

Volume I – Technical Proposal

1. Technical Capability

The ROI Consulting Team is structured to provide the full range of required capabilities in Zones 1 & 2, for the following 12 Product Areas. As demonstrated below, the depth and breadth of our qualifications and prior experience meet or exceed the requirements in each functional area of the Statement of Work (SOW).

1.1 Research and Development Support (SOW 3.1)

The ROI Consulting Team has significant experience in multiple areas of research and development, from ground-up development of autonomic-system-operational-logic valves for shipboard application, to survivability assessments of the complete, integrated, ship system designs.

Our Team is a core member of the Navy's largest research and development program, the DD(X) Program, as subcontractors on contract N00024-04-F-2303. We make up the entire Government Live Fire Test and Evaluation (LFT&E) team, responsible for overseeing all DD(X) LFT&E efforts performed by the Government and the design contractor to ensure compliance with legislative requirements and documented agreements between PMS 500 and the Office of the Secretary of Defense, Director of Operational Test & Evaluation.

In this capacity, the ROI Team performs, manages and oversees the survivability portion of all research and development efforts within the program. As the Government's survivability agents, we have direct input in the DD(X) design requirements in the ORD and lower level operational/performance requirements, often developing requirements to compensate for lessons learned from prior Naval battle scenarios (*assessment of system and subsystem requirements*). We have participated in design and evaluation of many DD(X) new technologies, including design and testing of the automated fire suppression system, and lethality assessment of the long range logistic armament projectile (*development*). We use extensive modeling and simulation to assess the damage that would be inflicted on individual systems and the integrated ship system, to determine ability to survive or recover mission capabilities (*analysis and evaluation of concepts, technologies, systems and subsystems*). The ROI Team also leads the DD(X) efforts to identify methods for resolving issues identified during LFT&E assessments, including establishing tactics to reduce detection and enhance decoy effectiveness (*development of operational concepts and tactics*).

Members of ROI's Team are recognized throughout the Navy for being on the leading edge of technology in our development of computer-based, autonomic (hands-free) operation, sensing and recovery logic. Our Team has experience in all levels of research and development for autonomic technology. Fairmount Automation, our subcontractor, was the first company to design and develop autonomic valves for the Navy, and are experts in the development of advanced automation and control algorithms for device level control (*concept formulation*). The Team has participated in multiple international summits on autonomics, presenting their findings

and incorporating the beneficial aspects of other nation's efforts (*research and scientific study*). Our Team developed, validated and installed the autonomic control system for the DD(X) Automatic Fire Suppression System evaluated during the Ex-PETERSON weapon effect test (*experimentation*). This work is being performed under contract N65540-03-D-0066, with ROI Consulting as the prime contractor. The state-of-the-art technology developed by the ROI Team will be used to support the DD(X) reduced manning concepts.

1.2 Engineering, System Engineering and Process Engineering Support (SOW 3.2)

Each member of the ROI Consulting Team averages more than 15 years of experience in engineering, system engineering and process engineering support – providing a sound basis for determining appropriate application of engineering disciplines. Our Team has significant experience in all facets of the Navy's engineering process, including: design, in-service engineering, test & evaluation, and product improvements.

The bulk of our Team's engineering support is being provided to the Navy under the ongoing NAVSEA Philadelphia, 5-year, \$14M contract N65540-03-D-0066, with ROI Consulting as the prime contractor. Under this contract, our Team has supported NAVSEA in the development, test, analysis, installation, maintenance, and enhancement of multiple systems, including Chilled Water, Electronic Cooling Water, Firemain, Electrical Generation, Electrical Distribution, Sprinkling, High Pressure Air, Low Pressure Air, etc.

Our Team developed proposed automated auxiliary system designs in support of the DDG Modernization program using improved survivability and reduced workload as goals (*development of new systems*). Our Team participated in the review process of the DD(X) program shipbuilder specification for the electric plant. This effort minimizes program risks by identifying deficiencies in the existing system and component performance requirements, and ensuring that standards (Navy or nationally recognized) are referenced in the specifications. Also, the ROI Team integrated network protocols being utilized on similar device level main propulsion and auxiliary systems (*Support integration of existing equipment or software into different applications or platforms*). We also reviewed the functionality of commercially available switchboard Fault Current Detector (FCD) to determine if the existing configuration provides coordinated fault isolation. We provided recommendations regarding technical content, priority, category and applicability for FCD and Navy electric plant alignment(s) for battle survivability configuration. (*Support evaluation of foreign or non-developmental equipment and technologies*)

Our Team determined the technical requirements for engineering modifications of in-service equipment, including preparation of Engineering Change Proposals, equipment design, technical alterations, field changes and ShipAlts. We also provide primary technical support to investigate identified system integration, system performance and individual component issues. We research and propose the implementation of engineering changes to enhance electric plant survivability and performance. In addition, we conducted feasibility reviews and provided comments on proposed engineering changes to 60HZ and 400HZ electric plants such that program goals of

improved multi-mission readiness, survivability, and manning requirements are met over the ship's planned 35-year service life. We provided installation and test support for all Flight IIA MU upgrades and DDG modernization plant upgrades. (*Development of significant alterations to existing systems*).

Other applicable efforts performed under this contract included: investigation and review of the DDG 51 Flight I electric plant Fault Response Analysis for Selected Sustained Damage Scenarios; determining whether electric plant ECPs generated by SEP recommendations are meeting SEP intent; providing technical support in the investigation of power system and component issues as identified during EIM; and determining the technical requirements for engineering modifications to configure in-service equipment including preparation of ECPs, equipment design, technical alternations, field changes, and ShipAlts.

1.3 Modeling, Simulation, Stimulation, and Analysis Support (SOW 3.3)

The ROI Consulting Team members are model proponents for several Navy model and simulation efforts. Our experience runs the gambit of modeling and simulation, including: algorithm development, programming, coding, application, data analysis, verification, validation and updating.

Our Team's most extensive modeling and simulation efforts are being performed under the NAVSEA Philadelphia contract N65540-03-D-0066, with ROI Consulting as the prime contractor. Under this contract, we have developed a computer software model, called Integrated Recoverability Model (IRM), that will replicate the as-built operating relationships among damage control and mission systems, and their associated support systems (*create model*). Development efforts included the ability to replicate the deactivation and reactivation of damage control and mission-essential system components over time, as a function of primary, secondary and cascading damage. The program also incorporates a graphical software program that will be used to develop and edit the shipboard system database, and to insert the ship design into the database. Our Team also inserted the Cruiser Modernization ship design into the program to support verification, validation and accreditation efforts (*validate model*). We are currently tasked to run the models for the Cruiser Modernization and DD(X) program's proposed ship designs (*use models to develop data*). The resulting data will be used to identify potential vulnerabilities of the proposed designs, and to initiate rectification processes (*support technical and strategic decisions*).

1.4 System Design Documentation and Technical Data Support (SOW 3.5)

Members of the ROI Consulting Team have developed and instituted system documentation and technical data for multiple Navy information systems, including EOSS, CSOOS, Technical Manuals, training material, test plans, test reports, etc.

Some examples of Navy system and technical documentation developed by our Team can be found in the statements of work for the NAVSEA Philadelphia contract (N65540-03-D-0066), with ROI Consulting as the prime contractor. Under this contract, the ROI Consulting Team

reviewed and developed engineering operating system standards, training packages, design detail, and other documentation for the DDG Chilled Water program. We provided the piping, electrical, monitoring and control system drawings to fabricate the Land Based Demonstrator, in support of the Chilled Water Automation System. We also provided engineering drawings for the development of an Automation and Control Advanced Demonstrator platform to develop and demonstrate advanced automation and control system technology. *(Prepare and assure technical data documentation necessary to support system development)*

The ROI Consulting Team proposed automated auxiliary system designs in support of the DDG Modernization program, incorporating improved survivability and reduced workload as goals on these new system designs. We also developed IRM software documentation and perform training on how to use the modeling software. *(Ensure documentation reflects the latest design, configuration, integration and installation concepts)*

1.5 Software Engineering, Development, Programming, and Network Support (SOW 3.6)

The ROI Consulting Team includes the Navy's leaders in developing computer-based, autonomic (hands-free) operation, sensing and recovery logic and software. This software supports the Navy's efforts to implement reduced manning, enhanced mission capability survival, and improved crew survivability.

Our Team's most extensive software development efforts have been performed under the NAVSEA Philadelphia contract (N65540-03-D-0066), with ROI Consulting as the prime contractor. Under this contract, the ROI Consulting Team has developed algorithms for automation systems for use on shipboard fluid systems (i.e. chilled water, firemain, fuel oil, lube oil and potable water), air systems (high pressure air, low pressure air, bleed air, prairie air and masker air), propulsion systems (i.e. main engines, generators) and other auxiliary systems such as steering and anchor windlass *(Planning, designing, coding, testing, integrating, supporting and delivering software)*.

Our team also supported analysis of multiple commercially available software tools, by developing additional Network Interface Modules (within the Chameleon Baseline Architecture) to support assessment of new networks and HMI's such as ICAS, and other protocols such as LonTalk®, DeviceNet®, ControlNet®, PROFIBUS®, HART®, and Foundation Fieldbus® *(selection of hardware and computer software)*.

Team members developed and integrated a fluid system model into the test platform using the Flowmaster Fluid System Simulation Modeling tool *(technically support software implementation in systems, subsystems and components)*. We also provided software integration support between the ACAD and test control software, and reviewed and commented on Naval network protocol integration architectures *(Technical analysis of software)*.

Our Team has performed software engineering, development, programming and network efforts under multiple other contracts. Another major effort included the development of Automatic Fire

Suppression System (AFSS) control software validated on board the Ex-PETERSON Weapon Effect Test. This software was able to detect the fire and activate the appropriate fire suppression hardware, for the spaces being tested to provide an automated damage control response. The software monitored the status of the fire and suppression activities. The system detected and optimally isolated damage to the installed AFSS. The software also reported the monitored fire and system damage to an overall situational awareness display. It collected data relevant to the performance of the system and logged the data for follow-on analysis.

We also built, demonstrated and delivered a Network Capable Application Processor Platform, with efforts including: design, test and transition to production of a fully qualified, reliable and cost-effective Network Capable Application Processor Platform for the Highly-Sensorized Ship. We also designed, developed, and tested the Chameleon-based burner management control system for LHD-1 class propulsion boilers, and provided on-site technical support for LHD class SSTG auxiliary control system installation.

1.6 Human Factors, Performance, and Usability Engineering Support (SOW 3.8)

Members of the ROI Consulting Team have participated in multiple human-machine-interface efforts, from system design to graphic user interface. Our efforts have supported reduced manning concepts, decision aid software, man-in-the-loop operational procedures, etc.

Our Team is a core member of the Navy's most aggressive HMI program, the DD(X) Program, as subcontractors on contract N00024-04-F-2303. Tasks performed in support of this contract include assessment of casualty control manpower requirements (firefighting, dewatering, desmoking, etc.) associated with the proposed reduced manning for the DD(X) design (*ensure design of interactive systems are safe, more secure and easier to use*). As the Trial Manager for several weapon effect tests, our Team developed trial safety procedures and contingency plans to ensure the safety of all participants (*reduce accidents due to human error*). As part of the LFT&E assessment, the Team evaluated the ability of the reduced manning crew to contain casualties, treat injured crew members, and restore mission capability. We also developed recommendations for enhancing operation, based on issues identified during the assessment (*enable more efficient process operations*). Members of our team participate in the DD(X) HIS Working Group, and have contributed to the establishment of manpower complements for the various shipboard operating conditions (*ensure the number, type, mix, knowledge, skills and abilities have been defined and documented*).

The ROI Consulting Team has performed HMI under multiple other contracts, including development of HMI for Control stations and systems such as ICAS in the Wonderware and AIMAX applications; determination of the capability of ship's force personnel to maintain and operate the chilled water and electronic cooling water systems; and determining the capability of ship's force personnel to maintain and operate the chilled water and electronics cooling water systems.

1.7 System Safety Engineering (SOW 3.9)

The ROI Consulting Team members have developed and instituted system safety for multiple Navy events, including weapon effect tests, equipment operational procedures and the USS COLE damage investigation.

A classic example of the Team's experience in system safety is our analysis of the USS COLE after it sustained weapon damage. This evaluation was performed under the NAVSEA Philadelphia contract (N65540-03-D-0066), with ROI Consulting as the prime contractor. As part of this effort, members of the Team performed shipboard inspections of the post-weapon-hit ship, and interviewed crewmembers to identify equipment, component and system weapon effect responses that resulted in unsafe conditions for the crew. Identified issues were examined by the Team to determine rectification plans, which included modifications to operational procedures, enhancement of crew protective features, design modifications, and establishment of survivability and safety requirements for future ship designs. (*Ensure that safety is considered in all aspects of design, development, operation, maintenance, and modification of systems platforms*)

Other safety efforts performed under this contract included identification and review of "safe to operate" procedures for shipboard electrical and mechanical components, development of Safety Plans for multiple test and trials, and performing shipboard safety inspections for installed equipment that has been CASREPped or reported as operating outside of the component's specifications.

1.8 Interoperability, Test and Evaluation, Trials Support (SOW 3.14)

The ROI Consulting Team has technical and managerial experience across the gambit of tests and trials conducted by the Navy, including: Land Based Demonstrators, Ship Survivability Combat Exercises, Combat System Survivability Qualification Trials, Developmental Testing, Operational Testing, Weapon Effect Tests, Total Ship Survivability Trials, Shock Trials, etc. Testing efforts conducted by our Team have supported system design validation, design enhancement, system assessments, battle damage simulators, model & simulation updates, and conduct of testing required by OPNAV, DOT&E or US Code legislation.

Many examples of our Team's expertise in test, evaluation and trial support can be found in work done under the NAVSEA Philadelphia contract (N65540-03-D-0066), with ROI Consulting as the prime contractor. Under this contract, we have participated in Combat System Survivability Qualification Trials (CSSQT). During these trials, Team members assisted in the execution, evaluation, and modification of test procedures and participated during on-site evolutions. We conducted zonal electrical distribution system testing to ensure that individual component and overall system performance support combat system readiness; and identified component/system deficiencies requiring corrective action. We supported Ship Survivability Combat Exercises (SSCE), by assisting in the execution, evaluation, and modification of drill guides, and development of implementation and observation sheets. Our Team supported multiple Combat System Survivability Demonstrations (CSSD), by recommending

improvements to the test and execution plans. We investigated, and provided comments on, shortfalls in the electrical system's ability to ensure combat survivability, and provided system design change recommendations to reduce recurring failures during CSSD. *(Ensure developed systems and war fighting capabilities have been properly tested)*

Our Team also provides LBES test engineering support for all SIM/STIMs, and hot plant test requirements for main propulsion gas turbines, gas turbine generators, integrated bridge system, zonal power system, including electric plant survivability/reconfiguration ECPs, chilled water system survivability ECPs, and auxiliary support systems. We also developed design and test procedures for LBES testing of ECPs. For the DD(X) program, our Team members provide IPS LBTS engineering support for both the Engineering Development Model (EDM) and Ship production test platforms, and engineering support for the Integrated Fight Through Power Test Facility. *(Ensure developed platforms have been properly tested)*

Other ROI Consulting Team efforts performed under this contract include development of test plans and procedures for testing advanced automation and control technology on the NSWCCD Automation and Control Advanced Demonstrator, Chilled Water Automation System Land based Demonstrator, and shipboard testing of the Chilled Water Automation System. These efforts supported the integration and testing of advanced network healing technology into fleet designs.

1.9 Training Support (SOW 3.18)

The ROI Consulting Team has developed training materials for multiple Navy applications, from system operation to shipboard battle casualty training. Many examples of our Team's expertise in training can be found in work done under the NAVSEA Philadelphia contract (N65540-03-D-0066), with ROI Consulting as the prime contractor. Our training support included conduct of onboard crew training on DDG Chilled Water system operation, and ISEA training for Chilled Water and Electronics Cooling Water Systems on multiple ship platforms. We provided Zonal Electrical Distribution System (ZEDS) crew familiarization to ship's force, developed IRM software documentation and performed training on how to use the modeling software, as well as assisted in the development of training simulators for the FTSCs, ship's force, other Navy organizations and contractors. *(warfighter provided instruction to attain and retain knowledge, and skills)*

1.10 In-Service Engineering, Fleet Introduction, Installation and Checkout Support (SOW 3.19)

The ROI Consulting Team has extensive experience supporting fielded shipboard systems and components, including hands-on experience in equipment operational procedures, training, troubleshooting, and modernization efforts. Our team comprises In-Service-Engineering-Agents for multiple systems (air, power and water) across the spectrum of surface combatants (FFG, CG and DDG Class).

Examples of our Team's breadth of expertise in In-Service Engineering, Fleet Introduction, Installation and Checkout Support can be found in work done under the NAVSEA Philadelphia contract (N65540-03-D-0066), with ROI Consulting as the prime contractor. Under this contract, our Team has reviewed ship specifications and drawings and feedback received from the ship for information concerning the operation of the electric plant systems and the interface with the vital users/systems. From this research, our Team identified potential problem areas and made recommendations to correct the problems, ensuring that the electric plant will support vital systems in accordance with MIL-Standards. Additionally, the Team provided troubleshooting, testing, calibration and, where necessary, repair of hardware components from propulsion and auxiliary control systems upgrades. We provided power monitoring assistance to resolve recurring electric plant failures due to SABTs, excursion for Mil-Sandards, ECPs, Machinery Alterations and new users. We provided Zonal Electrical Distribution System (ZEDS) survivability training to ship's force, and participated in analysis of shipboard power monitoring data to quantify reported anomalies and provide detailed report of findings. For the DDG Chilled Water Systems, our Team determined the capability of ship's force personnel to maintain and operate the chilled water and electronics cooling water systems, and provided ISEA training. *(Establish and maintain long term engineering, operation and maintenance support for in-service war fighting capabilities)*

Under this contract, the ROI Consulting Team also provided on-site engineering and technical services for shipboard underway and/or sea trials for newly installed or upgraded FFG, CG and DDG Class propulsion and auxiliary control systems upgrades. Efforts were performed in connection with ship system automation upgrades and components being installed, maintained or altered by ship's force, private contractors and/or navy activities. *(Capability to modernize or introduce transformational technologies into capabilities)*

1.11 Program Support (SOW 3.20)

The ROI Consulting Team has provided program support for projects, tests, trials, and programs. Our Team's experience includes multiple events, from working level tasking to overall program management.

As subcontractors on N00024-04-F-2303, our Team is a core member of the Navy's new surface combatant acquisition program, the DD(X) Program. Our Team comprises the entire Government Live Fire Test and Evaluation (LFT&E) team, responsible for overseeing all DD(X) LFT&E efforts performed by the Government and the design contractor to ensure compliance with legislative requirements and documented agreements between PMS 500 and the Office of the Secretary of Defense, Director of Operational Test & Evaluation. As part of this effort, our Team establishes and manages all LFT&E schedule, cost, contracting, technical objectives, organizational structure, and teaming. This total program management approach ensures that an integrated final product is developed in a cost effective manner *(applying business, financial management, and technical disciplines for planning, organizing, staffing, controlling, and leading team efforts)*

We have performed project management and program support under multiple other contracts. Tasking from these contracts included providing maintenance support related to all LBES logistical databases; test engineer report databases; metrics generation and test schedules; development of test plans; test schedules; cost estimates; technology assessments and recommended design modifications for multiple shipboard systems to support fleet modernization efforts. *(results place a system in hands of the warfighter)*

1.12 Administrative Support (SOW 3.21)

The ROI Consulting Team incorporates personnel capable of providing clerical and administrative support for programs and projects of any size. Our Team has extensive experience in a multitude of software programs, including: Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Microsoft Project, Microsoft Outlook, Intuit QuickBooks, Quicken, Digital Video Gate, Adobe Acrobat, PrecisionScan, McAfee Virus Protect, MovieShaker, PictureGear Studio, Instant Messenger, Windows Media Player, FTP Protocol, etc.

Recent work performed as a subcontractor on N00024-04-F-2303 required the ROI Consulting Team to manage all aspects of the DD(X) LFT&E Program. Administrative support personnel were staffed to provide a variety of efforts, including development of status report documentation, maintaining and updating Action Item databases, providing facility security clearance monitoring, documentation management, facility coordination, service vendors, conference facilities, teleconferencing, web-conferencing, email, facsimile, graphic support, video support, travel coordination, logistics, time-keeping, and billing, achieving a seamless operation of office and support functionality. These functions were managed by the ROI Consulting Team in a manner that flowed down tasks that could be performed by less costly support personnel, ensure minimal cost incurred by the Navy customer. *(analytical, clerical, organizational assessments, and administrative disciplines for operation of offices and support functions)*