provide a Shipboard Integration Completion report at the conclusion of ship delivery that identifies the remaining/outstanding test procedures, production items, CR/CNs, trial cards, ECOs, and TCPs (CDRL A020). The Government and the Contractor shall agree to the contents of this report at or prior to ship delivery.

4.0 MANAGEMENT REQUIREMENTS

4.1 **Task Order Management -** The Contractor shall execute TOs, including defining, sequencing, and managing activities, resources, budget, and schedule to efficiently and effectively execute Contractor tasking. The Contractor shall employ industry standard concepts to ensure process efficiency. The Contractor shall develop and manage a WBS IAW CDRL A002, implement configuration management principles, and conduct closure activities for each TO. The Contractor shall coordinate responses to emergent requirements and facilitate timely action and resolution.

4.1.1 Platform Execution Plan The Contractor shall develop, maintain, and implement a Government-approved Platform Execution Plan that provides a thorough understanding of the C4I and other required systems' integration efforts required for a specific class of ship or individual hull. The Platform Execution Plan shall describe in detail organizational roles and responsibilities, the design budget approach, any necessary platform-specific programmatic and technical information, including Government Furnished Property (GFP) delivery dates. (CDRL A012).

4.1.2 Meeting and Trip Reports The Contractor shall attend meetings as directed by the Government. Additional responsibilities may include: coordinate meetings, develop agendas, provide presentation inputs, and track action items. The Contractor shall provide trip reports as directed by the Government. (CDRL A026, A027)

4.1.3 Integrated Master Schedule (IMS) The Contractor shall develop, maintain, provide to the Government, and execute tasking IAW a consolidated Master IMS (CDRL A023) for the entire CTII contract that will be updated upon each new Task Order Award. The Master IMS will provide for resource management in order to: complete requirements analysis, parametric development, shipboard installation, and integration and testing; review and update specifications and drawings; integrate C4I primary and related systems at the Platform TIF; maintain the systems during testing; support Dock Trials and Builder's Trials; and prepare systems for delivery and shipboard installation and testing across platforms in order to meet scheduled milestones. The Contractor shall obtain written approval from the Government for the original submittal and proposed subsequent changes to the IMS. The Contractor shall create and provide an IMS tailored to each platform (CDRL A024). Both IMS resources shall be delivered in Government-approved format so both the Contractor and Government can identify, coordinate, and implement changes necessary for desired results by ensuring each IMS is appropriately structured and used in conjunction with systems engineering principles, integrated scheduling, and risk management. Each IMS will enable PEO C4I to identify and assess actual project progress against planned progress; monitor critical path and near critical path; and assess program maturity.

4.1.4 Cost Management The Contractor shall develop and provide cost performance reports for each active TO IAW the Contractor's Progress, Status, and Management Report (CPSMR) (CDRL A001) and the Funds and Man-Hours Expenditure Report (CDRL A002), including monthly and cumulative costs by Sub-contract Line Item Number (SLIN), progress summary, action items, successes, and challenges. The Contractor shall perform cost management including cost estimating, budgeting costs, minimization of travel and per diem, and implementing cost control at the desired level stated in the TO. The Contractor shall provide a Contract Funds Status Report IAW CDRL A003.

4.1.4.1 Baseline Schedule Review (BSR) The Contractor shall schedule and hold a BSR as part of the first scheduled Platform Review after TO award to assess the performance measurement baseline. The objectives of this review are listed below.

a. The Contractor shall substantiate the existence of program baselines:

1) Demonstrate the effective configuration management of documents that adequately reflect the Government requirements, clearly define the design and approach, and identify hardware and software configurations and the integration thereof;
2) Produce, maintain, and provide an IMS that shows dependencies and critical path IAW CDRL A024; and
3) Produce, maintain, and provide a time-phased cost management baseline that is in place and reflects the baseline schedules and plans.

b. The Contractor shall produce, maintain, and provide a complete and consistent cost, schedule, and performance program capable of maintaining accurate and timely cost and schedule status.
c. The Contractor shall demonstrate adequacy of program and technical management plans and controls.
d. The Contractor shall demonstrate its management teams' understanding of program risks and mitigation plans.

4.1.4.2 Integrated Program Management Report (IPMR) The Contractor shall provide cost performance reports in accordance with CDRL A018. The IPMR shall include one or more of the following reports:

a. Estimate At Completion (EAC)
b. Percent expended on the task with applicable dollar rates annotated
c. Percent remaining with applicable dollar rates annotated
d. Cost Performance Index (CPI) at each WBS level
e. Schedule Performance Index (SPI) at each WBS level

4.1.4.3 Enterprise-wide Contractor Manpower Reporting Application (ECMRA) The contractor shall report ALL contractor labor hours (including subcontractor labor hours) required for performance of services provided under this contract for C4I Testing, Integration, and Installation (CTII) via a secure data collection site. The contractor is required to completely fill in all required data fields using the following web address https://doncmra.nmci.navy.mil. Reporting inputs will be for the labor executed during the period of performance during each Government fiscal year (FY), which runs October 1 through September 30. While inputs may be reported any time during the FY, all data shall be reported no later than October 31 of each calendar year. Contractors may direct questions to the help desk, linked at https://doncmra.nmci.navy.mil.

4.1.5 Engineering Review Boards and Inspections The Contractor shall participate in review boards and inspections to formally assess the maturity of Contractor-developed designs and products, identify defects and defect trends, record corrective actions, and obtain technical authorization to release documents and drawings when directed to do so by the Government. External products shall be reviewed at regular intervals with Government teams, including final product review.

4.1.6 Readiness Reviews The Contractor shall participate in Government-led readiness reviews. Readiness reviews are scheduled and conducted by the Government at planned intervals as specified in the IMS, and their purpose is to review technical and programmatic progress for a specific project or design effort. The review team typically consists of personnel representing relevant functional areas and/or stakeholders. Checklists, including entrance and exit criteria, will be provided by the Government for each review to ensure they are comprehensive and reflect lessons learned from previous reviews. The Contractor shall demonstrate that entrance criteria have been met prior to each review, and shall demonstrate that exit criteria have been met after each review. For example, the readiness reviews currently defined by the Government are:

a. Systems Readiness Review (SRR) The SRR examines the functional and performance requirements defined for the system and the preliminary program or project plan and ensures that the requirements and the selected concept will satisfy the stated requirements.
b. Design Readiness Review (DRR) The DRR evaluates the adequacy of the design requirements and the capability of the design to meet these requirements, and identifies problems before moving to procurement and production. The DRR is sometimes divided into a "preliminary design review" and a "critical design review".
c. Production Readiness Review (PRR) The PRR ensures that the production plans, the fabrication, assembly, and integration-enabling products, and the personnel are in place and ready to begin production.

d. Testing Readiness Review (TRR) The TRR ensures that the test article (hardware/software), test facility, support personnel, and test procedures are ready for testing and data acquisition, reduction, and control.
e. Installation Readiness Review (IRR) The IRR ensures that the installation plans, location, equipment, materials, and personnel are in place prior to the start of installation.

4.1.7 Technical Reports The Contractor shall develop and provide technical reports. Technical reports may include studies, white papers, technical presentations, and other technical reports, and the delivery dates shall be negotiated with the request for the specific report. (CDRL A016)

4.1.8 Risk Management The Contractor shall employ Risk Management principles to identify, assess, and mitigate events that could adversely impact the program/project. The Contractor shall perform risk management planning to include risk identification, qualitative and quantitative analysis, risk mitigation, and monitoring and controlling risk at the TO and program levels.

4.1.9 Technical Performance Measurement The Contractor shall collect performance metrics for key technical process areas as directed by the Government.

4.1.10 Equipment Installation Management The Contractor shall be responsible for integration of equipment installation efforts into the IMS, including status updates on an appropriate frequency.

4.2 **Quality Control and Quality Assurance –** The Contractor shall establish, institute, and maintain a Quality Control program and process in accordance with ISO 9000 family of standards.

4.2.1 Quality Control Plan (QCP) The Contractor shall develop and deliver a QCP IAW CDRL A017 that identifies how quality assurance and quality control will be implemented for the overall program IAW NAVSEA 9090.310E.

4.2.2 Process Reviews and Audits The Contractor shall conduct process reviews and audits in accordance with the requirements of NAVSEA TS9090.310E.

4.2.3 Continuous Process Improvement The Contractor shall support and participate in Lean Six Sigma (LSS) continuous process improvement events with the objectives of reduced cost of work, improved adherence to schedule, improved speed of transactions, enhanced quality of work life, or improved safety.

4.2.4 Support of Government Quality Initiatives The Contractor shall support and participate in ongoing Government quality assurance initiatives, including Capability Maturity Model Integration (CMMI) working groups, metrics development, increased efficiencies from lessons learned, and analysis projects.

4.3 **Platform Logistics Support –** The Contractor shall utilize a Government-approved system or method for ILS. The Contractor shall collect, correlate, and develop C4I primary and related systems logistics packages to be provided as part of a deliverable to the Government. The Integrated Logistics Documentation shall include an ILS report that captures action item status with narrative summary identifying the progress, delays, and/or problems associated with each ILS process. At a minimum, the status summary should provide reasons for delays and/or problems associated with the ILS deliverables, and recommendations for avoiding/minimizing them in the future. It shall include a final report of equipment procured and final cost, as well as the final Master Equipment List (MEL) listing.(CDRL A013)

4.3.1 Logistics Management The Contractor shall provide logistics management planning and support to include the identification and coordination of any logistics elements required to support the product. GEIA-STD-0007, Logistics Management Information applies.

4.3.2 ILS Certification Checklists The Contractor shall provide supportability documentation for non-POR systems only, including preparing ILS certification checklists for delivery to SSC–LANT, PEO C4I, and NAVSEA. The Contractor shall obtain logistics data for each non-POR component of the integrated C4I suite, and obtain and verify accuracy and currency of the information. (CDRL A013)

4.3.3 Logistics Data Management The Contractor shall enter logistics data for non-POR systems only into the Material & Equipment Real-time Logistics Information Network (MERLIN), Navy Data Environment (NDE), or other database as designated by the Government. The Contractor shall provide Configuration Management information for upload to Configuration Data Managers Database-Open Architecture (CDMD-OA) or other designated CM database to assist in the ship outfitting process.

4.4 **Material Management –** The Contractor shall implement a material management system that provides status and reports to include the ordering, receipt, inspection, test, inventory, control, and shipment of Contractor Procured Material (CPM) required on each Task Order prior to delivery to the TIF Warehouse at SSC-LANT. Government property shall be maintained in accordance with DoDI 4161.02 Accountability and Management of Government Contract Property, and DoDI 5000.64 Accountability and Management of DoD Equipment and Other Accountable Property.

4.4.1 Material Identification, Procurement, Tracking, and Receipt The Contractor shall provide support for the identification of material requirements and for the generation of procurement BOMs for each Task Order. The Contractor shall procure material as required in each BOM and shall provide support for Government procurements. The Contractor shall document the identification, procurement, status, and delivery to the TIF Complex and to the shipbuilder/other designated location of all GFP and CPM items associated with each BOM. The Contractor shall document the location and assist with the disposition of material throughout the production, testing cycle, disassembly, pack-out, load-out, shipment to the shipbuilder/shipyard, and final installation. The Contractor shall maintain Material Identification (MATID) numbers utilized by the relevant shipyard(s).

4.4.2 Material Discrepancy Status The Contractor shall identify CPM discrepancies as part of the material receipt inspection process and develop and provide MDRs for those discrepancies. (CDRL A017)

4.4.3 Material Status Accounting Support The Contractor shall provide support by verifying and tracking the status of material (including long-lead items), also documenting the latest projected delivery and actual receipt dates of equipment and materials. The Contractor shall monitor status of equipment (including facility hardware, technical data, and logistics support items) to ensure timely completion of the C4I primary and related systems integration effort. The Contractor shall report those instances when a late equipment delivery could impact the integration, test, and delivery schedule. The Contractor shall notify the Government about any items whose status will not support the shipyard schedule.

4.4.4 Material Status Report The Contractor shall develop and deliver a Material Status Report that lists CPM and Government Furnished Material (GFM) for the TO. The listing shall also include Material brought forward from specific previous TOs (by name and number) and any Material transferred from other hulls. This Report will be an Excel spreadsheet and shall be organized by: TO Number; Hull and Number; Part Number; Serial Number; Description; Unit Cost; Quantity Remaining; Location in TIF; Procured By (Contractor/Government); Disposition/Recommended Disposition. Disposition will describe how and where Material was used/disposed of/consumed during Period of Performance (PoP). Recommended Disposition will include transfer of Material remaining in inventory (either at the TIF Complex or at the Contractor warehouse at end of PoP) to a specified follow-on TO, disposal per approved processes, or transfer to other TOs/hulls that will benefit the Government in their cost-savings initiatives. This Report is due to the Government no later than forty-five (45) calendar days prior to the TO's Period of Performance end date. (CDRL A025)

4.5 **Systems Packaging and Transportation –** The Contractor shall establish and implement a plan to perform packaging, handling, storage, and transportation of ship systems to the shipbuilder or other U.S. destinations as the COR may direct. The Contractor shall coordinate transportation with Government or commercial providers to be approved by the Government.

4.5.1 Product Preparation and Packaging The Contractor shall plan and prepare the integrated suite for delivery to the shipbuilder and perform inventory and disassembly of the integrated suite. Packaging shall be accomplished in accordance with MIL-STD-2073-1(E)1: DoD Standard Practice For Military Packaging, MIL-PRF-55585G, Electronics Equipment and Parts: Packaging of; and MIL-STD-129, Military Marking for Shipment and Storage. The Contractor shall prepare and deliver a platform-specific Product Delivery Plan. (CDRL A013)

4.6 **Crew Support and Familiarization –** The Contractor shall conduct a needs assessment and develop and deliver a C4I familiarization program and familiarization manual, including primary and other related systems. The Contractor shall develop and provide classroom instruction, hands-on practical instruction, and as-required maintenance instruction for members of ship's force at the Platform TIF or in a classroom at a designated site and onboard the ship. The Contractor shall also provide crew familiarization for total system operation of the C4I suite and associated communications systems. (CDRL A015)

5.0 SECURITY

5.1 Security – The nature of this task requires some Contractor personnel with clearances sufficient to allow access to data and information up to Secret, and on a limited basis Top Secret with access to SCI. If discussions are held at the SCI level, the Contractor may be required to attend such meetings, VTCs, etc. Office and storage facilities must be cleared to the level of Secret.

5.1.1 Communications Security The Contractor shall be certified to handle Communications Security (COMSEC) Information up to the Secret level at the TIF Complex or other integration facilities and up to the Top Secret SCI level during shipboard production, integration and testing efforts, ensuring chain of custody of all classified material . The Contractor shall coordinate with the local CMS/EKMS custodian to obtain COMSEC material and shall conduct periodic inventories as required by applicable COMSEC regulations, maintain a CMS User Access List approved by the EKMS Manager, issue CCI and load and test Key material, and schedule yearly user training.

5.1.2 Operations Security. All work is to be performed in accordance with DoD and Navy Operations Security (OPSEC) requirements and in accordance with the OPSEC attachment to the DD254.

6.0 ACRONYMS

Acronym	Definition
ABS NVR	American Bureau of Shipbuilding Naval Vessel Rules
BOM	Bill of Material
BSR	Baseline Schedule Review
C4I	Command, Control, Communications, Computers, Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CBD	Cable Block Diagram
CCB	Configuration Control Board
CCI	Controlled Cryptographic Item
CDMD-OA	Configuration Data Managers Database-Open Architecture
CDRL	Contract Data Requirements List
CFE	Contractor Furnished Equipment
CM	Configuration Management
CMMI	Capability Maturity Model Integration
CMP	Configuration Management Plan
CMS	Crypto Management System
CN	Change Notice
COMM Plan	Communications Plan
COMSEC	Communications Security

CPI	Cost Performance Index
CPM	Contractor Procured Material
CPSMR	Contractor's Progress, Status, and Management Report
CR	Change Request
CRS	Cable Run Sheet
CSA	Configuration Status Accounting
CSPR	Cost, Schedule, and Performance Report
CTII	C4I Testing, Integration, and Installation
DoD	Department of Defense
DoDAF	Department of Defense Architecture Framework
DoN	Department of the Navy
DR	Design Requirements
DRR	Design Readiness Review
E3	Environmental Electromagnetic Effects
EAC	Estimate At Completion
ECO	Engineering Change Order
ECP	Engineering Change Proposal
ECR	Engineering Change Request
EDM	Engineering Direction Memorandum
EHF TIP	Extra-High Frequency TDMA Interface Processor
EKMS	Electronic Key Management System
EMP	Electromagnetic Pulse
ESOH	Environment, Safety, and Occupational Health
ESWBS	Extended Shipboard Work Breakdown Structure
FID	Functional Interface Diagram
GAR	Gateway Access Request
GFE	Government Furnished Equipment
GFI	Government Furnished Information
GFM	Government Furnished Material
GFP	Government Furnished Property
H.I.	High -Impact
HEMP	High-Altitude Electromagnetic Pulse
HERP	Hazards of Electromagnetic Radiation to Personnel
HFE	Human Factors Engineering
HSI	Human Systems Integration
HVAC	Heating, Ventilation, and Air Conditioning
IA	Impact Assessment
IAW	In accordance with
ICD	Installation Control Drawings
ICL	Inter-Compartment Cable List
IEEE	Institute of Electrical and Electronics Engineers

ILS	Integrated Logistics Support
IMS	Integrated Master Schedule
IRD	Installation Requirements Drawing
IRR	Installation Readiness Review
LSS	Lean Six Sigma
MATID	Material Identification
MDR	Material Discrepancy Report
MERLIN	Material & Equipment Real-time Logistics Information Network
MIPR	Military Interdepartmental Purchase Request
MOA	Memorandum of Agreement
NAVSEA	Naval Sea Systems Command
NDE	Navy Data Environment
NSN	National Stock Number
NSWC-CD	Naval Surface Warfare Center—Carderock Division
O&F	Outfitting & Furnishing
O&I	Outline & Installation
O&M	Outline & Mounting
OPSEC	Operations Security
OSHA	Occupational Safety and Health Administration
PBS	Product Breakdown Structure
PEO	Program Executive Office
PEO C4I	Program Executive Office for Command, Control, Communications, Computers, Intelligence
PITCO	Pre-Installation Test and Check Out
PoP	Period of Performance
POR	Program of Record
PRR	Production Readiness Review
PSP	Personnel Security Program
PWS	Performance Work Statement
QCP	Quality Control Plan
RCOH	Refueling Complex Overhaul
RF	Radio Frequency
RFP	Request for Proposal
RMA	Reliability, Maintainability, and Availability
SAG	Systems Administrators Guide
SAR	Satellite Access Request
SDCP	Shock Deficiency Correction Plans
SEMP	Systems Engineering Management Plan
SLIN	Sub-contract Line Item Number
SOE	Schedule of Events

SoS	Systems of Systems
SOVT	System Operational Verification Test
SPI	Schedule Performance Index
SPM	Ship Program Manager
SRR	Systems Readiness Review
SSC-LANT	SPAWAR System Center--Atlantic
SUG	Systems User Guide
SV	System View
SWAP	Space, Weight, and Power
TCP	Test Change Proposal
TDBD	Top-Down Breakdown
TDP	Technical Data Package
TIF	Test and Integration Facility
TO	Task Order
TPRR	Test Problem Report and Resolution
TRR	Test Readiness Review
TS	Technical Specification
TSTP	Total Ship Test Program
TVS	Tactical Variant Switch
WBS	Work Breakdown Structure

(End of PWS)