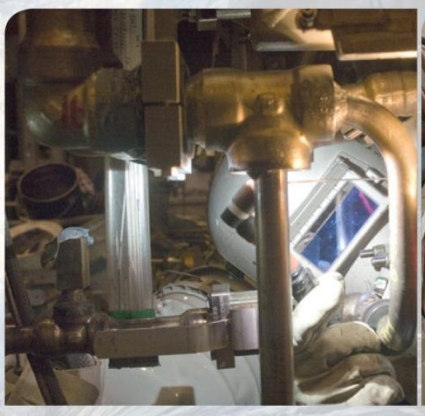
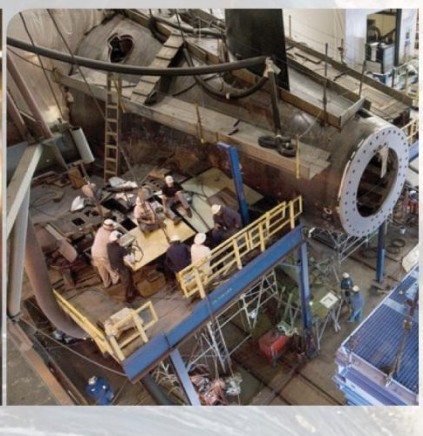
NAVY MANTECH

2013 NAVY MANTECH

PROJECT BOOK


Navy ManTech…transitioning affordable manufacturing technology to the Fleet

DEPARTMENT OF THE NAVY ONR Science & Technology

NAVY MANTECH

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2013 Navy ManTech Project Book: This 2013 edition of the Navy ManTech Project Book provides brief write-ups for most of the Navy ManTech projects active in FY12. To highlight the Navy ManTech's Investment Strategy with its concentration on development of manufacturing technology for the key platforms, the projects are organized by platform and by organization. Please contact any of the Points of Contact listed in the project write-ups for additional information on any Navy ManTech project.

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Navy ManTech Overview

The Navy Manufacturing Technology (ManTech) Program responds to the needs of the Navy for the production and repair of platforms, systems, and equipment. It aids in achieving reduced acquisition and total ownership costs by developing, maturing, and transitioning key manufacturing technologies and processes. Investments are focused on those that have the most benefit to the Warfighter.

For the past seven years, the Navy ManTech Program has been focused on shipbuilding affordability improvements for key shipbuilding acquisition platforms and has recently added the Joint Strike Fighter (JSF) as an affordability target. ManTech helps these Navy programs achieve their respective affordability goals by transitioning needed manufacturing technology which, when implemented, results in a cost reduction or cost avoidance (measured as $/hull or $/aircraft).

Navy ManTech works with defense contractors, the Naval Research Enterprise, Navy acquisition Program Offices, and academia to develop improved processes and equipment. The Program is structured to promote timely implementation to strengthen the defense industrial base. With their expertise in specific technology areas, the Navy ManTech Centers of Excellence (COEs) play a key role in the definition and execution of the Program.

Together with the Navy ManTech Program Office, representatives of the customers, industrial entities, and the COEs function as a team to define projects that address the needs of the Navy in time to make a difference. As an example, extensive interaction and cooperation between Navy ManTech, Navy ManTech COEs, General Dynamics Electric Boat, Huntington Ingalls Industries – Newport News, PEO (Subs), and the PMS 450 Program Office resulted in a focused ManTech initiative for the VIRGINIA Class submarine (VCS). To date, technology from 28 of the ManTech VCS portfolio of approximately 70 projects, have been implemented for a resulting real acquisition cost savings of over $25.2M per hull, verified by our industrial partners and PMS 450.

Management of the Navy ManTech Program is by the Office of Transition within the Office of Naval Research (ONR), with direct oversight from the Chief of Naval Research. With the transition of technologies to the Fleet and acquisition as top priorities, ONR's Office of Transition is composed of transition-centric programs including ManTech, Future Naval Capabilities (FNCs), the Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR), and other transition initiatives.

The directors of the ManTech programs of the Army, Navy, Air Force, and Defense Logistics Agency (DLA) coordinate their programs through the auspices of the Joint Defense Manufacturing Technology Panel (JDMTP) with representation from the Office of the Secretary of Defense (OSD), the Department of Commerce's National Institute of Standards and Technology (NIST), the Department of Energy, the Defense Advanced Research Projects Agency (DARPA), and industry. The JDMTP is organized to identify and integrate requirements, conduct joint program planning, and develop joint strategies. Department of Defense (DOD) oversight is provided by the Office of Manufacturing and Industrial Base Policy (MIBP) which was established by the 2011 National Defense Authorization Act (NDAA) to ensure that the linkage between industrial policy and manufacturing is firmly established and effectively coordinated.

Navy ManTech Objectives

The overall objective of the Navy ManTech Program is to improve the affordability and readiness of Department of the Navy (DON) systems by engaging in manufacturing initiatives that address the entire weapon system life cycle and that enable the timely transition of technology to industry to support the Fleet. More specifically, DOD Directive 4200.15 states that ManTech investments shall:

1. Aid in the economical and timely acquisition and sustainment of weapon systems and components.
2. Ensure that advanced manufacturing processes, techniques, and equipment are available for reducing DOD materiel acquisition, maintenance, and repair costs.
3. Advance the maturity of manufacturing processes to bridge the gap from research and development advances to full-scale production.
4. Promote capital investment and industrial innovation in new plants and equipment by reducing the cost and risk of advancing and applying new and improved manufacturing technology.
5. Ensure that manufacturing technologies used to produce DOD materiel are consistent with safety and environmental considerations and energy conservation objectives.
6. Provide for the dissemination of Program results throughout the industrial base.
7. Sustain and enhance the skills and capabilities of the manufacturing workforce, and promote high levels of worker education and training.
8. Meet other national defense needs with investments directed toward areas of greatest need and potential benefit.

Navy ManTech: Transitioning affordable manufacturing technology to the Fleet by ...

- Focusing resources on key, high priority acquisition platforms
- Targeting cost reduction as the primary benefit
- Developing critical manufacturing and repair / sustainment solutions
- Engaging relevant industry partners upfront and throughout the process
- Targeting ManTech transition and platform implementation as the key measures of success

Navy ManTech Investment Strategy

The Navy ManTech Program Investment Strategy concentrates ManTech investments on reducing both the acquisition and life-cycle costs of key Navy acquisition programs. ManTech transitions manufacturing technology which, when implemented, results in a cost reduction or cost avoidance. Platforms for investment are determined by total acquisition funding; stage in acquisition cycle; platform cost reduction goals; cost reduction potential for manufacturing; and other factors primarily associated with the ability of ManTech to deliver the technology when needed. Since FY06, ManTech investments have been focused on affordability improvements for: CVN 78 Class carrier, DDG Family (first DDG 1000 and now DDG 51), the Littoral Combat Ship (LCS), and the VIRGINIA Class submarine (VCS). Recently, the Joint Strike Fighter (JSF) was added to the ManTech investment strategy as an affordability target, with the portfolio jointly coordinated with the DOD and Air Force ManTech Programs.

Strategic planning for Navy ManTech is an ongoing effort. Navy ManTech annually analyzes acquisition scenarios and plans to determine major acquisition programs for potential investment. As the current platforms ManTech supports mature through their respective acquisition cycles, ManTech's investment targets will change.

Although different in focus, scope, and size, ManTech's affordability initiatives function similarly. For each, ManTech has established an integrated process team or IPT with representatives from Navy ManTech, the platform Program Office, and representative industry. The IPT meets regularly to coordinate and review the portfolio and ensure that projects are completed in time to meet the platform's window of opportunity for implementation.

Individual Navy ManTech projects are developed in conjunction with industry and the acquisition Program Manager (PM). With their expertise in specific manufacturing areas, the Navy ManTech COEs play a key role in project definition. Planning for transition prior to the initiation of projects is critical for the implementation of technology on the factory floor and eventually into the Fleet.

To clarify communication between program participants, Navy ManTech has established definitions for "transition" and "implementation". For Navy ManTech purposes:

- ***Transition*** denotes that point at which the ManTech project is completed and the technology meets customer (Program Office / industry) criteria / goals for implementation.
- ***Implementation*** denotes the actual use on the factory floor of Man-Tech results. (The resources for implementation are typically provided by entities other than ManTech including the Program Office and/or industry)**.**

Agreements are reached on the degree of participation of the PEO/PM in support of the projects. The goal is for each PEO/PM to contribute resources to enable successful completion and implementation of the ManTech projects. Resources supplied may include financial support or cost share for the ManTech project itself or funding of Navy laboratory personnel to provide test, evaluation, certification, and/or other services. In addition, each PEO/PM is expected to provide personnel with technical expertise and/or management experience to assist the ManTech Program Office in project oversight. This support affords assurance that the weapon system PM is truly committed to the successful outcome of the ManTech project. In addition, this close working relationship between the parties provides ManTech with a longer-term view of implementation.

On a per-project basis, Technology Transition Plans (TTPs) document roles, responsibilities, and required resources needed to achieve transition and implementation. TTPs highlight the path from the technology development that ManTech performs to implementation on the factory floor. TTPs are signed by Navy ManTech, the relevant COE Director, a management representative of the industrial facility where implementation will occur, the Program Office, and, if appropriate, the Technical Warrant Holder. To assess progress, ManTech has instituted a quarterly tracking of TTPs and an annual assessment of transition and implementation.

In early FY12, Navy ManTech expanded and formalized its focus on implementation and risks to implementation by instituting an Implementation Risk Assessment Management Process to assess potential future projects (those in the planning stages) as well as ongoing projects. For ongoing projects, risks are discussed during periodic Program Reviews to ensure ManTech is on the same page as the acquisition and industry stakeholders, all of whom have representatives attending the Program Review. For projects in the planning phases, the goal is to recognize risks to implementation upfront and, by doing so, prioritize funding of projects that have the greatest probability (least risk) of implementing and have a real impact on affordability.

Semi-annual affordability assessments identify projected cost reduction / avoidance per project, as well as an estimated total ownership cost savings per platform. These assessments, verified by industry and the relevant Program Offices, provide critical information to ensure that ManTech can continue to meet both platform and ManTech affordability goals and are essential to the Program's success.

Navy ManTech Investment Strategy

While the large majority of annual ManTech Program resources are invested in accordance with the affordability investment strategy, Navy ManTech does support smaller efforts in Energetics and Repair Technology (REPTECH).

Energetics: Energetics ManTech projects develop and transition process technologies for the synthesis of new or improved energetic materials, improved manufacture of propellants and explosives, and improved handling and loading of energetic materials into systems and components. Concentration is on developing solutions to ensure the availability of safe, affordable, and quality energetics products in support of Program Executive Offices such as Integrated Warfare Systems (PEO IWS/IWS3C) and Conventional Strike Weapons (PEO (W)/PMA 201). More information on Navy ManTech's Energetics Manufacturing Technology Center (EMTC) can be found on Page 11.

REPTECH: While the major emphasis of the Navy ManTech Program is on support of new production, ManTech also addresses repair, overhaul, and sustainment functions that emphasize remanufacturing processes and advancing technology. The REPTECH Program focuses on fielded weapon systems and provides the process and equipment technology needed for repair and sustainment. Requirements for REPTECH projects are driven by Navy depots, shipyards, Marine Corps Logistics Bases, intermediate maintenance activities, and contractor facilities responsible for overhaul and maintenance of Fleet assets. In general, REPTECH projects are usually shorter in duration and are funded at lower levels than standard ManTech projects. The REPTECH Program is run by the Institute for Manufacturing and Sustainment Technologies (iMAST). More information can be found on Page 12.

Navy ManTech Execution

The COEs were established as focal points for the development and transition of new manufacturing processes and equipment in a cooperative environment with industry, academia, and the Naval Research Enterprise.

The COEs:

- Execute projects and manage project teams
- Serve as a corporate expertise in technological areas
- Collaborate with acquisition program offices/industry to identify and resolve manufacturing issues
- Develop and demonstrate manufacturing technology solutions for identified Navy requirements
- Provide consulting services to Naval industrial activities and industry
- Facilitate transfer of developed technologies

Descriptions of ManTech's seven COEs are presented on the following pages.

Navy ManTech Execution

Center for Naval Shipbuilding Technology

The mission of the Center for Naval Shipbuilding Technology (CNST) is to identify, develop, and deploy in U.S. shipyards, advanced manufacturing technologies that will reduce the cost and time to build and repair Navy ships. The Center works closely with the Navy's acquisition community and the shipbuilding industry to identify manufacturing technology issues that negatively impact shipyard efficiency, with respect to both cost and cycle time. CNST solicits, selects, funds, and manages projects to address these critical and costly issues. The projects are focused on improving major ship construction and repair processes, such as optimizing production processes, predicting and reducing weld distortion, developing more efficient structural fabrication product lines, increasing the use of robotic welding methods, and eliminating inefficiencies in training, material usage, and supply chain procedures.

CNST has been operated and managed by Advanced Technologies International (ATI) in Charleston, SC since 2003. Looking forward, CNST will pursue technologies focused on improving the affordability of current Navy acquisition programs. New projects being considered include investigating the use of modernized production planning systems, further enhancing the use of computed radiography technologies, researching savings opportunities for high-cost components, streamlining material flow to and within storage and construction areas, investigating wireless management applications, and developing improved scheduling systems for new, aggressive build strategies.

CNST Web site: http://www.cnst.us

Composites Manufacturing Technology Center

The Composites Manufacturing Technology Center (CMTC), established in 2000, is located in Anderson, SC and is operated by Advanced Technologies International (ATI). The CMTC is consortium-based with a balanced membership providing expertise to address all Navy composites manufacturing technology needs. The Composites Consortium (TCC) membership includes prime contractors, composites industry suppliers, and universities. TCC has strong, in-depth knowledge and experience in composites manufacturing technology for all modern DOD weapon systems. As part of CMTC's organizational structure, all laboratories, facilities, and project labor resources are provided by project teams assembled from consortium members. This unique structure results in cost benefit to the Navy, with maximum funding going to project execution. CMTC's current portfolio includes composites manufacturing projects for manned and unmanned aircraft, surface ships, submarines, missiles, and land vehicles.

CMTC Web site: http://cmtc.scra.org

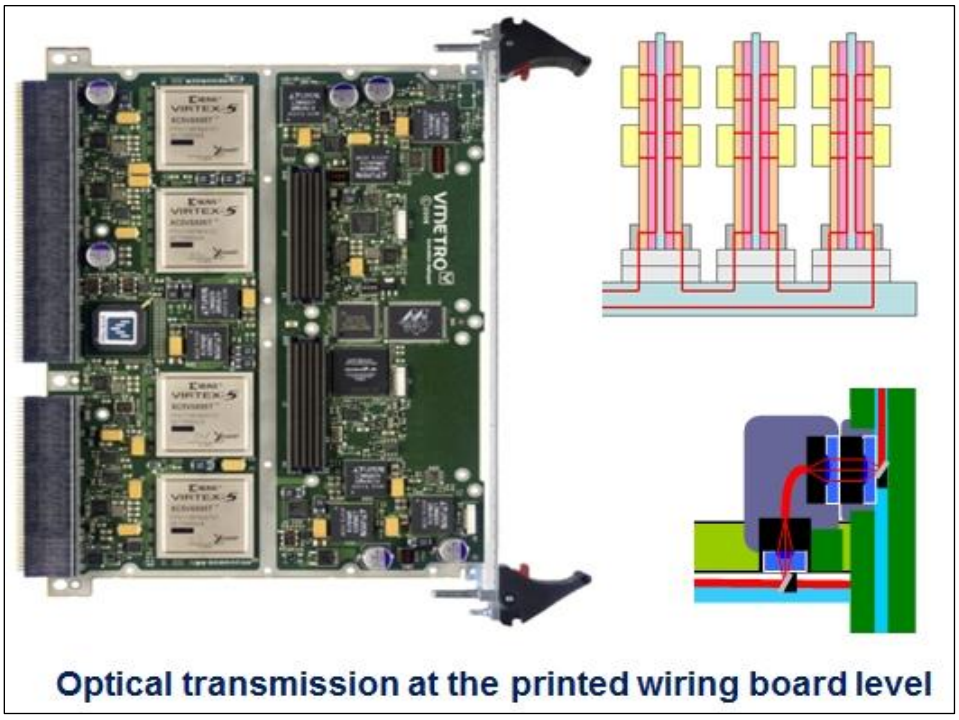
Navy ManTech Execution

The Electro-Optics Center

Since 1999, the Electro-Optics Center (EOC) has served as the Office of Naval Research's (ONR's) Manufacturing Technology Center of Excellence for Electro-Optics. The EOC's goal is to reduce acquisition costs, operational costs, and life-cycle costs while simultaneously improving mission capability of electro-optic military hardware and enabling transition of technology to industry, and, therefore, to the Warfighter. Since its inception, the EOC and its partner members of its Electro-Optics Alliance (EOA) have completed over 64 ManTech projects which have resulted in significant savings to the taxpayer. The purpose of the EOA is to advance DOD critical E-O Manufacturing Science and Technology and to promote U.S. preeminence in all areas of E-O. Alliance membership is available at no cost to all U.S. companies, government labs, and academic institutions involved in E-O technology. The EOA is committed to advancing the commercial viability of E-O technologies and promoting technology transfer to industry, as well as wide dissemination of new E-O related information.

The EOC, a proud part of The Pennsylvania State University, is a hybrid between the best components of a university and those of private industry. This relationship enables access to the university's researchers and scientists, its state-of-the-art facilities, and leading-edge research. EOC staff, comprised primarily of former industry and DOD personnel, brings experience in exceeding sponsor and corporate expectations. Through the application of this hybrid model, the EOC is able to provide its sponsors with solutions that combine leading edge research with on-time and on-budget deliveries.

EOC Web site: http://www.eoc.psu.edu



Courtesy of EOC

Navy ManTech Execution

Electronics Manufacturing Productivity Facility

The Electronics Manufacturing Productivity Facility (EMPF) was established in 1984 to aid the electronics industry in improving electronics manufacturing processes required in the manufacture of military systems. Today, the EMPF operates as a national electronics manufacturing COE focused on the development, application, and transfer of new electronics manufacturing technology by partnering with industry, academia, and government centers and laboratories to maximize available research capabilities at the lowest possible cost. The EMPF serves as a corporate residence of expertise in electronics manufacturing. The EMPF's principal goals are to: improve responsiveness to the needs of DOD electronics systems; ensure that deliverables make a significant impact in the electronics manufacturing industry; facilitate the development and transition of technology to the factory floor; and expand the customer base to a national level.

The EMPF operates in a modern 36,000 square foot facility adjacent to the Philadelphia International Airport. The facility houses a demonstration factory containing the latest electronics manufacturing equipment, fully equipped classrooms for skill-based and professional level technical training, and an analytical laboratory for materials and environmental testing. The EMPF offers many electronics manufacturing services and capabilities to the U.S. Navy, DOD, and the U.S. electronics manufacturing industrial base. The EMPF's resident technical staff consists of the nation's leading electrical engineers, mechanical engineers, materials scientists, chemists, physicists, instructors, and technicians. The EMPF staff is dedicated to the advancement of environmentally safe electronics manufacturing processes, equipment, materials and practices; flexible electronics manufacturing technologies; and workforce competency in electronics manufacturing processes, equipment, materials and practices; flexible electronics manufacturing technologies; and workforce competency in advanced electronics manufacturing.

EMPF Web site: http://www.empf.org

Energetics Manufacturing Technology Center

The Energetics Manufacturing Technology Center (EMTC), established in 1994 by the Office of Naval Research (ONR), is Navy-operated and located at the Naval Sea Systems Command's Naval Surface Warfare Center (NSWC), Indian Head Division (IHD), Indian Head, MD. The Indian Head Division serves as the focal point for the Center and as a renowned leader in energetics, provides a full spectrum of capabilities. These include energetics research, development, modeling and simulation, engineering, manufacturing technology, production, test and evaluation, and fleet / operations support.

Energetic materials (reactive chemicals), formulations (propellants, explosives, pyrotechnics), and subsystem components (fuzes, detonators, boosters, igniters, safe & arm devices) are critical to the performance and reliability of weapon systems and thus to our Nation's defense. Applications include missile, rocket, and gun propulsion; stores or ordnance separation; warheads and munitions; obstacle and mine clearance; flares; decoys; fire suppression; and aircrew escape. Energetics, inherently dangerous, require special processes,

equipment, facilities, environmental considerations, and safety precautions. At EMTC, this is kept in mind while ensuring the availability of safe, affordable, and quality products. The Center develops solutions to manufacturing problems unique to military system / subsystem acquisition and production requirements and the energetics industry. The Center does not own or operate any facilities and equipment but is essentially a virtual enterprise that involves government, industry, and academia in identifying requirements and executing projects. EMTC objectives are to identify weapon system and manufacturing base needs, develop and demonstrate the required manufacturing process technology solutions, and transition successful results.

EMTC Web site: http://www.navsea.navy.mil/nswc/indianhead/codeCA/EMTC/ main.aspx

Institute for Manufacturing and Sustainment Technologies

The Institute for Manufacturing and Sustainment Technologies (iMAST), established in 1995, coordinates Navy ManTech efforts at The Pennsylvania State University's Applied Research Laboratory (ARL), one of four U.S. Navy University Affiliated Research Centers (UARCs). Located in State College, PA, iMAST's primary objective is to address challenges related to Navy and Marine Corps weapon system platforms in the following technical areas: mechanical drive transmission, materials processing, laser processing, advanced composites, manufacturing systems, repair and sustainment, and complex systems monitoring. iMAST supports the Navy and Marine Corps systems commands, as well as PEOs and Navy laboratories.

REPTECH applies new and emerging technologies to improve capabilities of Navy depots, shipyards, Marine Corps Logistics Bases, and lower level maintenance activities throughout the Fleet. REPTECH cooperates and communicates with Navy COEs, the joint depot community, DOD industrial activities, industry, PEOs, and university laboratories.

iMAST Web site: http://www.arl.psu.edu/centers_imast.php

IMAST Development of an Advanced Navy Standard Watertight Door.

Navy ManTech Execution

Navy Metalworking Center

For 25 years, the Navy Metalworking Center (NMC) has supported the Navy's evolving needs by developing and transitioning innovative metalworking and manufacturing solutions. Currently, NMC conducts projects that improve manufacturing and shipyard processes by developing solutions that incorporate advanced metalworking, joining and coatings technologies, as well as design for manufacturability tools.

Since it was established as a ManTech Center of Excellence in 1988, NMC and its government and industry partners have driven advanced manufacturing technologies from research and development to application on Navy and other military weapon systems. Moving forward, NMC remains committed to meeting the Navy's critical need to reduce acquisition and total ownership costs through advanced metalworking solutions for naval systems that go in harm's way.

NMC is operated by Concurrent Technologies Corporation, an independent, nonprofit organization located in Johnstown, PA.

NMC Web site: http://www.nmc.ctc.com

Navy ManTech Execution

As previously indicated, the emphasis of the Navy ManTech Program is on transition of manufacturing technology that will result in tangible benefits for the Fleet. To achieve transition, it is imperative that the manufacturing advances be widely disseminated to the industrial base for implementation. To foster that dissemination, Navy ManTech provides the following:

Program Web site

The **Navy ManTech Program Web site** can be accessed at http://www.onr.navy.mil/mantech/. The web site is a central source for accessing general information about the program, program activities and participation, developments and events, and key points of contact. The site also offers links to the online annual Navy ManTech Project Book, program success stories, as well as other publications and reports.

Defense Manufacturing Conference

The annual **Defense Manufacturing Conference (DMC)** is a forum for presenting and discussing initiatives aimed at addressing DOD manufacturing technology and related sustainment and readiness needs. The conference includes briefings on current and planned programs, funding, DOD initiatives, and seminars relating to the various technology thrusts currently being pursued. Further details are available at the DOD Manufacturing Technology Web site at: https://www.DODmantech.com.

Project Book

The **Navy ManTech Project Book,** published annually and available through the Navy ManTech Web site, is a snapshot of Navy ManTech projects active during that particular fiscal year. Points of contact for each project are provided to facilitate technology transfer.

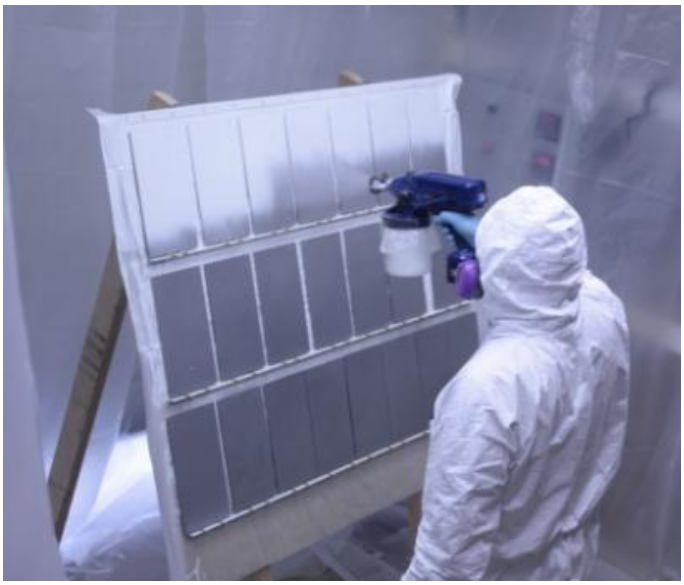
Centers of Excellence

The **Navy COEs** are focal points for specific manufacturing technology areas. The charter for each COE requires it to act as a consultant to both the Navy and industry and to facilitate the transfer of technology throughout the industrial base.

Navy ManTech Execution

The Navy urges government activities, industry, and academia to participate in its ManTech Program as participants, advisors, consultants and, most importantly, as beneficiaries. The goal of developing and implementing new and improved technologies will be achieved only through a concerted effort by everyone connected with the design, manufacture, and repair and sustainment of naval weapon systems.

For additional information on participation in the Navy's effort to strengthen the U.S. industrial base, impact platform affordability, and increase Navy readiness, contact any of the Navy ManTech Points of Contact who are listed on Pages 20-28.



(Courtesy of NMC and iMAST)

Navy ManTech – affordability improvements for five key naval platforms: VIRGINIA Class submarine (VCS), CVN 78 Class carrier, DDG Destroyer family (DDG 1000 and DDG 51), Littoral Combat Ship (LCS), and the Joint Strike Fighter (JSF).

ManTech: Continuing our Success at Facilitating Acquisition Cost Reduction / Avoidance for VIRGINIA Class Submarine

AT-A-GLANCE

WHAT IT IS

Navy ManTech's focused VIRGINIA Class submarine affordability initiative is developing and transitioning manufacturing technology for implementation on the factory floor to result in significant cost savings.

HOW IT WORKS

Navy ManTech works closely with PEO (Subs), PMS 450, General Dynamics Electric Boat, and Huntington Ingalls Industries – Newport News to focus ManTech resources on developing needed manufacturing technology.

WHAT IT WILL ACHIEVE

To date, twenty-eight of ManTech's projects have implemented on the factory floor for over $25.2M/hull cost savings (GD Electric Boat figure – Dec 2011).

Additional projects in work and in the pipeline for future implementation.

Projecting $35.6M / hull cost savings total.

Reducing the total ownership cost of current and future platforms is a critical goal of the Navy. Over the past seven years, the Navy ManTech Program has been focused largely on acquisition affordability improvements for key major acquisition platforms. ManTech has helped these Navy programs achieve their respective affordability goals by transitioning needed manufacturing technology which, when implemented, results in a cost reduction or cost avoidance (measured as $/hull).

A major success for Navy ManTech has been our VIRGINIA Class submarine (VCS) affordability initiative. Extensive interaction and cooperation between Navy ManTech, Navy ManTech Centers of Excellence (COEs), General Dynamics Electric Boat, Huntington Ingalls Industries – Newport News Shipbuilding, PEO (Subs), and the PMS 450 Program Office has resulted in a focused ManTech initiative that is successfully transitioning and implementing technology to aid in the Navy's and industry's common goal to reduce the cost of each VCS from $2.4B to $2.0B (FY05 $) enabling the construction of two submarines per year in 2012.

The current ManTech portfolio contains approximately 70 completed, active, or pending projects and has a potential acquisition cost savings of over $35M per hull for a return on investment in less than two hulls (from ManTech's Feb 2012 Affordability Assessment which was vetted through PMS 450). To date, twenty-eight of the ManTech affordability projects have implemented or are in the process of implementation. Realized cost saving / hull of over $25.2M have been recognized by the VIRGINIA Class Program Office and General Dynamics Electric Boat. These real acquisition cost savings for VCS have been negotiated into the Block III VIRGINIA Class submarine procurement, and a process has been established to achieve further savings during future submarine acquisition processes.

One of the projects recently implemented in the VIRGINIA Class Submarine portfolio is the Supply Chain Improvements project which is highlighted on the next page. This project demonstrates the real and significant cost savings that can accrue by examining components and their fabrication processes at the supply chain level and making what appear to be disparate improvements across the vendor base.

Navy ManTech is proud of our partnership with the VIRGINIA Class Submarine program and our success in helping to facilitate acquisition cost reduction / avoidance for VIRGINIA as well as the other key Navy platforms we support.

... "ManTech has provided financial and technical support for significant shipyard process improvements with a $21M per hull projected benefit. These actions contributed to Electric Boat and the Navy achieving the Virginia Class "2 for 4 in 12" goal in the Block III contract. We now look forward to the relationship continuing and making positive impact to ... submarine acquisition and life-cycle cost reduction efforts."

—Kurt Hesch, Electric Boat - VP - VIRGINIA Class Program Manager

VIRGINIA Class Submarine Supply Chain Improvements -

Contractor furnished components (CFE) make up nearly 30% of the overall cost (or approximately $600M) for a VIRGINIA Class Submarine (VCS), with about $146M of that attributable to 40 very costly components. Optimizing the material acquisition process for these components, from initial design through procurement, receipt and inspection, and installation in the ship, offers significant opportunity for overall construction cost reduction. The goal, of this ManTech effort, was to perform manufacturing technology reviews for each component to lower costs and improve on-time availability while maintaining technical and quality requirements.

Using the ISSR (inherent, structural, systemic, and realized) analysis process, General Dynamics Electric Boat (GDEB) and Huntington Ingalls Industries - Newport News Shipbuilding (NNS) conducted a structured review of these 40 most costly contractor furnished components. The initial cost savings goal was a reduction of $1.46M (1% savings of the "Top 40") in CFE costs per VCS hull, based on previous studies and similar supply chain reviews.

Through the manufacturing technology reviews, the assembled GDEB and NNS project teams thoroughly evaluated these 40 components from design through installation. Design engineers evaluated/optimized component designs to reduce cost and schedule. Dimensional accuracy requirements driving costs were challenged, and design-for-assembly techniques were considered where practical. Vendor infrastructures were evaluated to determine their ability to provide components for the two ships per year build rate and to identify opportunities for optimizing productivity areas. Ideas demonstrating the most cost savings potential were fast tracked, where possible, to realize initial cost savings.

Overall, nearly 60 cost savings opportunities were identified between the VCS co-build shipyards. Implementation began in January 2011 using a phased approach, and initial savings of $1.04M/VCS hull were accomplished with no implementation costs. Once fully implemented, shipyards and vendors expect cost savings to increase by over $7.4M per hull and will support Block IV reduction of total ownership cost initiative. The total estimated cost savings is $8.5M per VCS hull.

Figure 1 - Identifying and implementing cost savings pays big dividends in the vendor supply chain.

The VIRGINIA Class submarine Minnesota (SSN 783) is “pressure hull complete,” signifying that all of the submarine’s hull sections have been joined to form a single, watertight unit. (Courtesy of Newport News Shipbuiliding – a Division of Huntington Ingalls Indurstries)

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NAVY MANTECH
Manufacturing Technology Program

CVN 78 Class / Carriers Projects

New Watertight Door is Lightweight and is Expected to Reduce 30 Year Maintenance Costs by Approximately $5M per Carrier

PERIOD OF PERFORMANCE:
June 2004 to September 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
iMAST

POINT OF CONTACT:
Mr. Timothy D. Bair
(814) 863-3880
tdb14@psu.edu

STAKEHOLDER:
PMS 378

TOTAL MANTECH INVESTMENT:
$3,918,000

S2031 — Advanced Surface Ship Watertight Enclosures

Objective

Navy standard watertight doors (NSWTDs), designed in the early 1950s, are expensive to maintain and are too heavy for today's needs. Watertight doors are usually at or near the top of the Navy's Top Management Attention (TMA) list for hull, mechanical, and electrical (HM&E) systems requiring frequent maintenance due to poor functioning, corrosion, and loss of water-tightness. The objective of the project was to specify a new interior watertight door featuring improvements over the NSWTD, while incorporating advances in materials, design, and manufacturing processes including, but not limited to: use of stainless steel, a novel laser-fabricated metal honeycomb core sandwich panel, a new hydraulically actuated seal system, a distortion-reducing plug-in-hole frame, and highly accurate, high-speed, automated laser cutting and welding processes. In 2007, an additional objective -- to reduce the cost of NSWTDs -- was added. To maximize insertion and retrofit opportunities, this project focused on the 26 inch x 66 inch, 10 lbs per square inch interior door, weighing 292 pounds, with eight dogs (latches) and a 6-inch diameter window.

This effort, to date, has been primarily Navy ManTech funded although additional funding was awarded in FY11 from Office of Naval Research's (ONR's) Technology Insertion Program for Savings (TIPS) and the Swampworks.

Payoff

The weight of the new door is 213 lbs, representing a 27% reduction when compared to the NSWTD. Reducing the weight of the doors allows increased alternate weight allocation opportunities for armor, ordinance, cargo, and other warfighting-related functions. Reduced maintenance costs due to low distortion plug-in-hole installation and the use of a more corrosion-resistant material (304 stainless steel) than the low carbon steel (A-36) used in the NSWTD, combined with reasonable manufacturing costs, result in a reduction of total ownership costs, thereby providing more resources for the warfighter. A reduction in maintenance cost of 80% is estimated resulting (for an aircraft carrier with approximately 460 watertight doors) in a savings over a 30 year lifetime of $5.52M per carrier.

Implementation

Certification testing, in accordance with ABS Naval Vessel Rules, is in progress and is led by the Naval Surface Warfare Center, Carderock Division – Ships Systems Engineering Station (NSWCCD-SSES). Certification tests include hydrostatic, cyclic, vibration, fire, and EMI tests. The new door has passed the hydrostatic test and the cyclic test. Vibration, shock, fire, and EMI tests remain to be scheduled.

Two doors were installed on the USS Porter, a destroyer, in September 2010 for one year at-sea evaluation. Sponsored by ONR's TIPS program, four additional doors have been installed for one-year at-sea evaluations (i.e. two on the USS Wasp (LHD-1) in October 2010 and two on the USS Monterey in November 2010). So far, feedback from the installations and at sea evaluations has been positive.

Optimized Welding for Thin Panels Expected to Result in Cost Reduction of $2.4M per Hull for Ford-class Carriers

S2198 — Control of Thin Panel Distortion

Objective

Lighter weight designs for sponsons, decks, bulkheads, and other structures for the Ford-class aircraft carrier require the ship to be constructed from more lightweight plates and panels in comparison to Nimitz-class structures. Fabricating a larger number of thinner panels will result in increased cutting and welding distortion, which in turn will increase manufacturing costs and reduce production throughput. This project is assessing the specific needs of the Huntington Ingalls Industries – Newport News Shipbuilding (NNS) panel and final assembly fabrication processes, and will apply new technologies and lessons learned from previous Navy ManTech work to reduce distortion for Ford-class thin structures to prevent increases in ship construction costs and schedules. This project focuses primarily on current technologies and practices available and used within NNS, while identifying potential future practices and technologies for consideration on hull CVN 79 and future ships.

Payoff

For Ford-class aircraft carriers, implementation of project recommendations will impact cost targets associated with production hours for dimensional control of all ship structures. For the Nimitz-class, this was conservatively estimated at 156,000 man-hours: 78,000 for flame straightening of final assembled units, and 78,000 for correcting distortion to make units fit together. For the Ford-class, these hours are estimated to increase by 30% to 202,800 hours, and NNS is expected to spend $12,168K correcting thin plate distortion. The project will target a 20% reduction in these man-hours for an estimated cost benefit of $2,434K. Potential benefits from this project will also be applicable to all naval ships constructed from stiffened plate panels, as well as the potential for fleet-wide cost reduction for these vessels.

Implementation

Project results support construction of the Ford-class aircraft carriers and the cost reduction goals of NNS. The implementation site for the developed technology is NNS. Results of the business case analysis will provide justification for NNS commitments to implement the results of the project. Implementation of project results is anticipated for the fabrication of CVN 79 hull components by the end of 2013, approximately one year after project completion.

PERIOD OF PERFORMANCE:
April 2008 to December 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Facilities and Industrial Processes

CENTER OF EXCELLENCE:
NJC

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PMS 378

TOTAL MANTECH INVESTMENT:
$1,885,000

Digital Radiography to Reduce Inspection Cycle Time in CVN 78 Class Construction

PERIOD OF PERFORMANCE:
November 2010 to August 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
CNST

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PMS 378

TOTAL MANTECH INVESTMENT:
$706,000

S2280 — Digital Radiography: Transition for Inspection of Welds and Castings

Objective

Through a previous ManTech project, Digital Radiography Alternative to Film Radiography and its follow-on implementation efforts, the Huntington Ingalls Industries - Newport News Shipbuilding (NNS) team outlined a need for continued development of American Society for Testing and Materials (ASTM) commercial computed radiography standards for inspection of welds and castings, as well as ASTM digital reference acceptance standards for ferrous and non-ferrous castings. This project developed the required standards and validated the use of non-destructive testing inspection capabilities, using isotopes and high energy applications in conjunction with Digital Radiography. The primary goal was to provide a reliable, viable, and less costly replacement for film-based radiography that will resolve technical and implementation issues, reduce environmental impacts, and reduce inspection costs. The primary objective of this project was to develop a fully implemented digital computed radiographic imaging system (CR) that utilizes reusable phosphorescent plates that require no chemical development and offer more convenient storage of electronic images in addition to reduced inspection cycle time. The target for first-time use at NNS is production of the CVN 78 Class aircraft carrier.

Payoff

Reduction in radiographic inspection cycle times associated with film development, handling, and storage operations is a major driving force for the adoption of this technology. For approximately 70% of NNS radiographic operations, the potential exists for significant improvement in inspection cycle time. This improvement is associated with the anticipated elimination of film development and manual transport of conventional radiographic materials, as well as related manual storage and retrieval of film / records. In addition to the savings achieved by the radiographic inspection department, there will be improved cycle time getting the film read and the results back to operations more rapidly than with traditional film. The estimated cost savings of this project is $1M - $1.5M per hull.

Implementation

This project was executed in two phases. Phase 1, completed in August 2011, focused on eliminating or greatly reducing gray scale streaking artifacts while evaluating new technologies and acquiring Navy satisfaction with technical inspection processes and authorization of CR standards. During Phase 2, the project team completed the evaluation of all weld locations, detecting all discontinuities by both film and digital methods. A report of the findings is in progress. NAVSEA has removed the two-year trial implementation restriction of digital radiography evaluation of welder qualifications performed at the NNS Weld School. The project team is developing standards for use of digital radiography for evaluation of production welds and castings with the goal of implementing digital radiography in production on nuclear and non-nuclear systems. Implementation is targeted to occur during FY13 at NNS on CVN 78 Class carrier construction pending NAVSEA authorization.

Remote Welding Preheat Control System to Reduce Shipbuilding Costs

S2291 — Remote Welding Preheat Control System

Objective

Preheating of welding assemblies is a common practice in shipbuilding. A minimum preheat temperature must be achieved to satisfy welding needs, but the upper limit may be bound by the temperature sensitivity of non-metallic materials that are packaged inside the welding assembly in certain applications. Currently, an operator manually controls the temperatures through the use of percentage timers or by plugging / unplugging the power cord, and monitors the temperature by using "temp sticks" at each weld station to determine base metal temperature. With the current system, the assembly is susceptible to overheating, causing damage to the non-metallic material. Rework associated with cleaning and re-applying non-metallic material and addressing damaged weld assemblies causes significant additional cost and schedule delays. The objective of this project was to reduce labor costs associated with the control and monitoring of weld preheat temperatures and to reduce the risk of overheating non-metallic materials within a weld assembly. The Navy Metalworking Center (NMC) developed a prototype remote welding preheat control system to control the preheating process.

Payoff

Implementation of a remote welding preheat control system could reduce the cost to monitor and adjust preheat and interpass temperatures by an estimated $820K per hull. Also, the risk of damaging weld assemblies and the resulting cost and schedule impacts could be reduced.

Implementation

The developed system did not meet all of the project requirements. Since more precise control would be required to permit implementation and the cost of the system would approach that of competing systems, NMC recommended expanding the use of an induction heating system. While implementation will not occur at Huntington Ingalls Industries - Newport News Shipbuilding, General Dynamics Electric Boat is interested in a slightly different application. NMC is investigating this alternative application.

PERIOD OF PERFORMANCE:
November 2009 to February 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
NMC

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PMS 378

TOTAL MANTECH INVESTMENT:
$953,000

Alternative Brazing at NNS to Result in Savings of $2.6M

PERIOD OF PERFORMANCE:
August 2009 to January 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 378

TOTAL MANTECH INVESTMENT:
$1,097,000

S2298 — Alternative Brazing for Shipboard Use

Objective

Like most shipyards, Huntington Ingalls Industries - Newport News Shipbuilding (HHI-NNS) uses a hand-held torch to manually flame braze fittings shipboard. This method is labor- intensive due to the time required to reach the melting temperature of the filler material. Additionally, the process causes occasional paint damage as it is difficult to control the flame and negotiate the minimal clearances that may exist surrounding the fitting. The limited clearance also makes it difficult to manipulate the torch to achieve a uniform bond, which causes occasional pipe leaks. Paint damage and pipe leaks result in rework that further adds cost. The goal of this Navy Metalworking Center (NMC) project was to develop alternative flame brazing technology to be used on the majority of CVN 68 and CVN 78 Class aircraft carriers and VIRGINIA Class (SSN 774) submarine (VCS) construction fittings to address these problems. The new flame brazing technology uses a programmable logic controller, mass flow controllers, and a specially designed burner to surround the fitting.

Payoff

Using alternative flame brazing technology in this application will reduce the time required to braze each joint, as well as the amount of rework related to manual torch brazing. In addition, the alternative flame brazing technology will reduce training time and the need for highly skilled operators due to user-friendly operation. This will translate into significant labor and production cost savings. Implementing this alternative brazing technology at NNS will result in an estimated cost savings of $2.6M in the construction of three CVN and nine VCS hulls, and in the overhaul of seven CVN hulls. In addition, the proposed solution may benefit other platforms requiring flame brazing.

Implementation

NNS used the prototype flame brazing system developed during the NMC project to generate brazing procedures and qualification samples. NNS tested the qualification samples and provided the procedures and results to its Supervisor of Shipbuilding (SOS) for acceptance. SOS approved the alternative brazing procedure qualification in January 2012. The transfer of the prototype system to the PMS 378 Program Office signified that the alternative flame brazing technology is capable for use in CVN and VCS construction and can be implemented at NNS. In June 2012, NNS used the prototype brazing system to successfully braze production pipe joints in the construction of CVN 78. NNS also plans to purchase approximately 10 additional brazing systems from one of three companies interested in commercializing the technology.

Evaluation of Thermite Welding Supports Use in CVN 78 and Possibly Fleet-Wide Applications

S2330 — Exothermic Welding for CVN

Objective

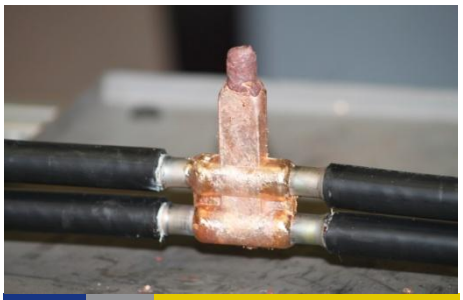
The Future Aircraft Carrier Program Office supports the use of thermite (exothermic) welding for performing multi-cable, copper conductor splices for Navy shipboard power applications as a means of reducing total ownership cost. Thermite welding requires no external source of heat or current and is expected to reduce the total number of man-hours required for installation, as well as man-hours required for preventive and corrective maintenance. However, the process was not approved for Navy shipboard applications. The effects of shipboard environmental conditions on weld quality were not fully understood, and Navy and shipbuilder experience with the process was very limited. The objective of this Navy Metalworking Center (NMC) project was to thoroughly evaluate the proposed exothermic welding and insulation processes for splicing the Electromagnetic Aircraft Launch System (EMALS) shipboard power cables and other applications on CVN 78 Class carriers. A shipboard installation and repair procedure was also developed and approved for use.

Payoff

Although life-cycle cost benefits associated with a more efficient multi-cable connection method are expected, there is no comparison data available to understand any cost impacts at the acquisition level. Qualitative benefits include reduced risk to quality and schedule; reduction in man-hours expected for installation as well as preventive and corrective maintenance of the EMALS cable system; increased system reliability and availability; and the creation of enhanced, repeatable, cost-effective installation and repair procedures. This project will potentially lead to a Fleet-wide process for splicing power cables, which is especially applicable to high-current applications, such as electric propulsion and pulse-energy systems.

Implementation

The CADWELD® Exolon exothermic welding process has been shown to be very robust; overall performance and quality of these splices are not affected by the environmental conditions at the time of fabrication of the splice. In addition, insulation of these splices using the recommended 3M insulation products is not affected by the environmental conditions at the time the insulation is applied. The project test program has verified that the electrical and mechanical properties of splices made using the developed installation procedure meet the test plan requirements for splicing EMALS power cables aboard CVN 78 Class carriers. Huntington Ingalls Industries - Newport News Shipbuilding (NNS) will implement the NAVSEA-approved procedure to complete installation of the EMALS on CVN 78 Class carriers in the third quarter of fiscal year 2013.



PERIOD OF PERFORMANCE:
March 2010 to February 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
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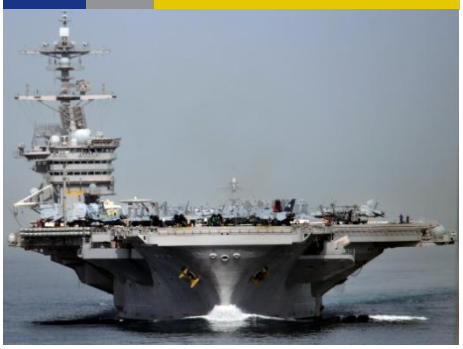
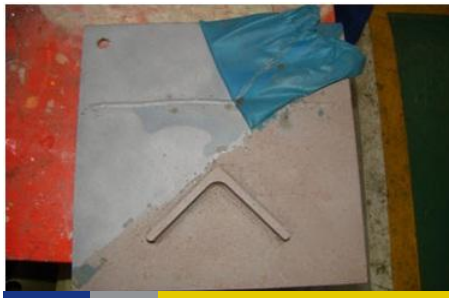
TOTAL MANTECH INVESTMENT:
$1,575,000



Temporary Protective Coatings Could Reduce Costs During Ship Construction



PERIOD OF PERFORMANCE:
March 2010 to March 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Coatings

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 378

TOTAL MANTECH INVESTMENT:
$1,110,000

S2331 — Temporary Protective Coatings

Objective

Both Huntington Ingalls Industries - Newport News Shipbuilding (NNS) and Huntington Ingalls Industries - Ingalls Shipbuilding (Ingalls) have similar needs for temporary coatings to protect certain CVN and DDG 51 components during construction. This Navy Metalworking Center (NMC) project identified and developed several temporary protective coatings that would prevent or reduce damage and corrosion that occurs during the shipbuilding process, significantly reducing the labor currently needed to remove the corrosion or repair damage. In addition, the project team investigated temporary coatings / materials that could be easily applied and removed. Commercially available materials used in other industries were considered for use or adaptation to meet established technical and cost-reduction goals.

Payoff

Implementing a temporary coating to protect an estimated 300,000 linear feet of exposed weld joint area on CVN 79 modules at NNS has the potential to save $1.04M to $1.54M per hull. This estimate includes a 50-70 percent reduction in labor and material costs for the temporary coating and was the original justification for this project. Subsequent updates to the baseline cost estimate by NNS resulted in a significantly lower baseline cost, and thus a significantly lower cost avoidance for the project.

Implementing a temporary coating to protect non-skid during the construction of DDG 51 at Ingalls has the potential to save $150K per hull. This estimate is based on approximately $200K spent on non-skid repair due to damage and staining on previous hulls. This savings is also expected to impact DDG 113 and DDG 114, as well as possible future hulls. Results of this effort may also apply to LPD, LHA, CVN, and other vessels.

These benefits are preliminary and are expected to improve with procurement of additional DDG 51 hulls and implementation on other vessels not currently included in the benefits calculations.

Implementation

Due to significant reductions in the cost benefits for the CVN 79 edge protection application; this project was terminated early, prior to completing tasking. No implementation is scheduled to occur at NNS; however, General Dynamics Electric Boat has recently identified a similar need for temporary surface protection in the production of submarine hull modules and is interested in further developing the solutions developed in this project.

Lower Unit Cost Through Improved Manufacturing of SEWIP System

S2340 — Low-Cost Antenna Assembly for the Surface Electronic Warfare Improvement Program (SEWIP) Block 2 Electronic Warfare System

PERIOD OF PERFORMANCE:
October 2010 to April 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Electronic Processing and Fabrication

CENTER OF EXCELLENCE:
EMPF

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STAKEHOLDER:
PMS 378

TOTAL MANTECH INVESTMENT:
$2,516,000

Objective

The intent of the Surface Electronic Warfare Improvement Program (SEWIP) Block 2 project was to upgrade the Navy's AN/SLQ-32 (V) electronic support measures system, which includes the system's receiver, antenna, and combat system interface. The Lockheed Martin (LM) team was selected by the Navy to provide the Integrated Common Electronics Warfare System (ICEWS) for SEWIP Block 2. This was a single enterprise solution designed to scale across all ship classes in the Navy's surface fleet. At-sea demonstrations of ICEWS in June 2009 were successful. The ICEWS maximized the reuse of SEWIP Block 1 elements and leveraged the LM Team's investment of $15M for a SEWIP Engineering Development Model (EDM) which was demonstrated at sea to achieve the lowest risk solution for Block 2. The ICEWS upgraded the receiver and antenna capabilities, as well as the combat system interface, of the legacy surface EW system. LM's scalable enterprise approach to ICEWS was based on the company's Rapid Commercial Off-The-Shelf (COTS) Insertion program, which has been used successfully on EW and sonar system upgrades on all classes of Navy submarines.

The objective of this project was to achieve a lower unit cost through improved manufacturing and ruggedization of the COTS SEWIP system elements, thus allowing the proposed elements to also meet the objectives of all SEWIP platforms including small ship Electronic Warfare (EW) systems, while improving producibility and lowering the unit cost for the standard SEWIP Block 2 System. This effort targeted the CVN 78 Class carrier program; however, classes such as DDG 51 and DDG 1000 would also benefit from implementation.

Payoff

The project addressed the desired cost targets and improved COTS hardware that did not meet system producibility. The project was developed to focus on the following: (1) improved manufacturability of the COTS Fiber Optic Transmitter, (2) improved manufacturability of the PDF Switch Matrix (RF Module), and (3) improved manufacturability of the RF Tuner. Implementation of the SEWIP ManTech developments has resulted in cost savings of $1M per ship hull.

Implementation

LM has completed insertion of this project's low-cost module into the SEWIP Block 2 EDM for CVN 78. The LM Mission Systems & Sensors (MS2) team has integrated these elements as part of the two planned EDM's for SEWIP Block 2, providing a low risk transition approach. In addition to the $1M cost savings per ship, cost avoidance is expected to be achieved within the first four platforms. There is a total plan of 150 platforms, not including Littoral Combat Ship (LCS), that will benefit from this ManTech effort via the SEWIP Block 2 Effort.

Enhanced Electrode will Improve Survivability of Navy Combatant Ships at Reduced Cost

PERIOD OF PERFORMANCE:
December 2010 to February 2013

PLATFORM:
CVN 79 Class / Carriers

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 379

TOTAL MANTECH INVESTMENT:
$1,046,000

S2372 — FCAW Electrodes with Improved Toughness

Objective

MIL-101TM flux-cored arc welding (FCAW) electrodes have exhibited inconsistent lot-to-lot notch toughness test values in production test welds, which have resulted in several instances of failure to pass the explosion test. Also, recent evaluations have found that the fracture toughness of MIL-101TM welds was lower than in welds made by other welding processes. Thus, there is a need for an improved MIL-101TM FCAW electrode with improved and more consistent notch toughness that does not reduce quality or operability. The Navy Metalworking Center and Naval Surface Warfare Center, Carderock Division are evaluating and optimizing candidate electrodes from leading electrode producers to support the qualification of these electrodes for CVN 79 structural welds and other critical applications.

Payoff

The major benefit of this project will be improved survivability of Navy combatant ships. An additional benefit is a cost avoidance of up to $1.9M if the improved FCAW electrode is approved for welding designated critical applications on CVN 79. The project team is also targeting a 50 percent reduction in electrode procurement costs due to the introduction of at least one additional qualified electrode source. This would reduce electrode procurement costs by $735K per CVN 78 Class aircraft carrier.

Implementation

Once the improved FCAW electrode is approved by Naval Sea Systems Command (NAVSEA) to be added to the Qualified Producers List (QPL) and the electrode is available commercially, implementation will occur when Huntington Ingalls Industries - Newport News Shipbuilding begins to use the electrode in the construction of CVN 79 in the first quarter of 2014.

Electro Magnetic Pulse Protection Methods to Result in Potential $989K Savings per CVN 78 Class Carrier Hull

B2384 — Electro Magnetic Pulse (EMP) Protection Methods for CVN Cables

Objective

CVN 78 is the first carrier to have all the requirements of MIL-STD-1310 invoked for Electro Magnetic Pulse (EMP) protections for electrical cables / cable penetrations during construction. More than 4500 cable systems need EMP protection on the CVN 78 class ship. A similar condition exists for the DDG 51 as well as other navy platforms. The current method of laying cables to meet Navy MIL-STD-1310 is guess work and requires a large amount of rework that causes major schedule delays. Along with this new requirement the referenced document, which governs the manufacture of conduit, was changed from a MIL-C document to a MIL-PRF. This has caused multiple similar products to be available on the market.

The objective of this project is to reduce material and labor costs associated with rework to lay electrical cables that meet EMP protection on CVN7, as well as provide a guidance document for use on other types of Navy ships. This will be accomplished by comparing all available ways to provide EMP protection using currently available products in the market and document best practices to install cable protection.

Payoff

Benefits from implementation of the results of this project are estimated to be $989K per CVN hull (starting with CVN 78) as a result of reduced labor and material from rework to provide EMP protection for electrical cables. After completion of the project and implementation on CVN 78, the project team will present the project results to other platforms and determine if additional cost savings can be realized. Anticipated benefits to the DDG 51, LPD, and LHS platforms are estimated at $270K per hull.

Implementation

Upon successful and timely completion of the project and the successful acceptance of the technology by PMS 378 and Huntington Ingalls Industries - Newport News Shipbuilding (NNS), the qualified technologies will be implemented at NNS beginning with CVN 78. Initial implementation began in May 2012. The results of this effort will also be made available to PMS 500 and Huntington Ingalls Industries – Ingalls Shipbuilding for use on the DDG 51 Class destroyer, LPD, and LHS platforms.

PERIOD OF PERFORMANCE:
February 2012 to December 2012

PLATFORM:
CVN 78 Class / Carriers

AFFORDABILITY FOCUS AREA:
Business Processes

CENTER OF EXCELLENCE:
B2PCOE

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PMS 378

TOTAL MANTECH INVESTMENT:
$460,000

Applying Design for Manufacturing Principles to Improve Quality and Schedule on CVN 79 Weapons and Stores Elevator Doors

PERIOD OF PERFORMANCE:
January 2012 to April 2014

PLATFORM:
CVN 79 Class / Carriers

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 379

TOTAL MANTECH INVESTMENT:
$1,920,000

S2469 — Weapons and Stores Elevator Doors Manufacturing Cost Reduction

Objective

Manufacturing issues such as weld distortion can have a serious impact on production schedule and cost in aircraft carrier ship construction. Relatively thin steel plates are being used to produce the CVN 78 Class weapons elevator doors and, after welding and pressing operations, the doors have not consistently met the required flatness and straightness tolerances. For CVN 79, this is being mitigated by beginning the doors earlier in the program, but the unpredictability of the weld distortion does not guarantee that the doors for CVN 79 will meet the budget and schedule targets. This project leverages work completed on the Navy Joining Center's Control of Thin Panel Distortion Project (S2198) and improvements initially identified on a Navy Metalworking Center (NMC) Rapid Response project (R2448). The Rapid Response project addressed fabrication issues and schedule impacts, and assessed improvements in three categories: (1) current manufacturing processes; (2) Design for Manufacturing and Assembly (DFMA) design for manufacturing and assembly recommendations; and (3) alternative solutions such as mechanized welding or lower heat input welding processes. The Rapid Response project focused on making improvements to CVN 78 door manufacturing, as well as supporting CVN 79 and beyond.

This project addresses weld distortion and fit-up issues associated with the new lighter-weight design of the CVN weapons and stores elevator doors. In addition to developing and assessing manufacturing improvements, the project is also facilitating design for manufacturing and engineering changes that would further enhance producibility. The Integrated Project Team (IPT) will develop improved door configurations, conduct limited subscale trials and fabricate a full-scale prototype. The project is employing a prioritized approach that focuses on incremental improvements as well as an improved balanced weld configuration. The IPT will evaluate and develop several innovative manufacturing improvements, such as advanced fixturing, and will improve welding sequencing to control distortion. Improved door configurations will be developed, limited subscale trials will be conducted, and a full-scale prototype will be fabricated. IPT members include Huntington Ingalls Industries - Newport News Shipbuilding (NNS),); NMC, PEO Aircraft Carriers, ; NAVSEA 05, ; Naval Surface Warfare Center, Carderock Division; and Edison Welding Institute (EWI); and NMC.

Payoff

The projected benefits include improvements in cost, schedule, and quality. Over five years, the estimated cost savings of improving the producibility and first-time quality of the weapons and stores elevator doors is $5.5M.

Implementation

Improvements such as removal of the back sheet, use of purchased pre-fabricated stiffeners, vertical down-welding into the door cross section, and improvements in camber compensation have been incorporated into the CVN 79 baseline design and are being validated and demonstrated for use in this project. NNS will implement additional project results on CVN 79 as doors are fabricated, beginning in 2013. NNS has qualified vertical down-welding with reduced distortion for use on CVN 79 and is fabricating a preliminary prototype door with these improvements as well as an additional machined bar and improved welding process to reduce distortion for the gasket door frame areas. Full implementation is expected to begin in April 2014 at NNS.

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NAVY MANTECH
Manufacturing Technology Program

DDG Family Projects

Rapid-Cure Deck Coating Expected to Reduce Schedule Delays

PERIOD OF PERFORMANCE:
July 2009 to January 2013

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Coatings

CENTER OF EXCELLENCE:
iMAST

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STAKEHOLDER:
PMS 500

TOTAL MANTECH INVESTMENT:
$255,000

S2297 — Rapid-Cure Deck Coating

Objective

With current long-cure multi-coat systems, access to passageways and compartments may be compromised for 7-10 days. Current interior deck coatings last 2-4 years and interior deck coating durability has been identified as an Engineering for Reduced Maintenance (ERM) opportunity by the Navy. Rapid-cure interior deck coatings are being investigated and the objective of this project is to identify or develop one or more rapid-cure interior deck coatings capable of meeting the requirements of Mil-PRF-24613A (SH). Additionally, interior deck coating formulations capable of lasting 4-8 years without replacement shall be investigated. The development of a rapid-cure interior deck coating will enable foot traffic within 4-8 hours of coating application. This will reduce manpower during new build and repair operations, plus it will reduce schedule risk associated with conventional long-cure-time interior deck coatings.

Payoff

Huntington-Ingalls Industries (HII) in Pascagoula MS (AKA: HII-Ingalls) calculated an approximate acquisition cost avoidance of $200K per hull for DDG 1000. Similar cost savings are expected on similar size ships. Similar cost savings are also anticipated for repair and refurbishment. Extending deck coating durability by 2-4 years should net an additional approximately $800K per hull every 2-4 years, resulting in substantial reduction in life-cycle costs.

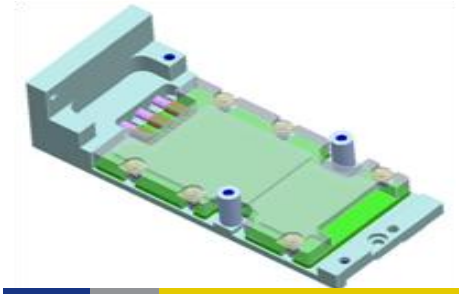
Implementation

HII-Ingalls is planning for a trial installation / demonstration before 31 December 2012. Results of the Rapid-Cure Interior Deck Coating project will be implemented on the DDG 1000 or DDG 51 programs after demonstration of technology success and acceptance of the technology by the acquisition Program Office, the management representative of the industrial facility and the relevant Navy technical codes. Following a successful demonstration at HII-Ingalls, the coating will go through the NAVSEA coating qualification and approval process. Qualification of Navy coatings requires extensive laboratory testing as well as a performance-in-service evaluation. Full implementation of this material, as a long duration deck covering will require a performance-in-service evaluation of not less than 5 years.

The likelihood of this coating meeting the performance requirements of Mil-PRF-24613A (SH) is very good, as a non-skid coating based upon similar resin system was successfully qualified to Mil-PRF-24667, the Navy non-skid specification. The extent to which this coating will be utilized, will depend upon the extent to which newer “light-weight” deck coverings are specified. In FY 2012, light-weight deck coverings were approved for shipboard use. Lightweight coatings are not expected to possess extreme durability. Consequently, there is still an expectation that the Rapid Cure Interior Deck Coating will be used for engineering or heavy-traffic spaces, where durability is more important than weight savings. Implementation results will be provided second quarter FY13.

Cost Reduction Efforts for Future Radar Systems

S2317 — Next Generation VSR Solid State LRU



Objective

This ManTech project was aimed at lowering the system cost of the Advanced Missile Defense Radar (AMDR) for the DDG 51 antenna by incorporating lower cost packaging technology and manufacturing approaches to reduce the Transmit / Receive (T/R) module cost by greater than 35%.

Payoff

The goal of this project was to reduce the T/R module cost by >35%. This was accomplished by reducing material and manufacturing labor costs during assembly and test. Material costs were saved by switching from chip and wire in ceramic packages (that require special assembly lines) to plastic Quad Flat No-Lead (QFN) packages that are assembled on a standard printed wiring board production line. Manufacturing labor costs during assembly and test were reduced by using known good QFN packages that are surface mounted to PWBs using automated surface mount assembly equipment. Use of pre-tested QFN packages and automated visual inspection stations also reduced module re-work and resulted in a higher module yield.

Implementation

This ManTech project funded the development of the low-power module and the manufacturing processes to enable the cost reductions. This manufacturing technology project also performed the module specification performance verification testing, QFN, and module environmental verification. A subsequent Lockheed Martin (LM) project (IRAD) will perform validation at the next higher assembly level, the line replacement unit (LRU). Upon approval, low-cost QFN packaging and printed wiring board (PWB) materials and processes can be used for T/R module production.

Under the AMDR Technology Development and AMDR Engineering Manufacturing Development contracts (not yet awarded), LM will design, test, and qualify (at the system level) the low-cost QFN packages and Circuit Card Assemblies (CCAs) for use on the DDG 51. PEO IWS 2.0 will also fund the module Engineering Change Proposal (ECP) to transition the ManTech module technology into production for the DDG 51.

PERIOD OF PERFORMANCE:

July 2009 to May 2012

PLATFORM:

DDG Family

AFFORDABILITY FOCUS AREA:

Electronic Processing and Fabrication

CENTER OF EXCELLENCE:

EMPF

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STAKEHOLDER:

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PEO IWS

TOTAL MANTECH INVESTMENT:

$2,454,000

Atomic Layer Deposition Coating Processes to Result in Significant Cost Savings for Navy Systems

PERIOD OF PERFORMANCE:
March 2010 to May 2013

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Coatings

CENTER OF EXCELLENCE:
EMPF

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STAKEHOLDER:
PMS 500
PEO IWS
G/ATOR Program Office

TOTAL MANTECH INVESTMENT:
$3,016,000

S2333 — Atomic Layer Deposition Coating Processes

Objective

The Navy plans to use advanced and integrated electronics in future radar platforms as the means to achieve transformational capability. These plans will include the development of less expensive, more easily applied, more reliable, and more moisture proof conformal coatings for radar electronics. Of particular interest is the Atomic Layer Deposition (ALD) ceramic-based coating that has the potential of providing hermeticity to these electronics. Significant savings are expected from avoidance of the heavy, bulky, hermetic ceramic packaging currently used for this application, by coating the Monolithic Microwave Integrated Circuit (MMIC) chips before packaging or by coating the completed electronic assembly using these ALD-based coatings.

The objective of this project is to evaluate cost reduction opportunities in current radar systems. By using ALD conformal coating at either the chip or completed module level (instead of the currently used hermetic ceramic packaging), an immediate reduction in the cost of all electronic hardware having conformal coatings on Navy weapons systems, ships, aircraft, and communications systems can be realized.

Payoff

This project will result in cost reductions for two systems: the Air and Missile Defense Radar (AMDR) for DDG 51 and the Marine Corps Ground / Air Task Oriented Radar (G/ATOR). The AMDR T/R modules currently use costly ceramic packages with hermetic seals. The goal is to reduce the labor and material costs of achieving plastic-based, but equivalent hermetic radar packaging. Combining ALD coatings with the plastic packaging technology being developed under Navy ManTech project S2317 (Next Generation VSR Solid State LRU) is expected to lead to a 40% cost savings for T/R modules.

The G/ATOR T/R module is currently designed for a hermetic ceramic package, whose cost has impacted affordability. An ALD coating will provide an environmental barrier to enable the use of non-hermetic packaging for significant module cost reduction. Implementing High Temperature Co-fired Ceramic (HTCC) packaging of GaN MMICs having an ALD coating in the G/ATOR T/R module is expected to allow a cost savings of $77K for each G/ATOR system.

Implementation

The ALD Conformal Coatings effort will help develop the ALD processes and qualification methods for use in low-cost plastic packaging and substrate technology for operation in a military environment. At project end, the ALD-coated T/R module performance will have been validated through testing. Follow-on efforts will then incorporate these reduced cost T/R modules into the AMDR system for test and qualification on the DDG 51.

For the G/ATOR system, the project will demonstrate that lower-cost packaging can eliminate hermetic enclosures and their testing, yet still assure component hermeticity and stable performance through the application of ALD conformal coatings on HTCC microelectronics assemblies. A follow-on Transition Program to integrate these processes into the G/ATOR system, which will provide a T/R Module ready for Low Rate Initial Production (LRIP), is currently slated to start in early 2013.

Mechanized Plate Edge Preparation Tool to Save on Shipbuilding Construction Costs

S2373 — Plate Edge Preparation Improvements

Objective

During ship fabrication, rust and primer must be removed from the weld joint areas of steel plates prior to welding. Currently, edge preparation is done manually using a pneumatic stone grinder or sander. This is a slow, labor-intensive process causing numerous vibratory and carpal tunnel injuries. The typical production rate in shipyards is approximately 10–12 feet per hour. There are several thousand plates on a typical naval surface combatant ship, with several edges per plate requiring preparation. A slight improvement in production could provide a substantial labor savings. In order to improve the plate edge preparation process, a prototype tool will be developed to increase the production rate and reduce injury claims. This will be accomplished by developing appropriate surface preparation and manipulation equipment, integrating the two technologies into a prototype system, utilizing the prototype for production of Navy surface combatants.

Payoff

The Navy Metalworking Center project team estimates a 300 percent increase in production rate is possible with the potential of saving as much as $7M on the cost of a typical surface combatant. The extent of savings will ultimately be determined by when the mechanized plate edge preparation system is introduced into the production cycle. Using a scenario involving three ships in various stages of completion, the project team estimates that savings approaching $14M may be possible across several hulls. Furthermore, the technology has the potential to reduce shipyard injury claims by 50 percent across a multi-ship construction effort. This technology can readily be implemented on virtually any ship type, not limited to surface combatants. Savings will be proportional to the amount of edge preparation required.

Implementation

Prototype operation will be demonstrated at Bath Iron Works (BIW) and Huntington Ingalls Industries - Ingalls Shipbuilding. Partial implementation of a modified alpha prototype will begin in fourth quarter FY12. Full implementation of technology using commercially produced units is targeted for second quarter FY13.

PERIOD OF PERFORMANCE:
December 2010 to January 2013

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Automated Tools

CENTER OF EXCELLENCE:
NMC

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PMS 500

TOTAL MANTECH INVESTMENT:
$1,567,000

Reducing Plate Distortion in DDG 51 Panel Production to Save $5M Over Five Years

PERIOD OF PERFORMANCE:
September 2011 to April 2013

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Facilities and Industrial Processes

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 500

TOTAL MANTECH INVESTMENT:
$1,315,000

S2400 — Thin Plate Distortion Mitigation

Objective

Thin steel plates (plates less than 3/8-inch thick) used for DDG 51 Class ship panel production are subject to excessive distortion during plasma cutting. This distortion results in significant rework costs associated with the required flattening and excessive weld joint gaps caused by distortion-related shapes during ship fabrication. To address these issues, NMC is evaluating the current production processes at the supplying steel mills. After evaluation, NMC will develop recommended plate procurement specifications to assist the supplying steel mills in reducing plate residual stress. To address thermal-cutting distortion, NMC is investigating the shipyard's plasma cutting equipment and practices and is establishing a set of guidelines for plate nesting, cutting, sequencing and equipment to improve the process.

Payoff

Reducing thin plate distortion will improve part accuracy and will diminish weld gaps, heat input, and heat straightening. Huntington Ingalls Industries –Ingalls Shipbuilding estimates that labor savings resulting from this project's recommendations will be more than $5M over the next five years.

Implementation

Pending successful development and acceptance of plate procurement specifications and cutting guidelines, Ingalls expects to implement these results for the procurement and cutting of all thin steel plates. Initial implementation is scheduled to begin in the first quarter of 2014 for construction of DDG 114.

Stud Fixturing Improvements Can Lead to Cost Savings

S2403 — Improved Stud Fixturing Processes

Objective

The Navy shipbuilding industry is required to attach tremendous quantities of equipment with a great variety of configurations, sizes, and weights in the process of ship construction. Traditional practice has been to mount equipment through the use of welded structural foundations that are then drilled for bolting of the equipment. Extensive engineering resources are expended to design these foundations. Significant costs are associated with construction, installation, and equipment mounting of these foundations. In many cases, installation of equipment in this fashion consumes a lot of space and weight.

This project's objective is to prove the feasibility of transitioning from attaching a broader range of shipboard equipment / hardware via bolted mounting to welded stud mounting. Consideration will be given to current limitations of stud sizes, shipboard configuration requirements, and all applicable Navy specifications / requirements during the course of the project. Currently, foundation and bolting methods have known or design limitations for strength and weight performance. These are generally governed by the bolt size, the ship structure thickness, and the quantity of bolts. The proposed work revolves around adapting the stud welding process to achieve different levels of weight holding / securing performance using several different types of stud designs. The stud welding process will be developed to minimize stud size and maximize mechanical performance relative to identified mounting applications.

The project will be executed in two phases. The first phase is the development of technical requirements for expanded applications for stud mounting. The second phase will execute NAVSEA-approved shock testing and develop the implementation requirements for expanded applications specifically for DDG 51.

Payoff

Savings will result from specific reductions in weight, work in process, component outfitting, material expenditures, and more effective resource utilization. While the project focuses specifically on improvements benefiting the DDG 51 Class ships, the same benefits described here can accrue to all naval ships, which would experience similar cost savings depending on the size of the ship and amount of equipment to be installed. For the DDG 51 program, projected savings are estimated at $2.46M per hull.

Implementation

Huntington Ingalls Industries (HII) management has expressed their commitment to implementation of these processes (pending satisfactory process metrics and exit criteria). Implementation is expected to utilize a phased approach, where the most beneficial opportunities will be assigned higher priority and implemented first. Results of this ManTech project may be implemented in production of DDG 51 ships as early as DDG 113; however, the schedule for implementation activities is dependent on project results.

PERIOD OF PERFORMANCE:
May 2012 to May 2014

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Outfitting

CENTER OF EXCELLENCE:
CNST

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STAKEHOLDER:
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TOTAL MANTECH INVESTMENT:
$2,259,000

Design Rules for IOU Flexible Circuits to Increase Yield, Reduce Manufacturing Costs, and Increase Performance

PERIOD OF PERFORMANCE:
June 2012 to December 2013

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Electronic Processing and Fabrication

CENTER OF EXCELLENCE:
EMPF

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STAKEHOLDER:
PMS 500

TOTAL MANTECH INVESTMENT:
$1,030,000

S2408 — Gigabit Ethernet Data Multiplex System

Objective

For over 20 years, the most expensive component in the production of the CV-4414/USQ-82(V), the input/output unit (IOU) used in the DDG 51 program, has been the flexible circuit assemblies. The cost of these assemblies comprises over 30% of the total cost of the unit. With the recent addition of gigabit Ethernet interface capability to the IOU, there has been a dire need for updating the flexible cable assemblies to support the higher signaling rates. The design of the modules that provide the Ethernet interface includes the capability to operate at a 1,000 Mbit/sec data rate. The existing flexible circuits, however, introduce an impedance discontinuity in the Ethernet interface that limits the performance to a 100 Mbit/sec data rate.

The continual upgrade of the Navy's equipment to Internet Protocol (IP) based interfaces is driving the need for the higher data rate interfaces to the GEDMS IOU equipment. Hence, there is an urgent need to develop a cost effective and producible IOU flex cable solution that meets the performance requirements. The objective is to develop high yielding design rules for flexible circuits that will accommodate the presently used 42-pin M28840 connector that provides an interface to the external user systems. The approach will utilize reproducible and transportable processes, as well as reducing the amount of touch labor in the manufacturing process.

Payoff

The introduction of these IOU flex cable solutions will improve performance by providing higher data rates, lower acquisition costs, and lower total ownership costs by reducing touch labor in the manufacturing process. A savings of $150K will be realized per hull and a total savings of $7.35M when the modernizations of all the current DDG Flight I platforms using DMS and the expected modernizations of the Flight II hulls are completed.

Implementation

The strategy for implementing the new flexible circuit design into the DDG program begins with the design team currently responsible for the maintenance of the AN/USQ-82(V) technical data package, thus minimizing the familiarization time for the team. Upon successful testing of the redesigned flex cable assemblies, the IOU technical data package will be updated to include the design created as a result of the ManTech project. The cost reductions will be realized beginning with the FY14 DDG Modernization ships (DDG 54 and DDG 68 AF) and new construction DDGs (DDG 114 AF).

This ManTech project will leverage Boeing's investment in manufacturing enhancement work to assemble and package prototypes for performance validation and inclusion in the government's production design package.

The transition point for the ManTech project will follow successful completion of the prototype flex circuits test, review, and approval of the test results by the GEDMS Program Manager, and completion of the incorporation of the design changes into the design production package.

Fiber Optic Installation Improvements Decrease Costs Through Optimization of Routing and Sequencing

S2437 — Fiber Optic Installation on Ships

Objective

The objective of this project is to reduce the costs associated with access during installation, diagnosis, and rework of installed fiber optic harnesses in the Huntington Ingalls Industries shipyards. The project will develop shipyard-specific designs and installation processes that maximize first-time acceptance of fiber optic data networks. To optimize the manufacturing process of shipboard fiber optic network lines, the complete process, from the initial system design to final installation / test, will be evaluated. Processes including cable routing, installation sequence, and test sequence will be evaluated for schedule and performance improvements. Commercially available equipment and hardware will be included in the evaluation. The overall project outcome will be improved installation processes designed for efficiency and performance.

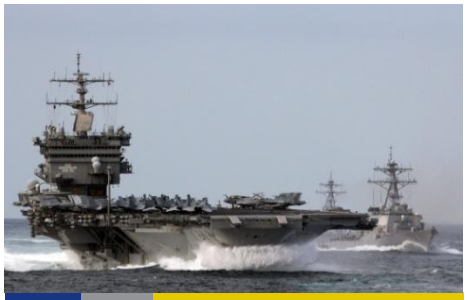
Payoff

Improvements to installation methods will increase first-time quality and, reduce cost and schedule impacts associated with rework. New and improved installation methods will enable Ingalls Shipbuilding and Newport News Shipbuilding to meet system requirements of new ship programs (DDG 1000 and CVN). This project is applicable to all ship programs at the Gulf Coast and Newport News operations. Acquisition cost savings are estimated at $600K per hull.

Implementation

The project will make improvements to the existing manufacturing processes, decreasing cost by clarifying requirements, establishing a baseline process, identifying metrics, and driving metrics with process improvements. Project activities will monitor data and perform engineering work related to process improvements. Implementation, (i.e. design documentation and production process updates) will be performed by the Huntington Ingalls Industries shipyards.

The transition event for this project will be the point where the feasibility of alternative methods for fiber optic installation has been determined to be suitable for implementation in the standard shipyard manufacturing practices in use at Huntington Ingalls Industries' facilities in Pascagoula, MS.



PERIOD OF PERFORMANCE:
May 2012 to November 2013

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Electronic Processing and Fabrication

CENTER OF EXCELLENCE:
EOC

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STAKEHOLDER:
PMS 500

TOTAL MANTECH INVESTMENT:
$876,000

Improved Thin Plate Panel and Insert Fit-up Processes Expected to Avoid Significant Rework

PERIOD OF PERFORMANCE:
February 2012 to February 2014

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Automated Tools

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 500

TOTAL MANTECH INVESTMENT:
$1,420,000

S2468 — Precision Panel Inserts

Objective

Significant distortion is often associated with the welding of inserts into thin panel plates used in DDG 51 Class production. Both, the shape of the cut-out opening for the insert and the shape of the insert deviate from drawing specifications due to plate movements from residual stress and thermal cutting distortion. The resulting mismatch between the plate opening and insert results in insert weld joints with poor fit-up and excessive weld root gaps. These oversized weld root openings require large welds and excessive heat input, which can cause significant weld distortion. Therefore, the need to improve the insert and panel fit-up process has been identified as a high priority in addressing ship affordability.

The Navy Metalworking Center is focusing on a three-step process to install inserts with resultant precise weld root openings. The first step is to rapidly measure the insert opening while the plate is being processed on the panel line. The second step is to use the dimensional output of the opening measurement as an input to a CNC or robotic milling cutter that will be used to trim the edges of an oversized insert plate to accurately fit into the actual panel opening. The third step is to develop techniques and tooling, based on insert shape, to minimize distortion during the welding process.

Payoff

Implementation of the project results will reduce fit-up time and improve quality, avoid costs associated with mitigating panel distortion, and enhance panel line capability for DDG 51 Class thin panels. Huntington Ingalls Industries - Ingalls Shipbuilding estimates more than 40,500 man-hour savings in the next five years. The five-year savings estimate is $2.63M related to reduction of thin plate distortion.

Implementation

A scaled prototype measurement / trimming system will be built as an implementable station that will demonstrate the capability and benefits to panel insert fit-up for as many plate sizes and weld profiles as possible. The results of the project are targeted to be integrated into DDG 117 panel lines at Ingalls in the first quarter of calendar year 2014.

Spatial Scheduling Software to Save Costs for Shipyards

B2486 — Facility Spatial Scheduling at HII-Ingalls

PERIOD OF PERFORMANCE:
March 2012 to April 2013

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Business Processes

CENTER OF EXCELLENCE:
B2PCOE

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STAKEHOLDER:
PMS 500
PMS 400

TOTAL MANTECH INVESTMENT:
$307,000

Objective

The Spatial Scheduling Tool (SST) is a stand-alone Java(TM) software application that was developed to provide shipbuilders with a robust method of allocating space for high-value facilities over time. Shipyard spatial scheduling software has been successfully transitioned and implemented at two major Navy shipbuilders: Huntington Ingalls Industries - Newport News Shipbuilding (NNS) and General Dynamics Electric Boat (GDEB) supporting VIRGINIA Class submarine (VCS) and CVN facilities space planning. Continued interest and development of the SST has led to numerous improvements in the user interface, including enhanced analysis capabilities. More recent development has focused on integrating the SST with legacy shipyard planning and scheduling systems to enable more robust and accurate planning.

The objective of this project is to configure and deploy the baseline SST for use on the DDG 51 at Huntington Ingalls Industries – Ingalls Shipbuilding facility in Pascagoula, MS. Project tasks will serve to modify and implement the Spatial Scheduling Tool at Ingalls in order to identify periods of time where space requirements are over capacity and modify the production schedule and placement of shipbuilding units to ensure that spatial capacity is not exceeded.

Payoff

It is anticipated that the implementation of shipyard spatial scheduling software will result in cost savings which will be realized through a reduction in non-value added material movement and reduced planning labor. The software will enable identification of long-range capacity issues and allow planners to perform what-if analyses to remediate overcapacity situations. Furthermore, the software will provide both improved graphical and textual reporting capabilities for dissemination of information as well as the ability to perform short term scheduling of space.

Implementation

The transition of this technology will enable immediate deployment of the software package at the HII facility for shipyard spatial scheduling of subsequent unit production. Lessons learned in this implementation will be available at the conclusion of this activity to support the Best Practice dissemination of shipyard scheduling requirements and software support capability. A technical transition plan is scheduled to be completed by November 2012 and will outline the transition event and strategy, implementation requirements and time line.

Composite Sonar Dome Results in $785K Lifetime Cost Avoidance Per DDG 51 Class Ship

PERIOD OF PERFORMANCE:
July 2012 to October 2012

PLATFORM:
DDG Family

AFFORDABILITY FOCUS AREA:
Composites Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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PMS 400
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TOTAL MANTECH INVESTMENT:
$391,000

S2493 — DDG 51 Low-Cost Composite Sonar Dome Installation

Objective

The objective of this project was to develop and verify a manufacturing and assembly process that incorporates the cost reduction techniques required to achieve a cost competitive Integrated Sonar Acoustic Window (ISAW) for the DDG 51 AN-SQS-53C sonar acoustic window. Manufacturing and assembly processes for the composite-to-steel joint were developed under this Mega Rapid Response project using a composite template for reducing composite-to-steel joint manufacturing steps and associated labor hours.

Payoff

Successful execution of this process will help reduce acquisition and life-cycle cost for the fabrication and installation of the composite ISAW on DDG 51 class ships. The proposed composite ISAW will reduce initial sonar dome component manufacturing and installation costs by 27% and 14% respectively over the currently utilized reinforced rubber dome realizing an estimated cost avoidance of $785K per ship.

Implementation

The developed manufacturing and assembly process will be used to install the ISAW on a DDG 51 while dry-docked for repairs. The target for implementation into production will be in 2013 and will be incorporated into DDG 51 Flight II via an Engineering Change Proposal.

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NAVY MANTECH
Manufacturing Technology Program

LCS Projects

Cost Savings and Reduced Maintenance to Result with New High Thermal Performance Electronics Enclosures

PERIOD OF PERFORMANCE:

September 2009 to December 2012

PLATFORM:

LCS

AFFORDABILITY FOCUS AREA:

Welding and Joining

CENTER OF EXCELLENCE:

NJC

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STAKEHOLDER:

PMS 501

TOTAL MANTECH INVESTMENT:

$1,445,000

S2292 — Joining Development for High Thermal Performance Electronics Enclosure

Objective

Modern naval targeting and control systems such as those for Phalanx and SeaRAM Close-in Weapon System (CIWS) require high performance electronic enclosures that handle the high heat loads associated with newly developed microprocessors. Current designs of electronic enclosure cooling systems are sensitive to corrosion and require special fluids, as well as special treatment, performance monitoring, and continual maintenance. There is a need for an ultra high-performance liquid-cooled electronics system enclosure for the next generation Phalanx and SeaRAM systems that solves the corrosion problems of the current design, reduces life-cycle costs, increases system reliability, and maintains superior thermal performance. The objective of this project is to select materials and identify manufacturing techniques for joining these materials to provide lightweight, highly-conductive heat exchanger components that support an improved liquid-cooled electronics enclosure design.

Payoff

Project benefits include life-cycle cost savings due to reduced footprint for the total system, reduced maintenance, and increased system reliability while maintaining superior thermal performance. Manufacturing cost avoidance due to reduced system size, weight, and part count. Savings of $2M per ELX system overhaul is estimated to yield a total of $40M over 7 years. Life-cycle cost avoidance due to reduced maintenance and increased system reliability while maintaining superior thermal performance is estimated to be $60K/ship/year and will generate $2M in savings over 10 years.

Implementation

Raytheon and IWS 3B will transition the results of this ManTech project to the Phalanx and SeaRAM CIWS by integrating the newly developed liquid cooled enclosure with the current signal processor electronics. These systems are implemented on current U.S. Navy surface ships such as the LCS, DDG 51, CG and CVN. The electronics will be the Block 1B Baseline 2 Radar Upgrade System with newly designed, conduction cooled, quad processor CCAs. Estimated implementation is in 2018.

Developments in Cryostat Manufacturing Technology Could Lead to Cost Savings in Navy Shipbuilding

S2304 — Development of Long-length, Flexible, Vacuum-Jacketed Cryostats

Objective

For High Temperature Superconducting Degaussing (HTSDG) coil systems, the cryostat (a double-walled vessel used in conjunction with extremely effective thermal insulation with a high vacuum) provides the necessary insulation to maintain a very low resistance condition in the cable. The Navy intends to use HTSDG coil systems on future Navy platforms. The applications require long lengths of cryostats to provide the necessary insulation. Currently no U.S. supplier is capable of manufacturing flexible cryostats that meet application requirements. With the adoption of HTSDG coil systems for the Littoral Combat System (LCS) and other future Navy platforms, orders of cryostats for HTSDG will be over 7,000 meters annually.

This Navy Metalworking Center (NMC) project addressed cryostat configuration and manufacturing issues associated with fabricating long lengths of flexible, vacuum-jacketed cryostats that meet Navy shipboard performance requirements.

Payoff

Using a domestic supplier for the HTSDG cable systems would result in an anticipated 30 percent cost savings, as well as diminished labor costs and installation duration due to a reduction in the number of cables to be pulled. The HTSDG cable systems would also reduce the overall degaussing system weight by an estimated 50 percent for most ship classes due to the reduced number of cables.

Implementation

The project results will not be implemented at this time because industry participant Southwire was unable to commit the capital investment required to upgrade its manufacturing facility and support a domestic supplier. However, the project did realize the several technical accomplishments. A baseline cryostat insulation system was developed and validated via thermal performance testing. This insulation system, consisting of double aluminized Mylar® and polyester net for the reflector and spacer materials of the cryostat, was shown to perform better than the typically utilized double aluminized Mylar® and polyester (non-woven) fabric. In addition, current technology available from an existing vendor has been identified for forming, welding, and corrugating stainless steel sheet of the desired thickness ranges for the manufacture of HTSDG cryostats. Analyses have shown that this technology will be able to produce corrugated tubing that meets application requirements.

A follow-on project with another industry partner could easily leverage this work to its logical conclusion of a U.S. manufacturing capability for long-length cryostats.

PERIOD OF PERFORMANCE:
October 2009 to December 2011

PLATFORM:
LCS

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 501

TOTAL MANTECH INVESTMENT:
$1,142,000

Best Practices for Shipyard Electronic Document Management System Identified

PERIOD OF PERFORMANCE:
March 2010 to December 2012

PLATFORM:
LCS

AFFORDABILITY FOCUS AREA:
Business Processes

CENTER OF EXCELLENCE:
B2PCOE

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STAKEHOLDER:
PMS 501

TOTAL MANTECH INVESTMENT:
$919,000

B2332 — IT Solution for Welding, Standards, Procedures and Documentation Benchmarking

Objective

Shipbuilders for the Navy are under constant pressure to improve efficiency and reduce manufacturing costs. Document management systems (DMS) are used in a broad spectrum of commercial businesses. Human resources, accounting, maintenance departments, and other traditionally heavy users of paper, have seen enormous benefits in converting to paperless systems.

The purpose of this effort is to survey Navy shipbuilders and determine what methods are currently being employed to deliver and record welding information on the shop floor. The survey also includes other types of records such as painting, training, maintenance and other large sources of paper documents. In this effort, the Navy Benchmarking and Best Practices Center of Excellence (B2PCOE) is working in conjunction with Lockheed Martin Space Systems Company (LMSSC) as a subject matter expert to survey several different companies that build Navy ships. The goal will be to identify a best practice for an electronic DMS for welding, painting, and maintenance records at the Marinette Marine shipyard in support of the Littoral Combat Ship (LCS) platform.

Shipbuilders will be surveyed to see how they are handling similar documentation. Once the survey is complete and the effort justified, a prototype system(s) will be developed for the shipyard. If the prototype system(s) can demonstrate required feasibility, the system can then transition to other shipbuilders or similar industries.

Payoff

There are a number of improvements expected from the use of a DMS. The potential for reduced costs due to elimination of time and effort associated with keeping paper records is one improvement. Improving the accuracy of the records and the data collection process by removing ambiguity and standardizing inputs is another. Streamlining the approval process for procedures and eliminating problems with authentication and operator identity as well as the automation of data collection and procedure tracking for Navy and other outside auditing agencies are expected improvements as well. There are also hidden costs, such as off-site storage expenses, on-site space usage, filing supplies, and document distribution expenses including overnight shipping and the cost for replacing lost or misplaced documents that will be improved from the use of a document management system. The benefit to this effort is both in accuracy improvement associated with weld documentation and in overall cost savings associated with document management. The benefit is both in accuracy improvement associated with weld documentation and in overall cost savings associated with document management. A $375K per hull cost savings is estimated.

Implementation

The B2PCOE, along with other contactors and government agencies, will work together to develop and integrate a set of best practices for the development and implementation of a DMS for the Marinette Marine shipyard. These best practices will be made available to all customers through the B2PCOE. The dissemination process will include training sessions and implementation of the best practices throughout the defense industry, including their suppliers, and government depot and sustainment centers as needed. Onsite training of the benchmarking process will be made available as needed to adequately prepare team members in accessing the best approach in evaluating different document management systems.

Alternative Material Solution Reduces Weight While Decreasing Cost for LCS Uptakes

S2341 — Reduced Cost Lightweight Uptakes for LCS

Objective

The initial Freedom- Class Littoral Combat Ship (LCS) sea trials showed that the ship weight must be reduced on the ensuing builds to meet performance objectives. One potential area for achieving weight reduction is the high-temperature exhaust ducting for the gas turbine engines, the uptakes. The uptakes are currently comprised of an INCONEL® Alloy 625 interior wall that is exposed to an exhaust temperature of 840°F, a layer of thermal insulation, and a stainless steel exterior that reaches a maximum temperature of 550°F.

The primary objective of this ManTech project was to reduce weight, lower manufacturing costs, and simplify the configuration of the legacy uptake system.

Payoff

The project team successfully demonstrated that an alternate material and simplified configuration of the gas turbine uptakes could save 22,000 pounds of structural weight on Freedom-Class LCS ships. The reduced weight will benefit the warfighter by enabling faster ship speeds and enhanced flexibility in changing out mission modules. While the alternate material is beneficial in terms of improved weight, performance, and corrosion resistance, it can be costly based on material price and fabrication cost. To offset the cost, the project team demonstrated that high-speed, hot-wire Gas Tungsten Arc Welding (GTAW) could be used to decreased welding fabrication time, and that a more simplistic configuration could reduce part count and labor cost, with a cost reduction goal of 29 percent. The design of the uptakes was modified to exploit the alternative material's properties, further reducing part count and construction labor costs. Once implemented, the well-proven corrosion resistance of the alternate material should enable life-cycle cost savings as well.

Implementation

A full-scale section of the uptake was manufactured and delivered to Naval Surface Warfare Center, Philadelphia, for a test stand trial using a gas turbine engine where a majority of the operational profiles will be carried out. The uptake will be inspected at selected time intervals, and, assuming that no damage is observed, the new uptake will be fully implemented and utilized on LCS 7 in early 2013 and for subsequent LCS builds.

PERIOD OF PERFORMANCE:
June 2010 to March 2012

PLATFORM:
LCS

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 501

TOTAL MANTECH INVESTMENT:
$1,354,000

Weight and Cost Saved on LCS Sliding Doors through Dual-Skinned, Engineered Sandwich Structures

PERIOD OF PERFORMANCE:
August 2011 to September 2013

PLATFORM:
LCS

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 501

TOTAL MANTECH INVESTMENT:
$1,740,000

S2399 — Sliding Door Manufacturing Improvements

Objective

The first Freedom Class Littoral Combat Ship (LCS) sliding door ship sets were manufactured under difficult schedule constraints. These door sets are challenging to manufacture because they must meet fire, water-tightness, and pressure loading requirements. Several welds are accomplished in a labor-intensive manner, leading to higher cost and weight than otherwise would be necessary.

The objective of this project is to apply lean manufacturing and design for manufacturing and assembly (DFMA) principles to the existing LCS Freedom Class sliding doors to reduce acquisition cost, weight, and total ownership cost. This project is identifying improvements that can be readily implemented in new construction and backward retrofitted to maximize benefits. In order to reduce weight while maintaining structural integrity, the interior components of the door panels are being converted from a conventional plate and stiffener type design to a dual-skinned, engineered sandwich structure built using hybrid laser arc welding (HLAW) technology. To improve corrosion resistance, the materials of construction are primarily corrosion resistant stainless steel (CRES) 2003/2205 with 300 series stainless steel used where material strength is not critical. The project is being performed by an Integrated Project Team comprised of PMS 501; Lockheed Martin; Gibbs & Cox; Marinette Marine Corporation; the Naval Surface Warfare Center, Carderock Division; American Bureau of Shipping; and Navy Metalworking Center.

Payoff

This project aims to reduce labor and assembly costs of the Freedom Class LCS sliding watertight doors. Overall acquisition costs are expected to be decreased by 18 percent per door through improved fabrication methods; additional total ownership cost reductions are projected per hull over the life of the ship for weight savings, improved corrosion resistance, and elimination of painting / re-painting. The improved design also reduces weight by 20 percent over the legacy door. In addition, the redesigned door provides a flat door surface, which reduces installation complexity, weight of the fire insulation blanket, and the number of studs applied.

Implementation

A prototype door will be fabricated and tested in this project. Pending successful completion of all performance evaluations and approval by Gibbs & Cox and PMS 501, the improved door configuration will be implemented. The improved sliding doors are planned for implementation on LCS 9 in late 2013; however, the team is working to achieve early implementation on LCS 7 in July 2013.

High Deposition Gas Metal Arc Welding System Will Enable Mechanized Process Improvements and Cost Savings

S2404 — High Productivity Aluminum Manufacturing

Objective

The objectives of this project are to develop and demonstrate a High-Deposition Gas Metal Arc (HDGMA) aluminum welding system and associated welding processes and procedures that will enable single-sided and single-pass welding of select aluminum primary structures for both Littoral Combat Ship (LCS) classes - Freedom and Independence. This project will be executed in two phases.

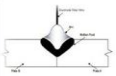
In Phase 1, the HDGMA welding process will be developed and optimized. The current HDGMA welding system is comprised of a conventional Constant Potential (CP) GMAW power supply and a push / pull wire feeder with a water-cooled torch. This phase will consist of six tasks and their associated subtasks. During Phase 2, system demonstration and development will consist of seven tasks and their associated subtasks. The project teams will conduct a full-scale demonstration of the HDGMA welding process for flat down-hand position. In addition, the process for out-of-position welding will be developed on a laboratory-scale and then demonstrated at the shipyards.

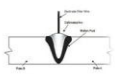
Payoff

When successfully implemented, the results of the project will offer specific improvements in manufacturing labor cost, cycle time, and quality compared to the current aluminum welding system and process utilized for butt welding in the LCS shipyards today. In addition to impacting LCS, this project also has the potential to improve aluminum manufacturing across the U.S. Navy's fleet. Estimated cost savings are $300K per/ hull for the Freedom Class and $3M per /hull for the Independence Class. In addition to impacting LCS construction, this project also has the potential to improve aluminum manufacturing across the Navy's fleet.

Implementation

At the conclusion of the project's technical effort, the result should be an approved welding capability and equipment or sets of equipment that will enable the LCS shipyards to perform flat down-hand, one-sided welding, and potentially out-of-position welding as well. In order to successfully achieve technology transition, the participating shipyards will conduct the following activities: (1) develop the business case analysis which will include data produced by the cost model; (2) generate any required capital expenditure request internally and obtain authorization for required equipment lease / purchases and facilities updates assuming business case justification; (3) conduct internal training on the equipment and the process; (4) develop a WPS for production welding; (5) conduct welder certification; and (6) qualify to MIL STD 248 Sections 4 & 5 and then certify to the standard. Implementation is anticipated to occur on LCS 5/6 during fourth quarter FY14 at Marinette Marine and Austal U.S.





PERIOD OF PERFORMANCE:
February 2012 to January 2014

PLATFORM:
LCS

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
CNST

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STAKEHOLDER:
PMS 501

TOTAL MANTECH INVESTMENT:
$2,230,000

Low-Cost, Open Architecture Radar to Provide 20% Cost Savings and Allow for Future Upgrades

PERIOD OF PERFORMANCE:
February 2011 to February 2015

PLATFORM:
LCS

AFFORDABILITY FOCUS AREA:
Electronic Processing and Fabrication

CENTER OF EXCELLENCE:
EMPF

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STAKEHOLDER:
PMS 501

TOTAL MANTECH INVESTMENT:
$7,302,000

S2410 — Low-Cost Open Architecture Radar (LCOR)

Objective

The current Littoral Combat Ship (LCS) radar system solutions have posed various challenges to the Navy. Both littoral combat ships currently use foreign-built Air Search Radars (ASR). Lockheed Martin (LM) uses the EADS TRS-3D radar and General Dynamics (GD) uses the Saab Sea Giraffe radar. The solutions do not provide the technical data the Navy requires for performance and radar system modeling, vital for a new surface combatant platform. Also, these current systems have not met the desired affordability objectives.

The initial intent of this project was to develop an open-architecture radar that would meet the Navy's current LCS requirement for a low-cost, upgradeable system. Due to an unacceptably high risk of not making the required transition deadline, the effort was re-directed to make use of a commercial- off- the- shelf (COTS) non-developmental radar that met all of the mission needs of the LCS, and was already in production.

The proposed radar (ITT/Thales SMART-S Mk 2) is architected to enable insertion on either LCS ship platforms. The objective of this ManTech effort is to provide PMS 501 with a demonstrated radar architecture that meets the form, fit, function, and requirements of the LCS.

An S-band Open-architecture Component Knowledge and Event Tester (SOCKET) will be developed to model and simulate the SMART-S Mk 2 Radar and its interfaces to the Combat Management Systems. In addition, an Intelligent Technical Data Package (ITDP) will be developed, accessed, and displayed on the SOCKET hardware. This redesign is being undertaken to address an availability issue on the existing PowerBook, and will result in a cost savings, which, along with other savings resulting from the TOKAT effort, will reduce the cost to the Navy of the SMART-S Mk 2 system $1M per shipset below the cost ROM provided to PMS 501 by ITT in March, 2011.

Payoff

This project will reduce the cost of the current LCS radar system by approximately 20% and fit into the existing radar's top-side and below decks available footprint. The manufacturing results of this open architecture, reduced cost radar effort will also be integrated back to the Army's EQ-36 for associated impact and cost savings.

Implementation

The ManTech transition event will occur at the completion of the radar string test in July of 2013. At this point, PMS 501 will make a decision as to what radar system to specify for the September 2013 FY14 LCS multi-ship procurement. The production of the SMART-S Radar system will be transitioned from the Thales, Netherlands facility to the ITT Van Nuys facility. Implementation will occur at Marinette Marine and Austral Shipyards on LCS Ship 11 and beyond with an estimated date of 2014 for Ship 11 and 12.

Relaxing Delay Time Constraint Between Cleaning and Welding of Aluminum Joints to Reduce Shipbuilding Costs

R2445 — Extended Delay Between Cleaning and Welding of Aluminum

PERIOD OF PERFORMANCE:
March 2011 to November 2011

PLATFORM:
LCS

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 501

TOTAL MANTECH INVESTMENT:
$122,000

Objective

Aluminum welded joints are sensitive to defects if the faying surfaces (i.e., surfaces to be joined) are not cleaned properly prior to welding. These defects include porosity, inclusions, entrapped oxides, and other discontinuities that can degrade the mechanical properties of the joint. Usually, a weld joint is prepped, cleaned, and tack welded and then left in this condition for some time prior to final welding. There is concern that moisture and shipyard debris may contaminate the joint surfaces during this delay, so Navy procedures call for re-cleaning of the joint prior to final welding. However, there is no standard procedure for re-cleaning the tack-welded joints, and the guidance on a delay time- limit varies from platform to platform. For example, the current requirement for the Littoral Combat Ship (LCS) 2 Independence Class is to re-clean the joint and adjacent surfaces if it sits longer than 16 hours, but, for other platforms (e.g., CG 47), this requirement is as little as six hours. Furthermore, commercial shipyards contend that cleaning only the exposed surfaces is adequate, and that breaking the tack welds to fully access the faying surfaces is too costly and unnecessary for a sound weld joint. This issue also impacts the LCS 1 Freedom Class, JHSV, LHA, and future Ship- to- Shore Connector (SSC) new construction, as well as Landing Craft, Air Cushion (LCAC), FFG 7, and CG 47 Class repairs.

This project's objectives were to better quantify the effects of the delay time between cleaning and welding on aluminum weldment mechanical properties. The mechanical property test results may provide guidance on aluminum welding procedures across the Fleet.

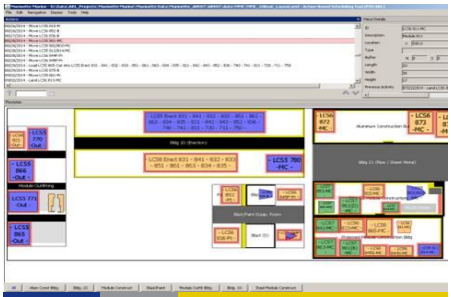
Payoff

Project results may show that longer delays or simpler cleaning procedures (e.g., not breaking tack welds) may result in acceptable weldment mechanical properties and, thus, lead to significant cost savings. A second cost benefit may result from relaxing the requirement for detailed inspection of joints that are not classified as high stress but are required to be inspected due to noncompliance with current Naval specifications. Another potential benefit is optimization and standardization of aluminum welding requirements across multiple platforms, thereby reducing the administrative cost of maintaining multiple welding guidance documents.

Implementation

Project test results (along with other factors) have contributed to the conclusion that tack-welded joints do not need to be broken, cleaned, and re-welded in cases where the exposure time has exceeded the requirement for LCS 2 Class; these results were implemented in early FY12. However, project results concerning the potential for extending the delay time for re-cleaning weld joints were inconclusive due to significant data scatter in tensile strength test results. Implementation of these results on various ship classes will depend on completion of an additional test program and positive test results. The first anticipated implementation will be on development of the fracture control plan for LCS 2 Class primary hull structures being fabricated at Austal USA in Mobile, AL; as of FY12 Q4, this plan is in development at NAVSEA. Another ship type that may benefit from these results is the Joint High Speed Vessel (JHSV), which also is being fabricated at Austal USA.

Tools Developed to Improve LCS Facilities Planning Scheduling



PERIOD OF PERFORMANCE:
July 2011 to March 2013

PLATFORM:
LCS

AFFORDABILITY FOCUS AREA:
Automated Tools

CENTER OF EXCELLENCE:
iMAST

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STAKEHOLDER:
PMS 501

TOTAL MANTECH INVESTMENT:
$350,000

S2456 — LCS Advance Planning and Facility Analysis Toolset

Objective

The Littoral Combat Ship (LCS) design is reconfigurable depending on the current mission. Reconfiguration of the platform to fit a threat / mission allows the base design to serve a variety of missions, reducing overall platform and life cycle cost to the Navy. With the planned production schedule for LCS, Marinette Marine Corporation (MMC) requires expansion and modernization to handle the increased demand making significant investments in facilities and the associated improvements in processes to meet the projected construction demand.

The objective of this project is to develop tools capable of assessing near-term space availability in existing facilities as LCS production ramps up as well as continually plan facility space effectively throughout the LCS acquisition. This will be achieved by investigating MMC legacy planning and scheduling systems to gain a better understanding of how the Activity Based Spatial Scheduling Tool (ABSST), developed under Office of Naval Research (ONR) ManTech funding, can interact directly with live shipyard data. MCC has also indicated an interest in incorporating rules and constraints pertaining to crane / flyover clearance as well as transporter access for module movement. Once proven and accepted by MMC, there will be a full transition and implementation to the module construction, blast and paint, outfitting, and erection facilities.

Finally, the utility of the 3D Erection Visualization Tool (developed under ManTech Project S2167) will be investigated to support LCS construction. The intent of the 3D EVT is to tie lightweight 3D CAD models of ship blocks to a sequence or schedule to visually evaluate the impact of changes to those sequences / schedules. If the spatial scheduling tools are maintained properly (i.e., schedules updated based on planning systems and feedback from shipyard management), the integrated 3D EVT provides a visual status of the erection of the ship from keel laying to launch. Implementation will be determined based on a preliminary investigation to identify the availability of 3D digital models of the erection blocks and feasibility of translation into a suitable EVT format.

Payoff

The use of ABSST will provide the following risk reduction opportunities: (1) the reduction in unplanned overtime to avoid construction delays and meet schedule, (2) the reduction in unplanned outsourcing of manufacturing, and (3) the reduction in unplanned non-value added movement of modules to maintain schedule. MMC anticipates an estimated cost avoidance of $364.3K/hull as a result of successful implementation of this project.

Implementation

The project team will execute this project in five tasks over a period of 21 months. Within each task, MMC stakeholders and software end users will be included and expected to provide feedback to the Institute for Manufacturing and Sustainment Technologies (iMAST) development team as well as the LCS Program Office PMS 501. Transition of the tools will be integrated into the development of the toolset with the tight coupling between the development team and the user groups. Because of the relationship, the new technologies will be transitioned to and implemented at MMC shipyard at appropriate insertion points. Final production implementation will follow established MMC software policies and will occur at scheduled transition events throughout the project duration.

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NAVY MANTECH
Manufacturing Technology Program

VCS / Submarines Projects

Alternative Damping Materials to Reduce Cost on VCS

PERIOD OF PERFORMANCE:
March 2009 to August 2012

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Coatings

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$855,000

S2139-2 Damping Material Application Improvements Phase 2

Objective

Several thousand square feet of damping tile are installed on each VIRGINIA Class submarine (VCS). An opportunity exists to reduce the cost of installed damping by finding alternate materials and/or installation methods. The goal for this Navy Metalworking Center (NMC) project was to reduce the cost of select damping systems by 20 percent. Alternate adhesives have been down-selected as a cost-effective approach with relatively low technical risk. The down-selected materials are pressure-sensitive adhesives available in peel-and-stick sheets. While the use of a pressure-sensitive adhesive can significantly reduce the cost of damping, verification that equivalent performance is possible must be validated. The current phase of the project is initiating this validation, which will transition to PMS 450 for completion.

Payoff

Implementation is being pursued at Huntington Ingalls Industries - Newport News Shipbuilding and General Dynamics Electric Boat for Type II, Class 1 and Class 2 applications. Pending successful test results, the benefits for implementing pressure sensitive adhesive are $715K per hull. This cost reduction takes into account installation labor, material costs, and damping support labor.

Implementation

Data generated under the current ManTech project will be used after project transition to verify performance of the damping system with pressure sensitive adhesive. Since implementation would affect virtually all areas of the sub, large-scale testing will be conducted to verify performance. PMS 450 is responsible for conducting these tests and determining final acceptance for implementation, which is expected to affect Block IV production in 2014.

Welding Improvements to Reduce Costs by 20% for VCS Structural Fabrications

S2199 — Structural Fabrication Welding Improvement

Objective

General Dynamics Electric Boat (GDEB) and the Navy are committed to reducing the cost and construction time for VIRGINIA Class submarines (VCS). The overall cost reduction goal is to cut construction costs from $2.4B to $2B per hull. Part of achieving this goal involves reducing construction time for a single submarine from 84 months to 60 months. A key part of this project addresses reducing ship construction labor costs, including welding operations. The Navy Joining Center (NJC) is supporting GDEB in this project to reduce the time and cost of internal structural welding operations. The goal is to reduce welding and assembly labor by 20% through improvements in technology, processes, and procedures. Manual welding and backgouging operations are being replaced by mechanized processes to improve productivity.

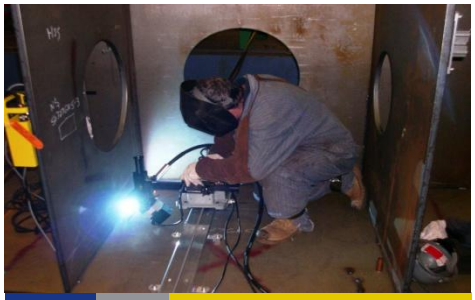
Payoff

To support implementation of the new welding/gouging systems at GDEB, a business case analysis was conducted on the specific bulkhead application, which supports the use of six mechanized systems. The estimated savings per ship is $72K with less than a 2 ship return on investment. GDEB has implemented several systems at Quonset Point.

Implementation

For a bulkhead application, current (manual) processes for welding and backgouging were measured to establish the baseline. Functional requirements were developed for the mechanized system. Potential suppliers of mechanized welding systems were identified, and the three most promising systems were demonstrated and tested at GDEB. The mechanized solution was selected based on ease of use and acquisition costs. Air carbon arc backgouging was selected over plasma arc backgouging due to easier joint accessibility and superior speed. During a 9-hour shift, welders using the new system were able to complete 4 weld joints compared to a manual welder who was able to complete 1.5 welds.

During Phase 1, improved technologies and equipment were identified. During Phase 2, equipment was procured, parameters developed and shipyard performance evaluations were conducted. The first whole ship impacted by the results of this project will be SSN 785.



PERIOD OF PERFORMANCE:
November 2007 to December 2012

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
NJC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$1,558,000

Cladding Procedures Decrease Time Required to Refurbish Propulsion Shafts

PERIOD OF PERFORMANCE:
November 2008 to September 2012

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:

CENTER OF EXCELLENCE:
iMAST

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$1,037,000

S2272 — VCS Propulsion Shaft Clad Repair

Objective

The objective of the VIRGINA Class Submarine (VCS) shaft repair project was to develop laser cladding procedures applicable to both original manufacture and repair and refurbishment of VCS main propulsion shafts. In the repair and refurbishment area, no procedures were in place for the overhaul of the shafts. Laser cladding provides a viable solution by minimizing clad metal dilution and heat input inherent to arc-based processes. This project leveraged the existing 4kW laser system at Pearl Harbor Naval Shipyard (PHNSY) provided by Navy ManTech under the Verticle Launch System Repair project and significantly improved the return on investment for both projects. Specific cost-saving targets for this project include a decrease in the time required to refurbish a shaft (currently two years) and minimize reduction in follow-on straightening and machining operations such as required for the cladding refurbishment of shafts for the Seawolf class.

Payoff

This project provides both cost savings and cost avoidance goals. Cost savings are primarily obtained through labor savings from the refit, repair, and refurbish tasks performed by the refurbishment vendor or shipyard. Cost avoidance is obtained by reducing the need for the procurement of additional spare shafts. Based on a $75/hour labor rate and a steady state rate of 3 shafts per year, the annual labor costs for refurbishment (after this process is implemented) are estimated to be $552K/year, or roughly one third the current methodology. Additionally, the cost of a spare shaft is estimated to be $3.7M. By decreasing the span time for shaft refurbishment by 50%, it is assumed that one fewer spare shaft will be required for VCS fleet support, providing a cost avoidance of $3.7M. The projected cost savings and avoidance of the initial five year period is estimated to be approximately $6.5M when implemented at a single shipyard. The savings are assumed to double with implementation of the system at two shipyards.

Implementation

The Institute for Manufacturing and Sustainment Technologies (iMAST) teamed with PHNSY to develop and evaluate laser cladding procedures as an effective and efficient repair for VCS main propulsion shafts. In addition to the development of laser cladding parameters and procedures, iMAST, working with the Naval Undersea Warfare Center – Keyport, designed and provided support to PHNSY for the integration of a laser cladding system to an existing weld positioner. By eliminating pre-heating and post-clad stress relief of the shafts, significant cost and schedule savings can be achieved in the refurbishment of shafts. The completion of the design and transition to PHNSY is planned for late 2012.

Material Flow Processes and Technology Improves Material Issuance and Operations

S2281 — VCS Material Flow Processes and Technology

Objective

In order to meet the increasingly aggressive cost and schedule challenges for the VIRGINIA Class submarine (VCS) program, it is critical to strive for 100% material availability and streamlined material flow processes to support on-time trade work execution. To achieve this goal, the General Dynamics Electric Boat (GDEB) project team evaluated the current material flow processes between storage, shops, and construction areas. Using Lean improvement methodologies, the team identified and executed the top opportunities for cycle-time and touch-count reduction associated with material movement.

The Phase 1 project activities were completed in February 2011. The key achievements included process mapping for both current and future states, documenting areas for improvement, and conducting benchmarking studies at several commercial industrial facilities. In addition, GDEB re-examined the business case and technology payoff for the proposed solutions and recommendations that were best suited for implementation.

The GDEB project team recently completed the Phase 2 effort, validating the 'best value' processes and technology recommendations from Phase I. Five pilot tasks were completed, leading to earlier than expected implementation and cost savings.

Payoff

The savings identified for this project are $2.05M per VCS hull in labor savings and $350K per VCS hull in material savings.

Implementation

Full implementation is expected to utilize a phased approach, where the most beneficial opportunities will be assigned higher priority and implemented first. With 43 of 62 improvement actions items already implemented, the VCS hulls that are currently in production (Hull 782 at GDEB - Groton; Hulls 783 – 786 at GDEB - Quonset Point,) are benefiting from this effort. The full implementation targeted timeframe is first quarter FY13 at both GDEB construction facilities.

PERIOD OF PERFORMANCE:
July 2010 to October 2012

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Facilities and Industrial Processes

CENTER OF EXCELLENCE:
CNST

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$1,859,000

Innovative Sail Cableways Foundation Plates to Reduce Corrosion

PERIOD OF PERFORMANCE:
February 2010 to December 2012

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Composites Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$750,000

S2286 — Cableways and Foundation Plates

Objective

Corroded foundation plates and cableways on the VIRGINIA Class submarine (VCS) require significant maintenance. The objective of this project is to replace the perforated Cableway Foundation Plates and angle bar cableways with innovative composite alternatives which: (1) can be easily integrated into the existing ship structure without significant or expensive alterations; (2) will not rust; (3) will require little maintenance during the 30-year life of the ship; (4) meet all performance requirements; and (5) will reduce total acquisition cost compared with the existing metal designs. The ability to easily attach and integrate these components the ship structure during construction without impacting cost and schedule will be one of the key criteria.

Payoff

The principal benefit of this project is to eliminate corrosion, reduce life-cycle cost, and potentially lower the acquisition cost for the perforated cableway foundation plates and angle bar cableways with innovative composite alternatives. The resulting technology will likely be suitable for rapid back-fitting on existing VCS during SRAs (Selected Restricted Availabilities).

The projected Reduced Total Ownership Cost (RTOC) savings forecast is $36M on the VCS sails, assuming backfits over six maintenance periods during the life of the boat and over the 30 boat class. The return on investment for this effort is expected to be 36:1.

Implementation

As part of the project, perforated cableway foundation plates and angle bar cableways will be inserted on the first available VCS via a TEMPALT (Temporary Alteration) or N-Type ER (Engineering Report) for a one year at-sea evaluation. Then, assuming a successful at-sea trial and acceptance of the technology by PMS 450 and the relevant Navy Technical Codes, the intent would be to have NAVSEA funding in place to accomplish all of the required integration steps for implementation on the VCS via a SHIPALT (Ship Alteration) for delivered submarines, an N-Type ER for submarines under construction, and a D-Type ER for submarines to be constructed. This project is targeting initial demonstration on SSN 783 and implementation on all future hulls / backfits. The target for implementation the TEMPALT is SSN 783 in February, 2013. Full implementation is planned for SSN 792 in 2014.

Integrated Link Testing Reduces Ship Harness System Certification Time

S2306 — Integrated Link Testing

Objective

There is a need to reduce the significant amount of labor involved in certification of the harness system used in the VIRGINIA Class submarine (VCS) platform. Manual measurement of thousands of electrical and fiber optic links, required for harness certification, is both time-consuming and error-prone. Uncertainties and omissions in each data record must be corrected before final submission. Typical harness test time per ship is 36,000 hours test time and 3,100 hours engineering time. Typical harness certification records are kept open for four years before they are ready for final certification. Associated with the manual certification process is risk with hook-up errors and data transcription errors. The objective for this project is to significantly reduce the current number of hours (from approximately 36,000) required for VCS harness certification and also reduce risk associated with manual data entry.

Payoff

As mentioned above, there is a need to reduce the significant amount of labor involved in certification of the harness system used in the VCS platform. The benefit of this project is to increase affordability by using automation to increase the efficiency and accuracy of harness test data collection. Project metrics would relate to: (1) efficiency, as certification time per pin, or total harness certification time, (2) reduction of defects and data transcription errors, and (3) return-on-investment measured as system cost versus reduced cost of the above items. In addition, the use of a portable test system linked to a database is expected to reduce deck plate time required for harness test activity. The total projected cost savings for VCS is $468K per hull.

An incentive toward further cost benefit may be realized through further standardization of harness hardware. This reduces fixturing cost by reducing the number of fixtures, and ultimately reduces life-cycle cost by driving a reduction in the number of harness hardware types.

Implementation

First implementation will occur aboard the VCS. However, the general approach will be applicable to harness applications for other ship platforms as well. Once the system is demonstrated on representative hardware, it will be established that the system, in general, will successfully operate in the VCS and other naval platforms. Further implementation (i.e., use of the Integrated Link Test System on other applications and platforms) then will only require specific fixturing for that particular platform.

The event that defines transition for this project will occur when the Integrated Link Test System is introduced into its first application within VCS production. This event will signify that the general system is ready for use in manufacturing systems and for further implementation on other platforms. For VCS, implementation is expected to begin in 2013.

PERIOD OF PERFORMANCE:
June 2010 to December 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Automated Tools

CENTER OF EXCELLENCE:
EOC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$1,474,000

Improved VCS Weapons Cradle Manufacturing To Reduce Costs

PERIOD OF PERFORMANCE:
November 2009 to April 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$4,465,000

S2319-1-2 — Weapons Cradle Manufacturing Cost Reduction Phases 1 and 2

Objective

VIRGINIA Class (SSN 774) submarine (VCS) weapons cradles are complex assemblies manufactured using extensive welding and machining processes. This complex design must be simplified in order to reduce cost and eliminate unnecessary labor to support the manufacturing rate required by the VCS Program. However, system performance must not be impacted. To improve the producibility of weapons cradles and reduce costs, the Integrated Project Team (IPT) will apply lean manufacturing and design for manufacturing principles to the complex design of the VCS weapons cradle. The IPT is comprised of PMS 450; the Naval Undersea Warfare Center, Division Newport; General Dynamic Electric Boat (GDEB); Newport News Shipbuilding (NNS); and the Navy Metalworking Center.

Payoff

This project anticipates an estimated cost savings of $60K per cradle or $1.1M per submarine hull. Overall, for a five-year period and 10 hulls, the estimated total cost savings are $11.1M.

Improvements include an estimated 30-part reduction, based on the planned configuration; improved quality, reduced rework and reduction in weldment fabrication times, with a projected 30 percent shorter build time for the machined cradle weldment; as well as product simplification and improved manufacturing consistency and repeatability. In addition, the improved quality will contribute to fewer engineering waivers and reduced scrap costs.

Implementation

Implementation will occur on VCS at NNS and GDEB. The end block consolidation, balanced weld joint, and improved dimensional tolerance process improvements are on schedule for SSN 786 / 787 insertion in 2013. The welding system and fixturing hardware developed under this project will be transferred to NNS and will be used to build a full-scale prototype weldment to validate the improvements. Collective prototype and manufacturing process improvements, including gusset standardization and reduction is planned for implementation on SSN 789 (February 2014) or possibly SSN 788 (October 2013).

Improved Pipe Processing Methods to Result in More Than $500K Savings per VCS Hull

S2326 — Large Diameter Pipe Process Improvements

Objective

Current VIRGINIA (SSN 774) Class submarines (VCS) contain off-hull new construction pipe welding details consisting of complex configurations of large diameter pipe (3"-12" diameters) that require detailed preparation, fixturing, positioning, fit-up, and welding. Current fabrication techniques and weld processes require significant labor to set-up and process these assemblies, reducing work cell process flow output and efficiencies. This Navy Metalworking Center (NMC) project developed several improved fixturing and positioning methods, as well as work cell automation techniques. These improvements will reduce pipe section cutting, rework, and pipe material scrap.

Payoff

Projected savings are currently estimated to be 8,500 man-hours per hull in manual labor. This man-hour savings, multiplied by the conservative hourly rate of $65 per hour, results in a projected $552K per hull savings and $5.5M savings over the next 10 VCS planned hulls in the FY13-FY17 period.

Implementation

The project team developed several automation methods for pipe preparation including fixturing, positioning, and fitting; pipe boss welding and machining; and internal pipe joint blending tools. Prototype process improvements were tested and validated in both General Dynamics Electric Boat and Huntington Ingalls Industries - Newport News Shipbuilding pipe shops in Q3/Q4 FY2011. Full implementation is expected in both VCS pipe shops for the SSN 788 hull in the fall of 2012.

PERIOD OF PERFORMANCE:
March 2010 to November 2011

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
NMC

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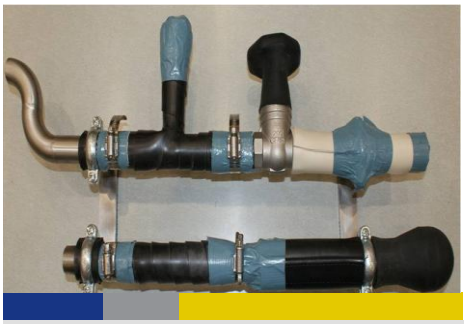
STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$1,080,000

Improved Blasting Techniques Reduce Shipyard Labor, Material, and Disposal Costs



PERIOD OF PERFORMANCE:
May 2010 to March 2012

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Facilities and Industrial Processes

CENTER OF EXCELLENCE:
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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$610,000

S2338 — Optimization of Blasting Operations

Objective

Proper surface preparation prior to coating application is critical for coating longevity. Grit blasting is the most common method of surface preparation in shipbuilding, and there are opportunities to make grit blasting and the associated processes more efficient. In this project, the Navy Metalworking Center (NMC) project team conducted a series of trials to optimize the grit blasting parameters for VIRGINIA Class (SSN 774) submarines (VCS). These trials leveraged the results of previous studies and included various combinations of parameters. These parameters included variations of blast media type, blast media size, nozzle angle, and nozzle type. The project team ensured that all recommendations complied with surface cleanliness, blast profile, and pipe wall thickness requirements. The project team also looked at the associated processes of pipe wrapping and unwrapping. Shipyard procedures require that piping systems be protected when blasting nearby surfaces. The current practice is to wrap the piping, blast the surface, remove the wrapping, clean the piping, and rewrap the piping prior to painting.

Payoff

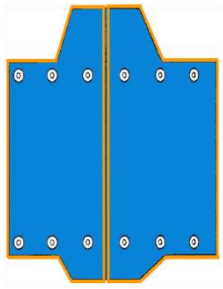
The results of this project are expected to save approximately $367K per VCS hull in reduced labor, materials, and disposal cost. The majority of these savings are the result of reducing the labor associated with wrapping pipes prior to blasting in a tank. Improved processes developed by the project team are expected to reduce wrapping and unwrapping labor by 60 percent. In addition, the use of extra-long venturi nozzles in blast guns can reduce grit blasting labor by 29 percent.

Implementation

Full implementation is expected to take place at General Dynamics Electric Boat (GDEB) by the end of 2012. Partial implementation has occurred at GDEB and at Portsmouth Naval Shipyard. In addition, Puget Sound Naval Shipyard and Huntington Ingalls Industries - Newport News Shipbuilding are evaluating project recommendations.

Composite Sail Cap Covers and Plates to Result in Reduced Maintenance Requirements and Costs

S2345 — Net-Shape Fabrication of Composite Sail Cap Covers and Doors



Objective

A variety of existing VIRGINIA Class submarine (VCS) sail cap covers and doors (i.e., steel radar mast cover, bridge closure door, towing pendent access cover, lookout closure door, universal modular mast (UMM) closure doors (6 total), snorkel mast closure, and permanent and removable sail caps) are susceptible to general corrosion over the lifetime of the submarine, resulting in significant maintenance costs. In addition, the cost to manufacture the steel covers, doors, and permanent and removable sail caps include touch labor required to rework the "as-fabricated" component to facilitate fit-up in the sail cap. This fit-up is required for every new submarine as a result of boat-to-boat variability. The objective of this project is to develop and demonstrate an integrated, innovative, low-cost net-shape composite cover and plating fabrication technology to: (1) address corrosion, (2) reduce maintenance and acquisition cost, and (3) meet performance requirements.

Payoff

The principal benefit that will accrue from the results of this project is life-cycle cost reduction due to implementation of corrosion-resistant material systems that reduce the amount of maintenance required per scheduled maintenance interval and reduced periodicity of maintenance over the life of the submarine. It is also anticipated that acquisition cost reduction will be realized since rework of the as-fabricated metal components will not be necessary for net-shape fabricated composites and the counterweight system currently required for metal closure doors may be eliminated. Finally, the lighter weight composite covers and doors provide easier installation and closure by the ship's hydraulics and crew.

The return on investment is based on 14 ships remaining in the class, an estimated minimal savings of $750K per hull for a return on investment of at least 9.1.

Implementation

The VCS Program Office (PMS 450) has funded a RTOC Block IV Sail task which is seeking to reduce the acquisition, assembly, and maintenance costs for the sail. In a coordinated effort with the RTOC Sail Task, the composite door cover and removable sail cap in this project will be non-destructively inspected using a calibrated ultrasonic inspection technique. Calibration blocks will be fabricated to facilitate the calibration of the proposed nondestructive inspection (NDI) method. Funding for TEMPALT installation and NDI calibration block fabrication will be part of the RTOC effort. If successful, full implementation will occur on SSN 792 in 2014.

PERIOD OF PERFORMANCE:
January 2011 to December 2012

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Composite Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$850,000

Alternate SHT Inspection Methods to Avoid Costs During VCS Construction

PERIOD OF PERFORMANCE:
October 2010 to December 2012

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Outfitting

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$499,000

S2363 — SHT Debond Detector

Objective

Special Hull Treatment (SHT) must be sufficiently adhered to the hull to permit longevity of the system and to ensure peak functional performance while in service. Debonding or delamination of the system can degrade both durability and performance. To ensure proper adhesion, quality inspections are completed after installation of the system. The current inspection process consists of manually tapping the SHT using a hammer to identify debonded areas, which is very subjective to the inspector performing the inspection. This Navy Metalworking Center (NMC) project is investigating the use of impulse hammers to increase the accuracy of detecting debonded areas. Use of an impulse hammer mimics the current inspection method; however, the input force and response are measured electronically instead of using human senses. Prototype test equipment is being generated as part of this project. Additional evaluation and possible modifications need to be completed to transfer this technology into the construction process for VIRGINIA Class submarines (VCS).

Payoff

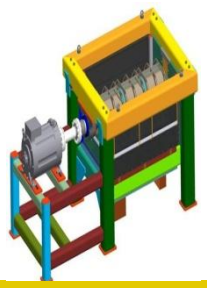
Identifying and correcting a debonded SHT area during VCS construction is significantly less costly than correcting the problem after delivery of the ship. During construction, the processing equipment, staging, and environmental controls are already in place. While the labor to correct the problem in dry-dock is similar to that during construction, additional effort is required to set up the equipment and staging area and to establish the proper environment in a dry-dock situation. A cost avoidance of $348K per hull may be realized by repairing SHT debonds during construction as opposed to after delivery.

Implementation

Detailed inspection procedures are being generated and used for training of inspection personnel, and construction references are being updated to identify the new inspection technique to be used during installation of the SHT system. Additional inspection systems must be procured by the shipbuilder to have sufficient testing capacity to support new construction. Implementation is planned for early 2013 at General Dynamics Electric Boat for SSN 786.

Shafting Material Recommendations Proposed to Enable Cost Reduction on VCS Main Propulsion Shafts

S2368-A-B — Improved Shaft Cladding Materials and Processes



Objective

The inspections of in-service VIRGINIA Class submarines (VCS) main propulsion shafts have revealed noticeable grooving of the electro-slag strip (ESS) cladding on the propulsor bearing journal. Naval Sea System Command (NAVSEA) is overseeing a series of coordinated efforts to investigate three individual tasks: (1) identifying the root cause and solution to the bearing journal wear; (2) increasing the VCS main propulsion shaft change-out periodicity to 96 months or more; and (3) developing technologies to provide the necessary background knowledge to achieve the goal of a 144-month shaft change-out periodicity for the Ohio Replacement Program (ORP).

The main objective of this project is to identify appropriate solution(s) to the bearing journal wear observed on the VCS main propulsion shafts that is capable of increasing the current shaft replacement cycle from 72 to no less than 96 months. The project will also develop and provide potential solutions for the mitigation of the grooving wear. In developing these potential solutions, Navy Metalworking Center (NMC) and the Institute for Manufacturing and Sustainment Technologies (iMAST) will combine the knowledge and the data obtained from the on-board instrumentation suite and use it to provide the Navy with realistic alternatives for improving the lifetimes of VCS main propulsion shafts.

Payoff

Cost savings originating from longer shaft operational lifetimes can be realized through two primary mechanisms: the increase in shaft change-out periodicity and the need for fewer spare shafts. The cost of each shaft change-out is calculated at $4M, including the labor and material for the replacement of the shaft itself ($3M) and the refurbishment at the vendor ($1M). Indirect cost savings can be attributable to the avoidance of costs involved in the procurement of additional shafts as the current 72 month change out schedule is increased to 96 months or beyond. Considering the cost of a spare shaft ($3.7M), additional savings can also be obtained by decreasing the number of spares.

Implementation

An Integrated Project Team (IPT) has been formed, consisting of Naval Surface Warfare Center, Carderock Division- Ships Systems Engineering Station (NSWCCD-SSES), Naval Sea Systems Command (NAVSEA), and General Dynamics Electric Boat (GDEB) to oversee shafting programs including this project. Jorgensen Forge and Erie Forge and Steel, Inc., as manufacturers of the main propulsion shaft for VCS will participate to facilitate transition and implementation of project results.

NMC will be primarily responsible for the materials testing and evaluation tasks and iMAST will be responsible for the fluid dynamics modeling and on-board instrumentation suite development tasks. Success begins when NMC and iMAST provide the Navy IPT with the required information regarding the properties of the journal bearing material and the fluid flow conditions in the bearing and also when the Navy implements a solution to the current bearing wear issue.

Note: This project is a joint COE effort between the Institute for Manufacturing and Sustainment Technologies (iMAST) and the Navy Metalworking Center (NMC).

PERIOD OF PERFORMANCE:

December 2010 to August 2012 (iMAST)
November 2010 to January 2013 (NMC)

PLATFORM:

VCS / Submarines

AFFORDABILITY FOCUS AREA:

Metals Processing and Fabrication

CENTER OF EXCELLENCE:

iMAST and NMC

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STAKEHOLDER:

PMS 450

TOTAL MANTECH INVESTMENT:

$349,000 (iMAST)
$2,574,000 (NMC)

Improved Inspection Technology to Reduce Total Ownership Costs for Submarines

PERIOD OF PERFORMANCE:
February 2011 to December 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Coating

CENTER OF EXCELLENCE:
iMAST

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STAKEHOLDER:
PMS 450
PMS 392

TOTAL MANTECH INVESTMENT:
$900,000

S2390-A — Nondestructive Corrosion Detection Under MIP

Objective

The project objective is to develop and demonstrate nondestructive technologies capable of detecting disbonds and corrosion between the Special Hull Treatment (SHT) coating and the hull structure to enable quality control of the original fabrication and to reduce labor / time content for maintenance operations. The reduction of total ownership cost (RTOC) and acquisition cost avoidance of initial MIP application will result from the implementation of rapid wide area inspection technologies at the Navy Maintenance Shipyards.

Current Nondestructive Inspection (NDI) procedures for assessing debonding and corrosion under SHT hull coatings are insufficient for shipyard implementation. Replacement procedures are time consuming, they rely on visual confirmation of adhesive bonding between the MIP and hull, are labor intensive and lack area mapping to locate hidden debonds prior to deployment and during maintenance cycles. The quantity of missing and partially debonded tiles pose an operational performance issue while the exposure of hull material to salt water may introduce a corrosion issue . Inspection technologies are required to detect and locate the debonded areas to help improve the SHT coating performance and maintenance.

Payoff

Inspection technologies are required to detect and locate disbonded areas to assess the initial fabrication improvements and long-term adhesion of the SHT coating performance. The primary project benefit will be the development and implementation of an inspection technology with enabling capability of initial evaluation and maintenance cycle assessment of the coating adhesive integrity. The current project will significantly reduce labor costs associated with rework and unplanned maintenance. It may also facilitate shorter maintenance times via the accurate location of disbonded areas. General Dynamics Electric Boat has estimated initial acquisition cost savings at $1M/hull with reduced total ownership costs (RTOC) of $855K/hull. Subsequent RTOC, based on reduced shipyard time and labor, suggest a return on investment at 6.5 over 5 years.

Implementation

Implementation will be through direct technology insertion at Pearl Harbor, Puget and Portsmouth Naval Shipyards. Pearl Harbor will be the primary planning and coordinating partner due to scheduled platform availability and immediate maintenance support needs. The aggressive three year development, demonstration and implementation schedule will rely heavily on established open communication between iMAST and the Navy Shipyards with support from the VIRGINIA Class Submarine Program Office and pertinent NAVSEA personnel and warrant holders. This allows the numerous design, development and fabrication tasks at iMAST to be rapidly evaluated and frequently reported to the shipyards and other team members. Demonstrated engineering solutions will be selected and reviewed for implementation at the shipyards. Additional early implementation may assist the maintenance shipyards with unplanned inspection and rework tasks. Implementation will be through technology insertion at shipyard maintenance facilities, scheduled for second quarter FY13.

Improved On-Hull Pipe Assembly Processes to Save Costs in VCS Construction

S2398 — Pipe Assembly Installation Improvements

Objective

VIRGINIA Class submarines (VCS) currently require approximately 45,000 labor hours to install piping assemblies on-hull due to extensive manual preparation, fitting, aligning and welding process steps. The objective of this Navy Metalworking Center project is to reduce the labor hours of on-hull manual pipe assembly installations and associated welding processes by a minimum of 20 percent per hull (9,000 man-hours per hull). Candidate tooling concepts will be generated to improve methods for pipe assembly installation fit-up, fixturing, and positioning, and/or to allow for the extended use of automated welding equipment. Tooling concepts will be down-selected to fabricate prototypes for bench-top testing. Initial results will be used to generate second article prototypes for test and evaluation in the VCS Modular Outfitting Facilities (MOFs) to confirm effectiveness in reducing labor time and cost. This project leverages the success of the recent VCS Small (S2224) and Large Diameter Pipe Process Improvements (S2326) projects.

Payoff

VCS installation process improvements will decrease the cost of preparing, fitting, welding, and repairing on-hull installation pipe assemblies and details by 20 percent or greater, equivalent to 9,000 man-hours per hull. Utilizing a conservative hourly rate of $65 per hour equates to projected savings of $600K per ship.

Implementation

Validation of the developed prototypes will be completed via evaluation in the VCS MOFs. Implementation is expected at both General Dynamics Electric Boat and Huntington Ingalls Industries - Newport News Shipbuilding for use in the construction of SSN 788 in early FY 2014.

PERIOD OF PERFORMANCE:
November 2011 to October 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Automated Tools

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$1,323,000

Lead Installation Processes to Reduce Labor Related Costs

PERIOD OF PERFORMANCE:
April 2012 to April 2014

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
CNST

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$491,000

S2407 — Lead Installation Process Improvement

Objective

The objective of the Lead Installation Process Improvement project is to identify, review, and select processes to improve current lead installation procedures for VIRGINIA Class submarine (VCS) construction. The goals of the project team are to reduce man-hours, improve lead installation efficiency, and minimize or eliminate hazardous work procedures for lead shielding installation.

General Dynamics Electric Boat (GDEB) will execute a two-phase project with incremental implementations as the project results allow. The first phase effort will focus on the development of a current state map, the investigation of alternative methods and equipment / material that support VIRGINIA contractual requirements, and the development of a desired future state map. These maps will support conduct of a gap analysis review to identify the most significant areas of opportunity for improvements in lead installation cost, cycle-time performance, and environmental compliance. Phase 2 will focus on those Phase I opportunities deemed promising for implementation and will include conducting prototype evaluations and creating an implementation plan with validated business case. GDEB will investigate three areas specific to lead installation (lead caulking, lead pouring, and lead bin outfitting) to determine if more efficient processes exist that provide increased safety.

Payoff

For VCS construction, the estimated savings of this project is 3,000 man-hours and $277K per hull for an estimated return on investment in 2.3 hulls. Findings from this project will be applicable and beneficial to construction activities at other major shipyards and easily extended to commercial and other combatant platforms.

Implementation

Upon successful completion of this project and acceptance of the technology and associated business case by the acquisition Program Office (PMS 450), the results will be transitioned to the VIRGINIA Class Submarine Program at the GDEB – Quonset Point facility. The anticipated target date of implementation is third quarter FY14.

VCS Non-Metallic Sail Trailing Edge to Lower Acquisition and Maintenance Costs

S2414 — VCS Non-Metallic Sail Trailing Edge

Objective

The existing VIRGINIA Class submarine (VCS) sail trailing edge is very susceptible to corrosion over the lifetime of the submarine resulting in significant maintenance costs. The existing steel trailing edge is also labor-intensive to manufacture, resulting in high acquisition cost. The project objective is to develop and demonstrate an innovative manufacturing process for the non-metallic VCS Sail Trailing Edge that will meet all requirements, have lower acquisition costs, and address maintenance issues. In order to accomplish this, a project plan has been developed to design prototype trailing edge concepts that can be structurally tested to verify performance.

Payoff

The principal benefit from this project will accrue from potential acquisition and life-cycle cost reduction due to implementation of a non-metallic corrosion-resistant sail trailing edge that is less expensive to fabricate and install and reduces the amount of maintenance required per scheduled maintenance interval and results in reduced periodicity of maintenance over the life of the ship. Assuming implementation to start with Block IV of VCS and a 30 ship class, this equates to a potential total $600K class acquisition cost savings and a total ownership cost savings of up to $3.9M.

Implementation

Implementation of a platform-ready solution is contingent upon successful achievement and Program Office acceptance of the project objective identified in the program technical plan. Critical to implementation is regular interaction with PMS 450. Once the critical manufacturing process trials have been completed, a decision will be made on proceeding with the prototype Non-Metallic Sail Trailing Edge fabrication. Process specifications, process routers, assembly processes, inspection procedures and material specifications will be produced as project deliverables. The TEMPALT documentation will be submitted to NAVSEA for approval. Assuming NAVSEA approval and funding for the TEMPALT and successful completion of the TEMPALT, steps to make the change permanent will be taken. Insertion is planned for starting with SSN 792 in 2014.

PERIOD OF PERFORMANCE:
July 2012 to November 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Composite Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$742,000

Improved Welder Productivity to Result in Cost Savings of $1.28M per VCS Hull

PERIOD OF PERFORMANCE:
January 2012 to April 2014

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Facilities and Industrial Processes & Automated Tools

CENTER OF EXCELLENCE:
CNST and iMAST

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$768,000 (CNST)
$424,000 (iMAST)

S2454-A-B-1 — Improved Welder Productivity Phase 1

Objective

The overall objective of this project is to identify inefficiencies and propose potential process improvements / technologies to reduce welder start-up time and rework and increase welder output in VIRGINIA Class submarine (VCS) construction. The current welding start-up process takes up to 1.5 hours due to the series of requirements checks.
This project will consist of a two-phased approach. The first phase consists of a comprehensive investigation of the current welder start-up process to identify the time drivers to get a welder fully prepared to execute welds at the start of their shifts. Upon completion of the investigation, improved processes will be proposed to increase welder productivity. In addition, a market survey will be conducted to identify the current state of welding equipment technology that could provide additional process improvements and specification adherence assurance.

The second phase will focus on targeted, small-scale pilot testing of process improvements identified in Phase 1 and will involve the implementation of rapid-response initiatives to reduce inefficiencies in the current start-up procedures. The second phase will also include the development of a pilot "Smart Welder" system that leverages state-of-the-art technologies in welding equipment. The Smart Welder system will include weld machine and computing hardware capable of providing the necessary information to the welder to actually begin welding, as well as the required software and data interfaces to extract that data from existing systems at General Dynamics Electric Boat (GDEB).

GDEB's "Zero Tolerance" policy is aimed at achieving 100% compliance to weld specifications with no rework while increasing welder arc time by improving daily start-up tasks. The results of this project will ensure welders meet specifications prior to actually completing welds. Additionally, this project will automate the numerous manual "checks and balances" that are required to ensure procedure compliance which will improve productivity.

Payoff

There are estimated to be 400 welders and 30 supervisors at GDEB that spend time preparing welding assignments. It is estimated that 0.4 hrs/day for welders and 0.5 hrs/day for supervisors will be saved with a successful implementation of the proposed welding system. The estimated cost savings of this project is $1.28M per VCS hull. Additionally, findings from this project would be applicable and beneficial to construction activities at other major shipyards.

Implementation

New technologies will be implemented at GDEB - Quonset Point facility at appropriate insertion points during third quarter FY14.

Note: This project is led by the Center for Naval Shipbuilding Technology (CNST) with portion of the work performed by the Institute for Manufacturing and Sustainment Technologies (iMAST).

Mechanized Backgouging System Will Improve Weld Joint Quality and Reduce VCS Hull Fabrication Cost

S2467 —Hull Fabrication Improvement Phase 3

Objective

This project will develop a portable, production-hardened, track-based plasma arc backgouging system for VIRGINIA Class submarine (VCS) hull butt joints. This system design will be an extension of the robotic welding technology that was successfully demonstrated in Phase II of a prior ManTech project (S2197) executed by the Navy Joining Center and will use the same track from that mechanized welding system. Phase III will focus on hardening the backgouging system components against electromagnetic noise and physical hazards and integrating these components with a simpler control system on a dedicated carriage. The system will be tested on a hull butt weld joint, production schedule permitting.

Payoff

As a result of implementing this technology for backgouging the hull weld joints, General Dynamics Electric Boat (GDEB) estimates a three percent savings in overall welding labor hours is possible. This savings is a result of an overall increase in efficiency of the backgouging method, consistent backgouge profile allowing for more efficient welding, reduced grinding time, and reduced set-up time. A small compression in schedule (approximately 14 days) also allows other trades to begin their work earlier. The net impact is a total labor reduction of 910 man-hours per ship.

Implementation

The prototype system is expected to be available for training or as a back-up system at GDEB Quonset Point by early 2014. GDEB will procure two production backgouging systems from the commercialization partner, Servo-Robot, for use in its Quonset Point assembly plant for preparing VCS hull butt joints, starting in the spring of 2014.

PERIOD OF PERFORMANCE:
January 2012 to January 2014

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Automated Tools

CENTER OF EXCELLENCE:
NMC

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PMS 450

TOTAL MANTECH INVESTMENT:
$770,000

Improved Abrasives to Reduce Costs in VIRGINIA Class Submarine Construction

PERIOD OF PERFORMANCE:
February 2012 to September 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Outfitting

CENTER OF EXCELLENCE:
NMC

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PMS 450

TOTAL MANTECH INVESTMENT:
$841,000

S2471 — Improved Abrasive Technology

Objective

Recent advancements in abrasive technologies have greatly improved productivity in many industries, but these advancements cannot be easily transferred to nuclear shipbuilding due to stringent regulation and control of support material to mitigate risk associated with cleanliness and detrimental material introduction. Significant savings associated with decreased labor, improved abrasive life, and reduced fatigue and injury due to less vibration are all possible if improved abrasives can be implemented during construction of VIRGINIA Class submarine (VCS) hulls.

The objective of this Navy Metalworking Center project is to ensure industry can manufacture abrasives with improved properties, including increased material removal rates and increased abrasive life, while meeting cleanliness and detrimental material requirements associated with nuclear shipbuilding. The Integrated Project Team will establish requirements, identify candidate abrasives for the selected applications, perform technical evaluations, work with the manufacturers to perform modifications if necessary, and conduct production evaluations of the final selected abrasives to verify project metrics are being met.

Payoff

Improved abrasive technologies that will allow shipbuilders to remove material faster, with less fatigue, fewer injuries, improved hygienic conditions, and will provide a cost savings to the VCS Program, will occur as a result of this project. Current cost savings are estimated to be $700K per hull, which includes a 7.5 percent labor reduction in operations utilizing improved abrasives at General Dynamics Electric Boat (GDEB). Additional benefits may be realized for overhaul activities.

Implementation

Implementation will be organized through the Tool Crib at GDEB in support of SSN 784. The results will initially be implemented as a pilot program in late 2013 for a six-month period to minimize potential impact on shipbuilding activities should problems arise. If the pilot program is successful, then full implementation will occur. It is expected that all baseline abrasives on-hand will be consumed prior to full implementation of the advanced abrasives.

Improving Electrical Cable Installation to Result in a Twenty Percent Labor Hour Reduction

S2472 — Improved Cable Routing Tools

Objective

During ship construction, the installation of electrical cable, or cable pulling, is an expensive, labor-intensive, and injury-prone operation. This Navy Metalworking Center (NMC) project is developing innovative solutions that will reduce labor costs and injury claims associated with installing electrical cables in VIRGINIA Class submarines (VCS). The Integrated Project Team (IPT) will investigate cable routing process improvements in two areas. First, the IPT will identify possible improvements and/or modifications to the current cable routing practices and methods at General Dynamics Electric Boat (GDEB) shipyards. Second, the IPT will develop easy-to-use, small, lightweight, portable tools that can be used to pull portions or entire lengths of cables, decreasing the effort required for these operations whenever possible. The tools will also reduce the amount of effort required to route cable through bends. Since these tools are not commercially available, the IPT will work with industry to generate concepts for consideration. Candidate concepts will be down-selected for prototype development, evaluation, and implementation. Industry involvement not only provides viable options to the solution, but their engagement early in the project will help to identify a potential industry partner to support the technology commercialization.

Payoff

The project's objective is to reduce the labor hours associated with routing cables on new VCS construction by at least 10 percent. In addition to the labor reduction, the technology has the potential to reduce injury claims and medical costs.

Implementation

Project results will be implemented initially on SSN 790 by the end of the first quarter FY15. Project results will eventually be implemented at both GDEB-Groton and GDEB-Quonset Point.

PERIOD OF PERFORMANCE:
June 2012 to December 2014

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Outfitting

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$2,125,000

Development of VCS Composite SOF Bin Doors has Potential to Save $90K per Hull

PERIOD OF PERFORMANCE:
June 2012 to January 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Composite Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$250,000

S2491 — VCS Composite Sail SOF Bin Doors

Objective

The SOF (Special Operation Forces) Bin Doors on the VIRGINIA Class submarine (VCS) are currently constructed as a composite plate with a metal framework. In use, the metal frame corrodes and requires replacement throughout the life of the boat. Replacing the composite metal framework door with an all-composite option, via a low-cost, structurally robust, net-shape SOF Bin Door which meets all of the performance requirements within the existing geometric envelope and without changing any of the other features, would result in a significant reduction in the maintenance costs for these doors.

This ManTech Mega Rapid Response effort will develop and demonstrate the composite manufacturing technology needed for SOF Bin Doors to meet performance requirements and reduce acquisition and maintenance costs. The goal is to demonstrate that an all-composite SOF Bin Door will be acceptable for insertion in the Block IV Sail and will result in reduced total ownership cost. Disparate material interface design as well as material and manufacturing lessons learned from legacy ManTech Submarine Cover Plate and Sail Cusp and ongoing Sail Cap Cover efforts will be leveraged to the maximum extent possible to mitigate process development risks.

Payoff

The acquisition cost of the doors will be cost-neutral while the reduced total ownership cost (RTOC) of the doors will save $90K per hull. This corresponds to a total savings of $1.1M or a return on investment (ROI) of 3.6.

Implementation

The VCS Program Office (PMS 450) has funded a RTOC Block IV Sail task which is seeking to reduce the acquisition, assembly and maintenance costs for the Sail. While the RTOC Sail effort can perform some trade-off studies to evaluate different all-composite designs for the SOF Bin Doors, manufacturing prototype(s) will be required to demonstrate the ability to fabricate all-composite doors which will meet all performance requirements and remain affordable. The ManTech project will be closely coordinated with the RTOC Block IV Sail task so that the prototype(s) will be used for performance testing and TEMPALT (Temporary Alterations) insertion. The TEMPALT is targeted for SSN 785 in 2013 and full implementation on SSN 792 in 2014.

Composite Sail Flood Ports to Result in Reduced Acquisition, Installation, and Maintenance Costs

S2492 — VCS Composite Sail Flood Ports

Objective

Existing VIRGINIA Class submarine (VCS) steel and rubber sail flood grates are both bolted to the sail and have significant corrosion and maintenance issues. Louvered composite sail flood ports (SFPs) would reduce acquisition, installation, and maintenance cost for these items. This ManTech effort will develop and demonstrate the low-cost composite manufacturing technologies needed for these complex geometries while meeting all performance requirements and leverage the ongoing NAVSEA Block IV Reduced Total Ownership Cost (RTOC) Sail Effort.

Payoff

The principal benefit that will accrue is both acquisition and life-cycle cost reduction due to implementation of composite, corrosion resistant SFPs. These SFP are less expensive to fabricate and install and reduce the amount of maintenance required per scheduled maintenance interval as well as reduce the periodicity of maintenance over the life of the submarine. This project will also provide a reduction in weight (i.e. improved stability). Assuming implementation to start with Block IV of VCS and a 30 ship class, the cost savings equate to a $516K per VCS hull acquisition cost savings, $4.73M life-cycle savings, and $5.25M total savings respectively assuming a production insertion starting with SSN 792. The resultant return on investment is 7.1.

Implementation

Implementation of a platform-ready solution is contingent upon successful achievement and program office acceptance of the project objective identified in the project's technical plan. Critical to implementation is regular interaction with PMS 450. Once the critical manufacturing process trials have been completed, a decision will be made on proceeding with the prototype fabrication. Process specifications, process routers, assembly processes, inspection procedures and material specifications will be produced as project deliverables. Assuming a successful ManTech project, NAVSEA approval and funding for the TEMPALT and successful completion of the TEMPALT steps (to make the change permanent) will take place in the RTOC Block IV Sail Project with insertion starting with SSN 792 in 2014.

PERIOD OF PERFORMANCE:
July 2012 to June 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Composite Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$400,000

Safe Non-skid Removal System for VIRGINIA and SEAWOLF Class Submarines to Reduce Cost

PERIOD OF PERFORMANCE:
March 2012 to September 2013

PLATFORM:
VCS / Submarines

AFFORDABILITY FOCUS AREA:
Coating

CENTER OF EXCELLENCE:
iMAST

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PMS 450

TOTAL MANTECH INVESTMENT:
$548,000

S2494 — Improved Topside Non-Skid Removal for VIRGINA Class and SEAWOLF Class Submarines

Objective

Current non-skid coatings applied over Special Hull Treatment (SHT) on VIRGINIA and SEAWOLF Class submarines are prone to cracking and disbonding, particularly in way of seams. Even in the absence of cracking and disbonding, non-skid is often re-applied over existing non-skid coatings for cosmetic reasons. Repair yards and intermediate maintenance facilities (IMFs) understand that the customer will demand uniform-looking topsides and further understand that 100% removal and reapplication is necessary to accomplish this. These situations necessitate frequent pier-side non-skid coating repair (removal and re-installation). Pier-side non-skid removal is typically performed using hand-sanders and/or grinders. Abrasive blasting using coal slag has been used for non-skid removal in drydock. All of these techniques are prone to causing damage to the underlying SHT. This, in turn, necessitates repair of the SHT material, thereby incurring additional cost and labor to restore the SHT in way of the removed non-skid. Current removal rate using 24-36 hand sanders and grinders is ~ 6 ft2 / hour. Target removal rate using the new tools is anticipated to be between 60 – 100 ft2 / hour.

The objective of this project is to develop, test, demonstrate, transition and implement a non-skid removal tool (or tools) capable of removing non-skid from VIRGINIA Class and SEAWOLF Class submarines without causing damaging to the underlying SHT. Ultra-high pressure (UHP) waterjet and impact-based hammer-mill type removal devices shall be investigated. Both processes shall take advantage of the compliance mismatch between non-skid coatings and the underlying substrate. These two technologies (UHP waterjet and hammer-mill) will be evaluated independently and in combination.

Payoff

This project has cost-saving ramifications in both new acquisition and repair. Acquisition cost savings accrue from labor reduction associated with removal and repair of non-skid by the shipbuilder prior to final delivery. Maintenance and repair cost savings accrue from labor reduction associated with non-skid removal, erection of containments, cleanup of spent abrasive and waste disposal. Total cost reduction on the order of $336K per each non-skid removal job is expected. Cost savings are based upon abrasive blast removal during maintenance availabilities. Assuming two non-skid removal jobs per year, the 5-year return on investment is approximately 6:1.

Implementation

The project team includes end-user personnel from PSNSY & IMF and PHNSY & IMF. Subject-matter experts and technical warrant holders (SHT / MIP-SHT and Coatings) have been briefed and are involved in this project. Program Offices (PMS 392, PMS 450) have been briefed. A UHP waterjet system designer- manufacturer has been recruited to participate. Implementation is targeted for the fourth quarter FY 2013.

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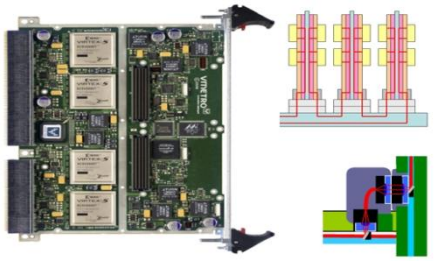
NAVY MANTECH
Manufacturing Technology Program

Joint Strike Fighter Projects

Cost Savings through the Use of Optical Interconnects for JSF



Optical transmission at the printed wiring board level

PERIOD OF PERFORMANCE:

January 2012 to January 2015

PLATFORM:

Joint Strike Fighter

AFFORDABILITY FOCUS AREA:

Electronics Processing and Fabrication

CENTER OF EXCELLENCE:

EOC

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STAKEHOLDER:

PEO (JSF)

TOTAL MANTECH INVESTMENT:

$2,855,000

A2337 – Photonic Printed Wiring Board

Objective

The objective of this project is to develop electronics using optical interconnections with focus on the Joint Strike Fighter (JSF) Integrated Core Processor (ICP). The project will develop manufacturing processes to facilitate this, while redesigning the ICP Fibre Channel Switch (FCS). This project will develop new manufacturing technologies that will enable both electrical and optical signal transmission in ICP modules.

Payoff

The JSF ICP demands extremely high performance processing that will utilize optical interconnects. Success of this effort will prevent processing systems from becoming I/O bound and therefore realizing higher performance for a constant Size, Weight, and Power (SWaP). The programs that will benefit are those that demand high performance at a minimal SWaP, including F-35, F-18, E-2D, UCLASS, BAMS, and MMA.

The initial benefit is for the JSF F-35 ICP module, the Fibre Channel Switch (FCS). The program cost savings is estimated at $117.4M for a projected return-on-investment of 11.5 and payoff within one year of insertion. This cost benefit analysis (as well as the assumptions used) will continue to be updated / tracked and reported at each project quarterly review.

Implementation

The transition event for this project will occur with the prototype build of the JSF ICP FCS module prototype and proof that manufacturing processes can produce interconnect systems that meet performance requirements. The FCS switch sits at the center of the F-35 Mission Systems Network and provides 32 Fibre Channel interfaces for module-to-module and system-to-system communication. A demonstration of the FCS module using Photonic PWB manufacturing technologies, validated against performance and environmental requirements, will be the project acceptance criteria for approval by the Joint Program Office representative.

This ManTech project will develop the photonic printed circuit board technology and manufacturing processes specifically intended for use within the F-35 ICP FCS module, provide performance testing and a limited set of environmental tests intended to bring qualification risk to an acceptable level. The JSF Program Office will fund the development of an Engineering Change Package designed to coordinate configuration changes and qualification activities which are necessary to accomplish incorporation of the new design and its integration into a future JSF ICP build. The Joint Program Office will also fund the build of production JSF ICPs which are configured with the Photonic Printed Wiring Board technology. Implementation is targeted for the JSF Mission Systems Avionics Suite with the planned production insertion point the first year of Multiyear Buy 1, beginning in FY16.

F-35 Canopy Thermoforming Automation Saves Over $75M

A2346-A-B — F-35 Canopy Forming Thermoforming Automation

Objective

F-35 and other military aircraft require large, thermoformed stretched acrylic canopies for mission success. The canopies are critical for pilot vision, interface with night vision and helmet mounted sights and low-observable (LO) performance through shape and coating systems. The F-35 Canopy is a significant advancement in size, shape and dimensional tolerances compared to legacy transparencies. The F-35 requires a transparency that will simultaneously satisfy demanding optical requirements, withstand severe bird impact events and provide acceptable LO performance. These design drivers result in a large, single-piece stretched acrylic canopy with an integral laminated windshield section and external coatings. The F-35 canopy is one of the largest thermoformed transparencies in the industry and requires a demanding, high temperature process to meet optics and thickness tolerances.

The objective of this project is to develop an automated method of controlling and monitoring the thermoforming process to: (1) reduce manual intervention, (2) cut thermoforming cycle time by as much as 30%, (3) reduce overall costs by 5-10% and, (4) improve the optical quality of the canopies after forming and increase capacity of existing tools and facilities. Achieving this will result in significant cost savings to the F-35 project over the aircraft life cycle.

Payoff

Total savings are estimated at $75M in recurring canopy procurement, $1.4M in non-recurring PNR tooling costs and 30-50% reduction in the forming and clean-up manufacturing cycle times. These improvements are significant, especially as manufacturing capacity has been a concern on legacy canopy and windshield programs in the past.

It should yield a reduction in recurring production costs with a savings to the government of $75M over the life of the aircraft assuming that the transparency and associated systems (frame, severance systems and finishes) achieve the design life of 2,000 flight hours or five years of service. A return on investment (ROI) of 67 is expected. If the canopy lifetime is three years, then as many as 30,000 canopies would be required over a 30 year aircraft service life. This would provide a $150M savings to the program. A ROI of 132 is expected.

Implementation

The technology developed under this ManTech program is expected to be implemented at GKN where production canopies are currently being produced for the F-35. The Technology Transition Plan has been approved by all necessary organizations. GKN ATS will implement the processes developed in this project to the existing F-35 thermoforming tools and equipment starting in December 2012 for demonstration purposes. Implementation is expected to occur in the LRIP 7 time frame.

Note: This project is led by the Composites Manufacturing Technology Center (CMTC) with a portion of the work performed by the Institute for Manufacturing and Sustainment Technologies (iMAST).

PERIOD OF PERFORMANCE:

December 2010 to December 2012 (CMTC)
January 2012 to July 2013 (iMAST)

PLATFORM:

Joint Strike Fighter

AFFORDABILITY FOCUS AREA:

Composites Processing and Fabrication

CENTER OF EXCELLENCE:

CMTC and iMAST

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STAKEHOLDER:

PEO (JSF)

TOTAL MANTECH INVESTMENT:

$1,377,000 (CMTC)
$53,000 (iMAST)

Development of System-on-Chip RF Tuner Reduces Unit Recurring Flyaway Costs for JSF

PERIOD OF PERFORMANCE:
March 2010 to September 2013

PLATFORM:
Joint Strike Fighter

AFFORDABILITY FOCUS AREA:
Electronics Processing and Fabrication

CENTER OF EXCELLENCE:
EMPF

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STAKEHOLDER:
PEO (JSF)

TOTAL MANTECH INVESTMENT:
$3,917,093

A2347 — Joint Strike Fighter System-on-Chip RF Tuner Manufacturing

Objective

In the continuous drive to improve Unit Recurring Flyaway (URF) costs on the F-35 Joint Strike Fighter (JSF), technology advancements are being developed and incorporated into the redesign of existing modules. These changes may be driven by various circumstances such as Diminishing Manufacturing Source (DMS) events, additional required capability enhancements, or straight cost trades. The RF Tuner System-on-a-Chip (SoC) concept consists of a redesign that is driven by DMS and capability demand. A very real benefit of cost savings due to this redesign is also a factor. Manufacturing materials selection and process development for the use of these SoC devices in the extreme military environments are required to ensure the same level of excellence in military applications benefited by standard commercial technology products in today's industry. This ManTech effort entails material evaluation and downselect as well as the development of manufacturing processes that can withstand the military environments, while assuring low-cost, repeatable manufacturing of SoC devices.

The primary goal of this project is to identify and develop manufacturing processes and materials that will mature the Manufacturing Readiness Level (MRL) associated with the SoC technology from an MRL 4 to MRL 5. This project will result in a material selection guide and manufacturing process for the assembly of SoC devices that facilitate the developed technology's move up the MRL curve, enabling its implementation into JSF production. The results of this project will also be shared with the DOD industry, enabling a wider use of the cost, power, and capability enhancements offered by SoC technology. This can speed up the adoption of this new technology by other defense equipment producers to magnify the payback on this investment by eliminating costly duplication efforts in maturing processing of SoC-based hardware materials and processes.

Payoff

The redesign for DMS replacement will cost approximately $24M with no additional capability. Replacement of the DRFM suite with BAE Systems DCR/TG approach will yield added performance capability mandated to meet the more stringent Block 4/5 performance enhancement requirements, as well as achieve size, weight, and URF cost savings. A key component to this suite is a Quad Tuner which utilizes SoC technology. Savings are estimated at $410K per shipset. Based on current production quantity projections, LRIP-9 savings are projected to be $38M across a quantity of 93 JSF systems, LRIP-10, $62M across 150 systems, and LRIP-11, $67M across 163 systems.

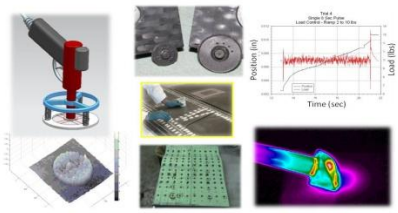
Implementation

The results of this Navy ManTech project will be implemented as part of a hardware upgrade to the EW system for the JSF. BAE supplies the JSF EW suite to Lockheed Martin. The hardware upgrade is currently planned for cut-in during LRIP-9. Though the EW Suite for LRIP-9 has not been formally specified, it is expected that the use of the SoC-based RF Tuner will play a critical role in the LRIP-9 hardware upgrade. The SoC-based RF Tuner meets the product affordability and performance improvements specified by the JSF roadmap.

Faster Fastener Filling on F-35 Offers Significant Cost Savings Opportunity

A2348 — F-35 Fastener Fill

A2510 — MEGA RR – F35 Fastener Fill



Objective

All fastener heads on the exterior of the F-35 aircraft must be filled with a specialty compound. This is achieved either by; (1) applying a two part thermosetting material that must be allowed to cure before finish sanding or (2) melting a thermoplastic disk or 'hot dot' into the head and then leveling. The current methods used to complete these processes are time consuming and prone to error. Materials and methods are needed that will facilitate much faster manual filling processes and similarly efficient finishing operations. The current processes will not meet rate requirements beyond Low Rate Initial Production. Problems exist with both thermosetting (paste) and thermoplastic ("hot-dot") processes. The integrity of the adhesion between the fastener and the fill material must be robust. The overall goal of this program is to identify materials and methods that reduce the touch labor involved in the fastener filling processes. This will be achieved by thorough characterization of the fastener filling materials in terms of their processing behavior and devising methods that reduce cycle time. In collaboration with Lockheed Martin (LM), Northrop Grumman (NG) and other organizations, iMAST is seeking to devise, analyze and evaluate both materials and processing methods that may be used to reduce the time required. Currently the standard fastener filling processes require approximately three minutes of touch labor to complete; of this, approximately one to two minutes is required to complete the filling of the fastener head. The specific goal of this project is to reduce fastener fill time by one minute per fastener. It is important to note that this ManTech activity seeks to address both paste and hot-dot processes. All potential cycle time reduction approaches will be explored, including critical path optimization, heat activation of curing processes, rapid heating/melting techniques, increased sanding or skiving rates or material modifications. A Rapid Response project focused on ultrasonic heating is underway. Fill times on the order of six seconds have been demonstrated using this approach.

Payoff

All full rate production (FRP) aircraft (approximately 2,500) will be impacted by developed technology. A total of 43,000 fasteners need to be filled on each aircraft. Current processes take around three minutes per fastener. A one minute reduction provides approximately 90 days reduction in touch labor or $140K per aircraft. Therefore the total estimated program cost savings is on the order of $350M.

Implementation

This project is structured in a fashion that will allow technical cognizants at both LM and NG to assess developed technology and transition to production operations. Therefore the transition path will be direct technology insertion at F-35 plants. As the iMAST initiative has neared completion, technology interchanges have increased. Ideas gleaned from a process time study yielding a critical path optimization approach are currently being evaluated at the LM Johnstown, PA facility. Similarly, recently identified ultrasonic hot-dot fastener filling technology will soon be demonstrated at LM, Fort Worth, TX.

PERIOD OF PERFORMANCE:

August 2010 to January 2013 (iMAST)
April 2012 to December 2012 (CMTC)

PLATFORM:

Joint Strike Fighter

AFFORDABILITY FOCUS AREA:

Coatings and Composites Processing and Fabrication

CENTER OF EXCELLENCE:

iMAST, CMTC

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STAKEHOLDER:

PEO (JSF)

TOTAL MANTECH INVESTMENT:

$659,000 (iMAST)
$440,000 (CMTC)

Note: This project is a joint COE effort between the Institute for Manufacturing and Sustainment Technologies (iMAST) and the Composite Manufacturing Technology Center (CMTC).

Male Cure Tool and Pre-Cured Filler Reduces Cost of Fabricating F-35 Tight Radius Parts

PERIOD OF PERFORMANCE:

November 2011 to June 2013

PLATFORM:

Joint Strike Fighter

AFFORDABILITY FOCUS AREA:

Composites Processing and Fabrication

CENTER OF EXCELLENCE:

CMTC

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STAKEHOLDER:

PEO (JSF)

TOTAL MANTECH INVESTMENT:

$1,252,000

A2416 — F-35 Tight Radius Integrated Composites

Objective

Vehicle performance requirements for next generation combat aircraft result in a design that yields component parts with tighter radii requirements. Add tighter tolerance requirements and the result is increased fabrication complexity, tooling complexity, recurring manufacturing, and quality requirements. The F-35 composite chine part family falls into this category. The chine radii, along the leading edge of the part, have proven to be very challenging to manufacture. This is compounded by the fact that the parts are very deep with acute angles making them even more difficult to manufacture. Each F-35 variant has a pair of chines and has been experiencing various inner mold line (IML) defects along the radii. These non-conformances result in additional material review (MR) activity from additional stress analysis, repair, and occasionally a scrapped part.

The solutions identified to resolve the non-conformances are related to design for manufacturing (DFM) The solutions include orientation / ply sequence changes, interleafing film adhesive between the plies, and pre-curing the filler. This project will address some of these non-conformances through a cure process change, while some of the defects will be addressed through a pre-cured filler design change.

Payoff

If a more robust design and manufacturing approach were to be implemented today, the F-35 Program could save at least $23M over the life of the program. The design / manufacturing changes will be coordinated with concurrent design changes so that, the implementation costs can be dramatically reduced.

Implementation

Once the chine process improvement is demonstrated, the implementation of all process changes will be implemented through the F-35 Change Implementation Process (CIP) for approval. Implementation is targeted for LRIP6 in 2014.

Molded Inserts for Actuating Doors Results in Significant Cost Savings for F-35

A2442 — F-35 Molded Inserts for Actuating Doors

Objective

The focus of this project is to reduce costs and span times for fabricating inserts for actuating doors for all F-35 Joint Strike Fighter (JSF) variants. The current inserts are made with many plies of conventional fabric pre-preg material and are labor intensive and costly to manufacture.

The affordable solution to reducing insert cost and manufacturing span time is to mold the inserts out of sheet-molding type compound to reduce the number of plies, reduce the amount of machining, and reduce the amount of touch labor. This project will utilize the F-35 Program's current engineering loft information to keep the demonstration parts as representative as possible for the molded inserts. The scaled-up cobonded Weapons Bay Doors (WBD) will utilize JSF materials and current engineering loft information. Strength and stiffness evaluation testing will be performed to down-select to the preferred molding material(s) for further evaluation and then for final demonstration. The inserts for these parts will be fabricated at a domestic supplier.

Payoff

The cost savings are estimated at $32.4 M cost savings with a total project return on investment of 38.

Implementation

Once the insert strength, insert process development, and producibility demonstration article have been demonstrated, the implementation will be executed through the F-35 Change Implementation Process (CIP). Implementation is targeted for LRIP7 in the third quarter of 2015.

PERIOD OF PERFORMANCE:
June 2012 to April 2014

PLATFORM:
Joint Strike Fighter

AFFORDABILITY FOCUS AREA:
Composite Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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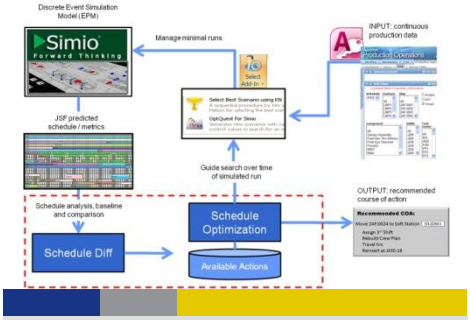
STAKEHOLDER:
PEO (JSF)

TOTAL MANTECH INVESTMENT:
$1,997,000

Decision Support System to Aid Decision-Makers to Support JSF Production



PERIOD OF PERFORMANCE:
February 2011 to February 2013

PLATFORM:
Joint Strike Fighter

AFFORDABILITY FOCUS AREA:

CENTER OF EXCELLENCE:
iMAST

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STAKEHOLDER:
PEO (JSF)

TOTAL MANTECH INVESTMENT:
$480,000

A2446 — Simulation-based Decision Support System for JSF Production

Objective

Lockheed Martin Aeronautics Company (LMAC) is in the process of ramping up production on the F-35 Joint Strike Fighter (JSF). Although LMAC has this capability, it is extremely time-consuming to perform the significant number of simulation runs to find the issues and even more time-consuming to perform the experimentation required to develop a model-based contingency plan. The objective of this project is to implement a simulation-based Decision Support System (SBDSS) that will automate the analysis and experimentation activities to aid the analyst and other decision-makers. The SBDSS integrates an optimization routine, or integrated search procedure, with the EPM to find the best operational values for station and factory capacity. Furthermore, the SBDSS will include time phased optimization of capacity and stochastic variation when optimizing, thus accounting for risk levels when proposing an optimal or near optimal solution.

Payoff

The long-term benefit of a SBDSS will be manifested in advanced planning techniques while a short-term benefit will be seen in reductions in the number and length of production delays. Two types of cost savings are expected from this project: (1) decreased downtime (cost avoidance) and (2) decreased re-planning (cost savings).

SBDSS implementation is expected to reduce lost days by approximately 50%. The cost avoidance due to workstation inefficiencies being decreased is projected to be $3.67M/year. Cost savings due to expedited re-scheduling reviewing is projected to be $173K/year. This results in a five-year net present value return on investment of 18.6:1.

Implementation

A prototype Simulation-Based Decision Support System has been developed and transitioned to LMAC. Incremental improvements have been made to the prototype to enhance the capabilities and overall decision-making ability. The current prototype system in transition at LMAC incorporates the search algorithm and the ability to plan station capacity over time to reflect a ramp-up capacity plan.

The prototype SBDSS will be enhanced such that it can be executed by multiple users in a production environment to answer a variety of queries by shop level supervision as well as production management. The final SBDSS will be delivered in February 2013 and will include the ability to perform detailed, multiple replication simulation analysis to enhance the level of fidelity for the decision makers. Full implementation of technology is expected at the conclusion of the project – March 2013.

Laser Induced Fluorescence for Detection of Heat Damage in Composites Structures

A2476 — laser Induced Fluorescence (LIF) Nondestructive Evaluation (NDE) Generation II Transition

Objective

The primary objective is to implement a new non-destructive inspection (NDI) technology into depots as part of their non-destructive evaluation (NDE) techniques for determining the extent of incipient heat damage to polymer matrix composites. A key deliverable of this effort will be the development of a procurement specification, which will allow vendors to bid on the technology solution. This product specification will use a systematic approach which moves from the general requirements of the prototype LIF NDE Generation (Gen) II, to the more specific components of the technology solution system configuration, equipment selection, and installation planning based on user feedback and the technology trends of the Navy.

Payoff

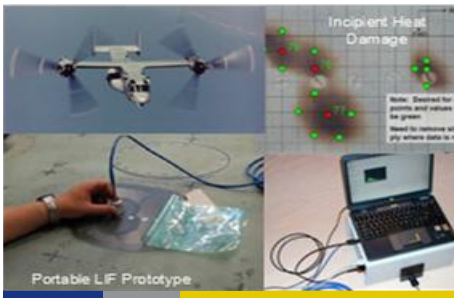
The joint services do not currently have the capability to measure heat damage to critical airframe structures. This project will deliver a specification and design for a system that can be incorporated into depot and flight-line operations to locate, identify, and track damage to these structures. Additionally, it will enable better commercial-off-the-shelf (COTS) hardware acquisition, through system descriptions of function and open architecture, as well as better component replacement including improved reliability through automated calibration scripts. Additionally, reduced uncertainty of heat damaged zone with robust signal processing algorithms and direct support for platform-specific composite materials should be a payoff as well.

Quantitative cost savings are being developed for this new project. The business case for this project is based on the potential of saving structural components that have remaining useful life after heat damage that are currently discarded due to uncertainty. As an example an F/A-18E wing would cost approximately $2M to replace if unquantified heat damage were to be identified. Based on this scenario alone, the return on investment for this project would be 2:1 for just one wing. Keep in mind this NDE tool will facilitate damage quantification for composites which are resident on most DOD fighter and vertical lift aircraft today.

Implementation

The development of the prototype LIF NDE tool provided proof of concept as well as the need for this capability within NAVAIR. Current NDE tools available shipboard or on the flightline / depot can identify damage but not a quantifiable determination of structural integrity and remaining useful life.

NAVAIR technical authorities are convinced of the need and utility of this tool. Implementation, upon successful iterative demonstrations of the depot-ready LIF NDE Gen II unit, will begin at NAVAIR PAX in FY13. NAVAIR will have direct input relative to required hardware capabilities in order to ensure tool adaptability to shipboard as well as depot and actual effectiveness as a NDE tool.



PERIOD OF PERFORMANCE:

October 2011 to October 2013

PLATFORM:

Joint Strike Fighter
REPTECH

AFFORDABILITY FOCUS AREA:

Composites Processing and Fabrication

CENTER OF EXCELLENCE:

iMAST

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STAKEHOLDER:

PEO (JSF)
NAVAIR

TOTAL MANTECH INVESTMENT:

$200,000

Controlled Volume Molding of Aft Chine Fairings Significantly Improves Manufacturability

PERIOD OF PERFORMANCE:
June 2012 to December 2012

PLATFORM:
Joint Strike Fighter

AFFORDABILITY FOCUS AREA:
Composite Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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STAKEHOLDER:
PEO (JSF)

TOTAL MANTECH INVESTMENT:
$442,000

A2490 — F-35 Aft Chine Fairings

Objective

The object of this project is to increase process reliability in the manufacture of F-35 Joint Strike Fighter (JSF) Aft Chine Fairings and reduce scrapped parts. The current manufacturing process results in wrinkles in the fabric plies and resin pooling in critical areas.

Several complex shaped F-35 aircraft parts have been fabricated using an alternate manufacturing process, designated as Controlled Volume Molding (CVM). CVM entails performing lay-up of the pre-preg materials on an aluminum male mold followed by insertion of the male mold and laminate into a steel female mold for curing. Pressurization of the laminate in the tool is accomplished by the combined interaction of tool bolt-up compression, injection of pressurized liquid resin added through ports in the tooling and interference pressure generated due to the differences in thermal expansion coefficients in the dissimilar metals during the thermal cure cycle.

The CVM process uses the same Lockheed Martin Aeronautics (LMA) specified pre-preg materials and follows the same thermal cure cycle as the autoclave process. Employing CVM to fabricate the ACF parts will eliminate the multi-stage co-bond step currently employed for these parts and provide high quality parts at a cost savings.

Payoff

If CVM proves to be capable of repeatedly manufacturing the ACF using the required resin and pre-preg systems, the potential benefits to the F-35 Program are numerous. The direct manufacturing benefits include: (1) reduced lay-up and compaction labor due to the tooling configuration (male mold vs. female mold), (2) elimination of the co-bond and isolation ply lay-up and cure steps, (3) elimination of the cure bagging step and autoclave cure (lower cost processing and increased autoclave capacity), (4) decreased number and complexity of rate tools required (single cure shell can support several lay-up inserts), (5) smooth tooled surface on both the OML and IML of the part, and (6) elimination of the need to machine the IML interface surface (lower labor and increased machining capacity). This project could save the Joint Strike Fighter (JSF) Program up to $31M.

Implementation

After completion of the development and refinement units, a determination will be made regarding the ability to produce acceptable parts. If the resulting parts are found to be in conformance, cost estimates will be generated. These cost estimates will be submitted to the JSF Program to compare to current project costs. If the cost savings meet program change request requirements a change request will be generated by LMA and a target date set for transition of part fabrication to production parts. The target is implementation in LRIP7 in 2015.

"V-Tip" Affordability Improvements to Result in an Estimated Savings of over $14M

A2504 — Vertical Tip ("V-Tip") Affordability Improvements

Objective

The F-35 Joint Strike Fighter (JSF) vertical tip is a honeycomb bonded assembly that tapers to a narrow forward leading edge. The tight dimensional requirements of this assembly drive the sacrificial ply machining requirement on the closeout rib detail to control bond assembly fit. The shape of the rib and the sacrificial ply machining are the primary attributes that drive the non-conformance activity for the rib detail and the bonded assembly. This project will seek to demonstrate rib producibility-driven design changes that simplify the rib shape and reduce or remove machining requirements to reduce cost and span time.

Payoff

The focus of this project is to reduce costs and span times for fabricating F-35 vertical tip assemblies for the short take-off vertical landing (STOVL) variant. Lessons learned will be applied to all variants. By demonstrating rib producibility-driven design changes that simplify the rib shape and reduce or remove machining requirements, rejection and rework can be eliminated resulting in an estimated cost savings of $14.35M over the life of the JSF Program. The total estimated project return on investment is 28.

Implementation

Once the vertical tip producibility has been demonstrated, the F-35 project vertical tip implementation package will be prepared including a summary of all changes, implementation costs, cost savings, return on investment, delta PNR (production non-recurring) if any, implementation schedule, and associated risks (if any). CRAD design and process recommendations, if successful, will be implemented through the F-35 change process for producibility solutions. This process follows a structured, change board approach that addresses all the requirements to implement a change on the F-35 program. "V-Tip" producibility enhancements are slated for implementation in LRIP 7 in 2014.

PERIOD OF PERFORMANCE:
August 2012 to March 2013

PLATFORM:
Joint Strike Fighter

AFFORDABILITY FOCUS AREA:
Composite Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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STAKEHOLDER:
PEO (JSF)

TOTAL MANTECH INVESTMENT:
$427,000

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Other Air Platforms Projects

Cost-Effective Incremental Sheet Forming Processing

PERIOD OF PERFORMANCE:
October 2011 to December 2013

PLATFORM:
Other Air Platforms

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
iMAST

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STAKEHOLDER:
NAVAIR

TOTAL MANTECH INVESTMENT:
$555,000

A2478 — Incremental Sheet Forming

Objective

The manufacture of some out-of-production components can take months. For example, it can take an average of 243 days span time to replace a typical AV-8B sheet metal component. The NAVAIR AV-8B community is very interested in implementing any process that reduces span time for one-off manufacturing of replacement components.

The objective of this project is to evaluate and implement cost-effective Incremental Sheet Forming (ISF) processing for the Navy's Fleet Readiness Center – East (FRC-East) at Cherry Point for manufacturing and repair of specialized sheetmetal components of the AV-8B.

Payoff

This process will be capable of reproducing any sheet metal component now being manufactured via the stamping process. The project return on investment will be calculated based on the AV-8B Bullet Fairing, which is an obsolete part requiring approximately 600 days from order to delivery. The business case for this fairing is based on a labor rate of $50 per hour and an annual requirement of 24 new fairings. FRC-E has looked at acquiring the capability to stamp these parts themselves instead of the current process that takes almost two years. Based on this plan, requiring purchase of a new stamp press, a bullet fairing will cost approximately $8300. The ISF-based process will cost approximately $230 each. Finally, there are several qualitative benefits that include:

1. New manufacturing repair option for U.S. Navy/USMC depots.
2. Elimination of sheetmetal fixture design process.
3. Rapid reverse engineering capability using CNC machining processes.
4. Elimination of lead in manufacturing depot environment (molds).
5. Reduction of lost sheetmetal manufacturing skills at US Navy / USMC depot community.

Implementation

Upon three successful demonstrations of the Incremental Sheet Forming Process, Fleet Readiness Center - East will begin implementation at their Cherry Point facility with internal or other program office funding allocation. It is unknown at this time what the implementation costs will be; however, a large benefit to the process is the small implementation costs.

Project Plan and Technology Transition Plan for Incremental Sheet Forming process evaluation for the USMC Aviation depot community have been submitted and approved. Need more about the actual implementation process.

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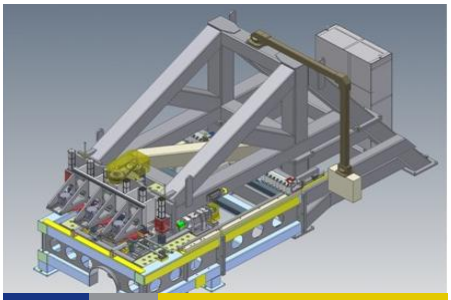
Other Sea Platforms Projects

Machine Design Modification Extends Capabilities for Low-Cost Friction Stir Welding



PERIOD OF PERFORMANCE:
December 2009 to January 2012

PLATFORM:
Other Sea Platforms

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
NMC

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STAKEHOLDER:
PMS 385 JHSV

TOTAL MANTECH INVESTMENT:
$2,034,000

S2321 — Expanded Capabilities for Low-Cost Friction Stir Welding

Objective

The Joint High Speed Vessel (JHSV) design incorporates the use of large integrally stiffened aluminum panels produced via friction stir welding (FSW). If panels are produced by off-site FSW vendors, the sizes of the panels are limited due to shipping constraints. Assembling smaller panels via conventional welding methods is costly and frequently results in excessive distortion and other quality issues. Austal USA is interested in developing an on-site FSW capability to reduce cost and increase quality of these panels. A low-cost FSW system was developed and demonstrated for Freedom Class LCS applications during a previous Navy Metalworking Center (NMC) project (S2100). This NMC-led project team developed a detailed design for an expanded capabilities low-cost FSW machine, developed processes and tooling for JHSV products, and was prepared to assist in startup and training of the new system at Austal USA.

Payoff

This project was executed to enhance the producibility of lightweight aluminum structures on JHSV, and to provide expected benefits such as reduced ship costs, improved welded joint quality, and decreased vessel weight. A cost saving of $1.8M per year to the JHSV Program was projected if the technical results of the effort were implemented. In addition, the technical developments could potentially be leveraged for application to other platforms with aluminum structures.

Implementation

NAVSEA and the American Bureau of Shipping are addressing updated inspection requirements. It's expected that the new requirements will be issued in late 2012 and that Austal will decide whether or not to procure the extended capabilities FSW system shortly after that.

White Light Scanning System for Inspecting Shaft Tapers to Reduce Shipbuilding Total Ownership Costs

S2365 — Main Propulsion Shaft Taper Inspection

Objective

Power is applied to submarine and aircraft carrier main propulsion shafts through a tapered connection between the shaft and the inboard coupling. To prevent mismatch, tapers are inspected using taper ring and plug gauges that are heavy and cumbersome. Each taper requires from six to 10 inspections as the taper is carefully shaped to the correct contour. Eight work shifts and up to 66 labor hours can be saved if these gauge inspections are eliminated. In addition, taper gauges cost $615K per set and must be refurbished every three years at a cost of $70K. Separate gauges must be used for every ship class. This NMC project is evaluating and developing white light scanning technology for inspecting submarine and aircraft carrier shaft tapers. This will eliminate the labor-intensive use of costly single-purpose gauges and replace them with less costly systems that allow for more rapid inspections. The project team is working with industry to identify the most promising white light scanning system, developing a prototype for shipyard use, and optimizing the prototype in response to testing and evaluation.

Payoff

The four naval shipyards (Portsmouth, Norfolk, Puget Sound, and Pearl Harbor) will see a cost savings of over $5M just by eliminating the purchase of the VCS taper gauges. They will see an additional cost savings of $900K per year by eliminating the need to maintain the existing taper gauges. The labor to perform the inspections will be reduced by eliminating the lifting and handling process and by reducing the time required to perform taper inspections. Employee safety will benefit from eliminating the repeated lifting and handling of 750-pound gauges.

Implementation

Implementation will occur in the second quarter of FY14 as Norfolk Naval Shipyard uses the prototype system delivered to them for evaluation. The other Navy shaft refurbishment facilities will also implement the results as the Navy eliminates the current gauge process.

PERIOD OF PERFORMANCE:
November 2010 to July 2013

PLATFORM:
Other Sea Platforms

AFFORDABILITY FOCUS AREA:
Automated Tools

CENTER OF EXCELLENCE:
NMC

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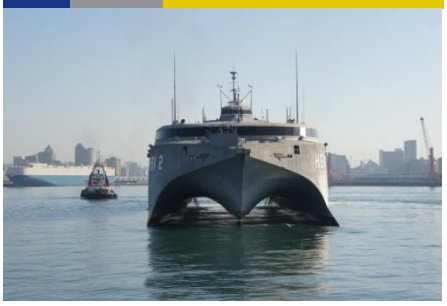
STAKEHOLDER:
PEO (Ships)
PEO (Subs)
NAVSEA 04X

TOTAL MANTECH INVESTMENT:
$948,000



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NAVY MANTECH
Manufacturing Technology Program

Business Enterprise Projects

Sensor Networks to Monitor Energy Usage in Shipbuilding Environments

PERIOD OF PERFORMANCE:
June 2010 to December 2012

PLATFORM:
Business Enterprise

AFFORDABILITY FOCUS AREA:
Facilities and Industrial Processes

CENTER OF EXCELLENCE:
B2PCOE

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TOTAL MANTECH INVESTMENT:
$372,000

B2343 — Sensor Networks for Energy Management in Shipbuilding

Objective

According to the Environmental Protection Agency (EPA), electricity purchases represented 75-85% of the energy sector expenditures in 2004. With the volatility of the global energy market due to geopolitical instability, the coming of peak-oil, and increasing environmental concerns, the shipbuilding industry needs to reduce energy usage in order to operate efficiently in an increasingly uncertain energy market.

Shipyard processes with the largest energy consumption are arc welding, forging, abrasive blasting, and application of marine coatings. The current generation of energy management systems does not meet the future needs of the Navy due to their high cost. Prototype versions of best-in-class energy sensors, networks, and analysis systems have demonstrated the feasibility of obtaining energy savings in industrial processes.

The purpose of this investigation is to assess the present approaches and processes and quantify the associated potential for cost reduction of the implementation of best-in-class energy sensors, communications systems, and data analysis in the energy management of key shipbuilding operations. The goal will be to identify a best practice for monitoring energy consumption in shipbuilding operations. This will entail the Benchmarking and Best Manufacturing Practices Center of Excellence (B2PCOE) evaluating energy management processes at shipyards. General Dynamics Electric Boat (GDEB), the lead manufacturer for the VIRGINIA Class submarine (VCS), has offered to document its best practices that were developed and implemented under the VCS Program in order to share with other manufacturers of similar ”one of a kind” equipment.

Payoff

The development of best practices for using sensor networks to monitor the energy usage within a shipbuilding environment will enable, for the Navy and its shipbuilders, the following benefits: (1) the potential for reduced costs due to improved accuracy of energy consumption measurement to ensure the large energy consumers are being targeted for improvement; (2) the automation of data capture for tracking for Navy and other outside auditing; and (3) accurate data from higher efficiency systems and detailed metering devices to identify opportunities for further reduction in energy consumption.

Implementation

The technology deemed as best practices will be documented as such after a thorough vetting process. Once the project tasks are completed, the entire scope and resultant data from this project will be made available to all interested entities through B2PCOE. Recommendations will be given to Navy shipbuilders and other DOD contractors via the B2PCOE.

Roadmap Provides Path to 50% Fuel Cell Cost Savings

B2397 — The Manufacturing Fuel Cell Manhattan Project

Objective

Fuel cells offer certain tactical advantages for military applications in support of the warfighter in areas of transport, communications, and reconnaissance. The potential for reduced fuel and battery consumption, fewer supply convoys, reduced weight and volume for the soldier, and quiet power make fuel cells a tactically attractive alternative to standard generators. Nevertheless, there has been no large-scale commercial or military demand due to the high cost of fuel cell manufacturing as well as questions on the reliability of fuel cell systems in rugged military environments.

To help understand how manufacturing affects the cost of fuel cells, the Office of Naval Research (ONR) undertook a study to determine the current manufacturing practices, to identify gaps and issues preventing cost reduction, and to recommend manufacturing solutions to reduce the cost of fuel cells. This objective was achieved by commissioning a team of subject matter experts (SME) in the field of fuel cells. The study focused in on the affordability and manufacturability of ceramic and polymer fuel cell systems under 10 kilowatts, along with their complementary balance of plant (BoP) and fuel processing (FP) subsystems. The specific power systems were selected as an area of study because they offered the greatest manufacturing maturity and are of interest to the Navy and other Services.

Payoff

The identification of fuel cell manufacturing best practices and the creation of a fuel cell technology roadmap allow R&D sponsors an insight into the requirements for the inclusion of fuel cells into Navy and other DOD systems. If proposed efforts were to be implemented, the resulting benefits would include a 50% cost savings (based on 5,000 units per year), increased reliability, JP-8 fuel compatibility, and reduced fuel consumption.

Implementation

The Manufacturing Fuel Cell Manhattan Project Book, available through the B2PCOE in both hardcopy and PDF versions, identifies manufacturing issues and provides a structured technology roadmap to address cost drivers. Implementation of the best practices would be throughout the defense industry, suppliers, and government depot and sustainment centers. The technology transfer has been accomplished by presenting the results of this project at industry events and quarterly reviews as well as distribution through the B2PCOE Web site.

PERIOD OF PERFORMANCE:

June 2010 to September 2013

PLATFORM:

Business Enterprise
Cross Cutting

AFFORDABILITY FOCUS AREA:

Electronic Processing and Fabrication

CENTER OF EXCELLENCE:

B2PCOE

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TOTAL MANTECH INVESTMENT:

$3,185,000

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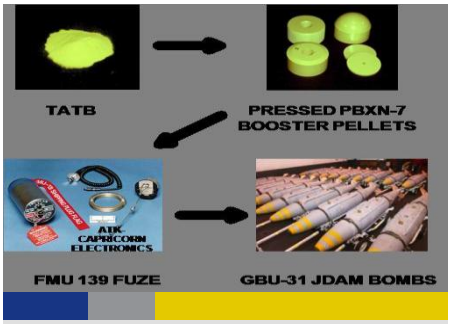
NAVY MANTECH
Manufacturing Technology Program

Energetics Projects

Reliable CONUS TATB Production



PERIOD OF PERFORMANCE:

November 2000 to January 2008 (Phase 1)
September 2009 to April 2013 (Phase 2)

PLATFORM:

Energetics

AFFORDABILITY FOCUS AREA:

Not Applicable

CENTER OF EXCELLENCE:

EMTC

POINT OF CONTACT:

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STAKEHOLDER:

PMA 201

TOTAL MANTECH INVESTMENT:

$3,485,000

A0983-1-2 — Alternative Manufacture of Energetic Material TATB Phase 1 and Phase 2

Objective

Triamino-Triamino--Trinitrobenzene (TATB) is one of the least sensitive explosive materials known and is a critical ingredient used to meet Insensitive Munitions (IM) requirements in the booster explosive PBXN-7 and PBXW-14. PBXN-7 is used in bomb and missile fuzes. All U.S. sources for this material ceased production in 1993, primarily due to demand and environmental issues. In 1999, the demand for TATB/PBXN-7 soared when the Navy began to re-booster over 80,000 FMU-139 bomb fuzes. The objectives of this project are to investigate and evaluate several alternative TATB chemical synthesis processes, determine the best approach, scale-up, and demonstrate the process at full-production scale.

Payoff

The project culminated in demonstrated alternative domestic manufacturing processes at ATK Launch Systems and the BAE Systems, OSI, Holston Army Ammunition Plant (AAP) to produce TATB explosive. However, during the qualification test program, both alternative TATB products were determined not to be suitable “drop-in replacements” for traditional TATB explosive in the PBXN-7 formulation. As a result, OUSD (AT&L) LW&M established a DOD/DOE Joint Integrated Program Team (IPT) to determine the path forward and establish a CONUS supplier for TATB explosive. The IPT recommendation was to re-establish TATB production using the traditional and proven Benziger synthesis process. A coordinated Memorandum of Agreement (MOA) between DOD and DOE National Nuclear Security Agency (NNSA) was established.

Implementation

Under the new DOD PEO Ammunition and DOE collaborative program initiative, ATK Energetics Systems at Radford AAP and BAE Systems, OSI Holston AAP were selected to reestablish the Benziger process and demonstrate synthesis capability in both bench-scale and pilot-scale reactor systems. While both contractors were successful under the bench/pilot-scale program, BAE Systems at Holston AAP was ultimately selected for TATB facilitization based on its qualified infrastructure capability and cost. The TATB production facility will be located in the Agile Manufacturing Facility at Holston and be operational in November 2012. Qualification should be completed by April 2013, and TATB/PBXN-7 and PBXW-14 will be available to the Warfighter.

TATB is needed to sustain current acquisition programs for FMU-139 and FMU-152 fuzes used in Navy and Air Force bombs (BLU-110, BLU-111, BLU-113, BLU-117, BLU-126, MK82, and MK84). Other users of PBXN-7 include FMU-143 (BLU-116, BLU-109), FMU-148A/B (Tomahawk), FMU-155/B (SLAM ER), MK436 fuze (MK146 warhead 2.75) and JSOW. TATB is also utilized in auxiliary boosters in 81/120MM mortars and fuze booster in M935 fuze for the Army and the U.S. Marine Corps.

Sustainable and Reliable Production Capability for RSI-007 Molding Powder

A2350 — RSI-007 Scale-up for Manufacture (RSI-007)

Objective

The objective of this project is to develop a sustainable and reliable production capability for RSI-007 molding powder that will significantly reduce the overall cost of the material as well as the environmental impacts and operational hazards during production. RSI-007 is a high energy, CL-20 based explosive that enables miniaturization of and increased output from low energy exploding foil initiators (LEEFIs). The higher performance of RSI-007 also allows for new and innovative initiators to be developed. RSI-007 based LEEFIs are used in multiple weapon systems including AIM-9X, RAM, ESSM, Standard Missile, Spider, FBM ordnance, FMU-139 Product Improvement Program, MEMS Distributed Initiation Systems, and SECAT Advanced Lightweight Torpedo Program.

Payoff

Production capacity will be improved as new production capability will be increased ten-fold. Additionally, the cost of RSI-007 will be decreased from a current price of $3,930/lb to $1,140/lb (a 70% decrease). This is also a significant decrease in cost from the legacy explosive, which was most recently purchased for $15,500/lb. Other benefits include the elimination of a halogenated solvent, a known carcinogen, providing a safer production environment, and the elimination of a non-conductive processing fluid to reduce both cost and static build-up on the final product. Understanding of manufacturing parameters gained through the designed experiments has been used to determine the influence of processing variables on product quality. The new process results in improved product quality and reproducibility. Overall, the production of the high energy output RSI-007 will allow for the miniaturization of fuze systems for various munitions.

Implementation

The Navy's AIM-9X program (PMA-259) will serve as the transition program for the scale-up of RSI-007 as RSI-007 will be used as part of the next generation warhead for AIM-9X, which is currently under development and uses the RSI-309 initiator and RSI-260 detonator. The RSI-007 scaled-up process is planned for implementation at the contractor facility in the third quarter of 2013.

The RSI-007 developed as part of this project will be used in initiators produced by Reynolds Systems. In fact, these initiators are already utilized in several DOD programs, including RAM, Standard Missile, ESSM, and SPIDER. These programs require a larger quantity than the current method is capable of producing. The increased capacity developed under this project will support this increased demand.

PERIOD OF PERFORMANCE:
July 2010 to March 2013

PLATFORM:
Energetics

AFFORDABILITY FOCUS AREA:
Not Applicable

CENTER OF EXCELLENCE:
EMTC

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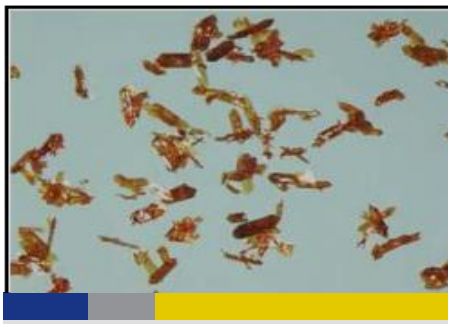
STAKEHOLDER:
PMA 259

TOTAL MANTECH INVESTMENT:
$809,000

Optimization and Scale-Up of the Manufacturing Process for DBX-1



PERIOD OF PERFORMANCE:

November 2010 to December 2012

PLATFORM:

Energetics

AFFORDABILITY FOCUS AREA:

Not Applicable

CENTER OF EXCELLENCE:

EMTC

POINT OF CONTACT:

Mr. Charles R. Painter
(301) 744-6772

STAKEHOLDER:

PMA 201
PEO (U&W)

TOTAL MANTECH INVESTMENT:

$1,396,000

A2375 — Manufacturing Evaluation and Scale-Up of DBX-1

Objective

Lead azide (LA) is utilized in most chemical detonators as the initial shock wave generating compound for detonation of subsequent main explosive charges. Despite being an effective energetic material, LA has a number of drawbacks associated with its use: (1) LA contains 71% lead, a toxic heavy metal that is released to the environment during production and use, (2) LA is unstable in non-hermetic munitions applications (forming copper azide) and, due to this, has been limited in use by NAVSEA 8020.3A, and (3) there is currently no qualified domestic production of LA with DOD relying on an aging and dwindling stockpile to support its needs.

DBX-1 is an environmentally benign copper-based LA replacement which has recently completed a NAVSEA 8020.5C qualification project. The objective of this project is to optimize synthesis techniques, scale-up to a 100 gram batch-size level, and generate a final product specification for DBX-1.

Payoff

This project will establish both a remote manufacturing process and specification for DBX-1 at Pacific Scientific Energetic Materials Company in Chandler, AZ. These procedures will be transitioned to the Navy to enable production of DBX-1 for use in items of military interest. The project will provide a method for preparation of an environmentally friendly drop-in replacement for LA without the potential for copper azide formation. More importantly, a “green” replacement for LA would establish a U.S. manufacturing capability and eliminate this single point failure source in the fuze/detonator supply chain.

Implementation

The Cartridge Actuated Devices (CAD) / Propellant Actuated Devices (PAD) group at the Naval Surface Warfare Center-Indian Head (NSWC-IH) has supported development of DBX-1 and started qualification of end- item applications in 2012. There are over 200 distinct CAD/PAD applications which can use DBX-1 as a replacement for LA, including the 25mm Mk210, M792, PGU-25; 30mm Mk266 and 40mm M430, M433, and M918 detonators. (I have no idea if this is punctuated correctly … please check with George) DBX-1 can also be used in aircraft pyrotechnic transfer lines and fire extinguisher cartridges for CAD/PAD devices on various airframes (i.e., F-18, V-22, and other airframes used by all DOD components). In addition, ARDEC has proposed and initiated testing DBX-1 in M55 and M100 detonators as well as in NOL-130 primer mixes.

Initial qualification testing of DBX-1 in the JL42 Firex cartridge and the ZY56 Drogue Cutter Detonator are currently underway and will be followed by gap tests between TLX cord and DBX-1 loaded high energy tips to ensure reliable initiation transfer in both directions.

Aluminized Explosive Formulation Manufacture Successfully Demonstrated on Twin Screw Mixer/Extruder

C2382 — PBXIH-18 Manufacturing

Objective

The project objective is to develop and demonstrate an efficient manufacturing method using Naval Surface Warfare Center, Indian Head Division (NSWC IHD) twin screw mixer/extruder (TSE) capabilities to process an aluminized explosive formulation, PBXIH-18. PBXIH-18 was developed as a less sensitive replacement for Composition A3 in enhanced blast warheads including shoulder-launched weapons systems.

Payoff

The benefits from this project include the development of an alternative manufacturing method for PBXIH-18 and will provide the Warfighter a seamless transition to the new source of PBXIH-18 for needed munitions.

Additional benefits include (1) increased efficiency in manufacturing explosive molding powder; (2) increased safety in manufacturing operations; (3) improved insensitive munitions (IM) characteristics with enhanced blast performance in the molding powder; (4) reduced cost due to more accessible manufacturing ingredients; and (5) increased manufacturing capacity.

Implementation

The project includes a review of current DOD manufacturing processes for aluminized explosive molding powder along with the development of manufacturing scenarios as well as manufacturing the PBXIH-18 explosive. In FY11, PBXIH-18 was successfully and safely manufactured and remotely granulated using twin screw mixer/extruder technology. Initial IM testing, granulation evaluation, and pressing studies have shown comparable results to current manufacturing methods. In mid-FY12, required IM and validation testing of aged material was successfully completed. Testing on aged material showed results comparable to the material manufactured using the current manufacturing process. The manufacturing process has proven to be a cost-effective and efficient manufacturing method, and there are transition opportunities to multiple DOD weapon systems. Naval Surface Warfare Center-Indian Head (NSWC-IH) will implement this technology into production for the Shoulder Fired Weapon System.

PERIOD OF PERFORMANCE:
June 2010 to November 2012

PLATFORM:
Energetics

AFFORDABILITY FOCUS AREA:
Not Applicable

CENTER OF EXCELLENCE:
EMTC

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STAKEHOLDER:
PM AMMO

TOTAL MANTECH INVESTMENT:
$913,000

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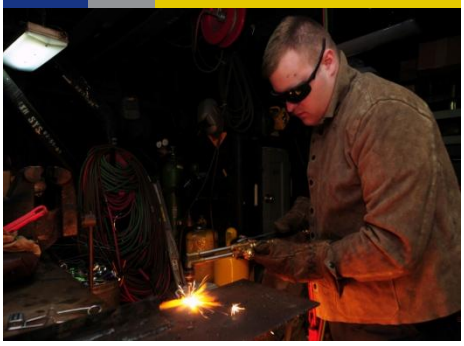
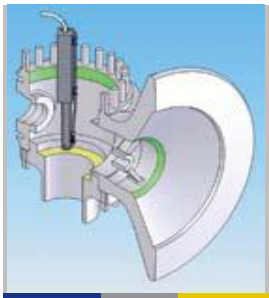
NAVY MANTECH
Manufacturing Technology Program

REPTECH Projects



Man-Portable, Wire-Based, Deep-Bore Clad Tool for Shipboard Repair of MSW/ASW Valves



PERIOD OF PERFORMANCE:
May 2007 to September 2012

PLATFORM:
REPTECH

AFFORDABILITY FOCUS AREA:
Welding and Joining

CENTER OF EXCELLENCE:
iMAST

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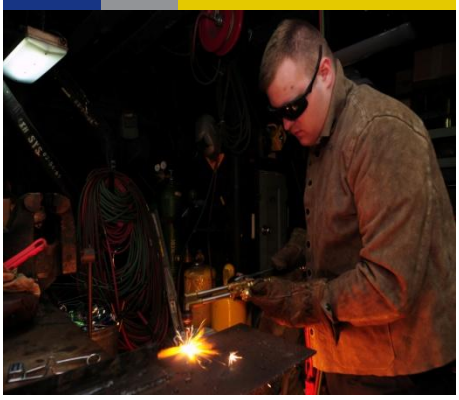
STAKEHOLDER:
NAVSEA
Pearl Harbor Naval Shipyard
Norfolk Navy Shipyard
Puget Sound Naval Shipyard
NUWC Keyport

TOTAL MANTECH INVESTMENT:
$1,420,000



S2178 — In-Situ Strategic Repair Process

Objective

The objective of this effort is to develop and transition improved technologies for long-lasting shipboard repair of Main and Auxiliary Sea Water Valves (MSW/ASW/valves).

This specific repair methodology will target MSW/ASW valves, but will be designed to be flexible in order to accommodate in situ repair of other cylindrical components. This will be realized by developing a simple, flexible approach to clad repair that keeps the man-in-the-loop where appropriate and utilizes mechanization when justified. The strategy has been formulated based on feedback from the RepTech Working Group, NUWC Keyport, and PHNSY.

The capstone transition event is to be a demonstration of the tools and repair technologies at PHNSY on their training MSW valve.

Payoff

ASW / MSW valves have been identified as requiring 3,390 manhours per vessel for repair operations and were identified by the Executive Planning Sessions as being a “Top Priority Candidate”. Based on an estimate of 30% reduction in repair time, a $65/hr labor cost, and utilization at all four shipyards, estimated annual savings for the Navy will be $793K. Based on recent conversations with PHNSY, the process could reduce repair time by as much as 85% in certain cases.

Based on improved durability and anticipated doubling of required mean-time-between-repair, as well as procurement and use at all four shipyards, anticipated cost savings are $6M over seven years and an additional $1.67M annual savings afterwards.

Implementation

The approach included: (1) defining the problem in detail, (2) developing conceptual flexible tools to address the problem, (3) engineering and fabricating suitable process heads and portable valve repair systems, (4) engineering and fabricating a valve mock-up to simulate the various repair surfaces and orientations of the MSW/ASW valves for system evaluation and training, and (5) demonstrating and transitioning equipment on-site at PHNSY. Technical Warrant Holders, NAVSEA 07 and 05, have been engaged throughout the effort. Additional funds from Defense Logistics Agency's Industrial Base Innovation Fund (IBIF) program were awarded and enabled design and fabrication of the portable valve repair tool. This process head (deep-bore, wire-based laser clad head) and portable valve repair system have been integrated and successfully demonstrated and evaluated at ARL Penn State. Detailed planning is currently taking place for a demonstration planned at PHNSY in late 2012, the capstone transition event for this project.

Portable Cold Spray System to Address Several Different Repair Processes

A2366 — Portable Cold Spray Repair

Objective

There are several areas on DOD aircraft that do not currently have feasible repair methods. Repair methods are either non-existent or very complex and expensive. Examples include the F/A-18 airframe mounted accessory drive (AMAD) transmission housing cover, IVD aluminum and cladding repair of the aluminum structure, Alumiplate repair on the JSF, and dimensional repair on the H-60 tail cone canted bulkhead bushings and the fifth mount A-Arm of the AH-1W Main Transmission Support Case Assembly (MTSCA). Economical repair methods that can easily be implemented are needed to repair these components and that can be applied to wide range of repairs.

The objectives of this project are to develop and transition economical repair processes using portable cold spray systems for these and other components. The repair process has been demonstrated on subscale test articles and is being qualified on the F/A-18 AMAD gear box housing. The repair procedure will include all process and operating parameters, powder specifications, equipment specifications, and training. A decision tree will be developed in conjunction with NAVAIR 509 and used as a guide for applying the cold spray process to NAVAIR components.

Payoff

The payoff of the technology when applied to the F/A-18 AMAD transmission housing repair will result in a cost avoidance estimated at $500K per year or $2.5M over five years. The transmission housings and covers have long manufacturing lead-times. The ability to repair components will improve readiness and reduce life-cycle costs. Application of the repair process to the MTSCA will result in an additional cost avoidance of $2.9M. The repair process can be implemented on other components to realize additional cost avoidance. This process can also be used to repair and prevent corrosion and wear damage

Implementation

The technology is being transitioned to several NAVAIR facilities including the Fleet Readiness Centers (FRC)-E (Cherry Point) and -SW (North Island). Repaired F/A-18 AMAD transmission housings have been returned to FRC-SW. One housing, with an external repair, currently has over 200 flight hours. The other transmission housings are being evaluated on an engine test stand prior to being returned to operation. FRC-E and FRC-SW have portable Centerline portable cold spray systems. The cold spray repair procedure for the transmission housing has been provided to FRC-SW. The technology development / transition is through the Materials Engineering Division: Corrosion & Wear Branch AIR-4.3.4.6 at Patuxent River. Repairs for additional assets are being developed and transitioned. Depot personnel will be trained to use the equipment and perform the repairs.

PERIOD OF PERFORMANCE:
November 2010 to April 2013

PLATFORM:
REPTECH

AFFORDABILITY FOCUS AREA:
Coatings

CENTER OF EXCELLENCE:
iMAST

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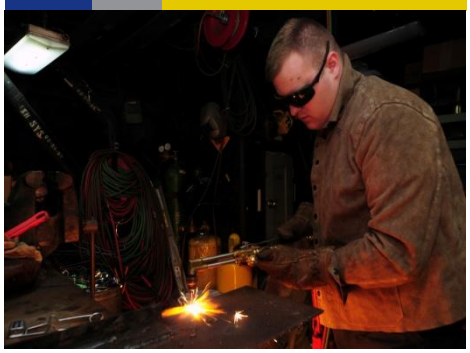
STAKEHOLDER:
NAVAIR

TOTAL MANTECH INVESTMENT:
$600,000



Repairing Shaft Seals and Mating Rings Reduces Scrapping of Parts and the Required Purchase of Replacements

PERIOD OF PERFORMANCE:
January 2011 to March 2013

PLATFORM:
REPTECH

AFFORDABILITY FOCUS AREA:

CENTER OF EXCELLENCE:
iMAST

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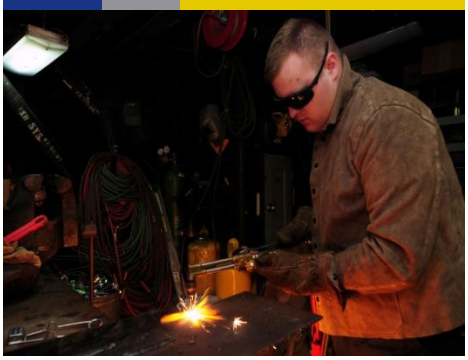
tdb14@psu.edu

STAKEHOLDER:
PMS 450

TOTAL MANTECH INVESTMENT:
$282,000



S2418 — Refurbishment of SSN-688 Class Shaft Seal and Mating Rings

Objective

Shaft seal assemblies for LOS ANGELES (SSN-688) Class submarines are comprised of seal rings and mating rings. When assembled, these two components are installed at the interface between the hull and the main propulsion shaft. These components are removed during periodic maintenance availabilities and returned to the sole original equipment manufacturer for refurbishment. The refurbishment of these components typically involves the machining of selected surfaces to a highly polished finish and the removal of any damage or wear from the surface of the component. After a few refurbishment cycles, the part is below minimum dimension; requiring condemnation and a new component must be purchased as a replacement. This method of refurbishment limits the number of refurbishment cycles for each component.

The project objective is to evaluate and implement a mature additive repair process to extend the life of SSN-688 shaft seal and mating rings, potentially indefinitely. This multi-phase project is being conducted in which the Institute for Manufacturing and Sustainment Technologies (iMAST) will develop processing parameters and procedures for the deposition of Inconel® 625 on shaft seal ring and mating ring components.

Payoff

The primary payoff is cost avoidance by repairing shaft seal and mating rings that would otherwise be scrapped. New component prices range from $140K to $200K. Current repair of shaft seal and mating rings ranges from 40% to 70%, of costs and $27K to $52K per unit for each refurbishment. Adding material via a laser deposition process will increase the repair effectiveness to near 100%, significantly reducing the number of new spare components that must be purchased to cover catastrophic failures only. In addition to these direct cost savings, there will be a reduced lead time for parts at the depot and an improved supply availability to the shipyards.

Implementation

Three potential laser deposition processes are being evaluated including a LENS®-based deposition process, a powder-fed laser cladding process, and a wire-fed laser cladding process. If successful in the process development tasks, all three processes will be implemented at Navy Undersea Warfare Center (NUWC) - Keyport. The accompanying processing parameters and procedures will then be transferred to Keyport, where the repair of these components will be implemented.

These three different additive manufacturing technologies have the advantage of being readily transitioned to NUWC-Keyport as the designated repair source. Keyport as equipment on hand to accommodate rapid implementation for which ever repair is down selected after complete characterization testing. Additionally, the project teams at ARL and Keyport have worked extensively with Wärtsillä to ensure repair processes developed by ARL and implemented at Keyport match their specifications and final machining specifications to ensure greatest benefit to the Navy.

Improved Interior Finish Coatings Reduce Total Ownership Cost

S2421-A — Advance Finish Coatings

Objective

The appearance of interior and exterior painted surfaces of naval vessels is important to the Navy. A substantial amount of money is spent on reapplying finish coatings solely for cosmetic reasons. The cost associated with routine application of finish coatings to repair cosmetic damage goes well beyond the material and labor cost associated with application of the paint. Eliminating or reducing over-coating for cosmetic reasons will reduce both acquisition and total ownership costs (TOC). This project will investigate the suitability of newer, commercially-available coatings that can be used in interior spaces of submarines and surface ships to reduce coating repairs associated solely with cosmetic damage.

The primary objective of this project is to identify and/or develop one or more high-durability interior finish coatings having the following characteristics: (1) low or no volatile organic compounds (VOCs); (2) improved cleanability, durability, scratch resistance, and stain resistance; (3) improved color-matching capability to enable shipbuilders or shipyard personnel to better match older intact coatings; (4) ability to feather-in with old / existing coatings; and (5) ability to cure in low temperatures and/or high humidity conditions. Initial evaluation will focus on acrylic, polysiloxane and epoxy-hybrid coatings.

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Payoff

The results of this project will be applicable to both new acquisition and total ownership cost (TOC) reduction. Acquisition savings accrue from reducing the ubiquitous paint repairs performed following ship construction and sea-trials prior to final delivery of the ship to the Navy. Reductions in TOC accrue from reduction or elimination of the need to overcoat for cosmetic reasons.

Implementation

To ensure transition, the project team includes end-user personnel, subject-matter experts, coating manufacturers and shipbuilder / shipyard preservation management representatives. Additional funding following project completion will be needed for coating qualification to achieve full implementation. Two commercial coatings manufacturers have agreed to participate with the ManTech project team to qualify, produce, and sell the improved interior finish coating. Due to the amount of time necessary for qualification, implementation is expected in the fourth quarter fiscal year 2013.

Note: This project is led by the Institute for Manufacturing and Sustainment Technologies (iMAST) with a portion of the work performed by the Center for Naval Shipbuilding Technology (CNST).

PERIOD OF PERFORMANCE:

April 2011 to September 2013 (iMAST)
June 2011 to June 2013 (CNST)

PLATFORM:

REPTECH
VCS /Submarines

AFFORDABILITY FOCUS AREA:

Coatings

CENTER OF EXCELLENCE:

iMAST and CNST

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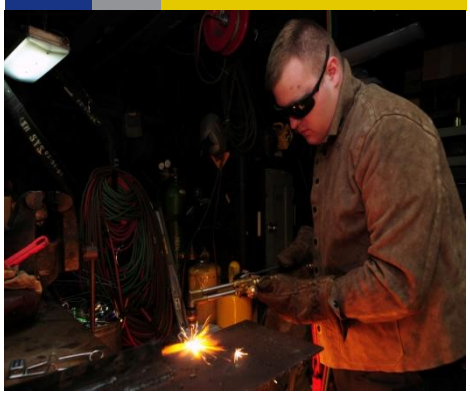
STAKEHOLDER:

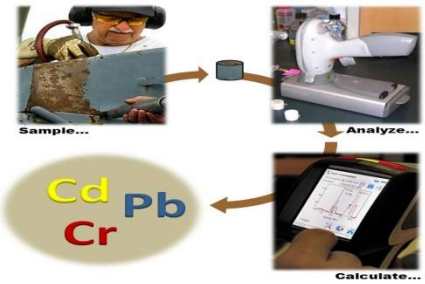
PMS 450
PMS 500

TOTAL MANTECH INVESTMENT:

$528,000 (iMAST)
$141,000 (CNST)



On-Site Paint Analysis to Reduce Ship Repair Scheduling Delays



PERIOD OF PERFORMANCE:
February 2011 to October 2012

PLATFORM:
REPTECH

AFFORDABILITY FOCUS AREA:
Coatings

CENTER OF EXCELLENCE:
iMAST

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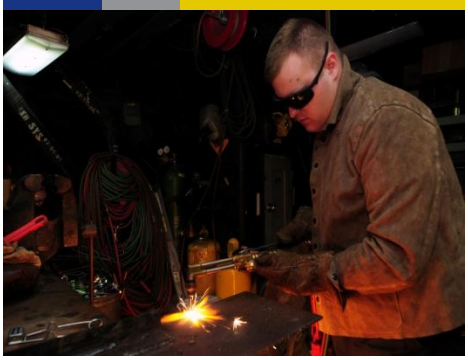
STAKEHOLDER:
SEA-04X
Shipyards

TOTAL MANTECH INVESTMENT:
$110,000



S2444 — XRF Analysis of Heavy Metals in Paint

Objective

Testing of paint on internal and external ship surfaces is required prior to other repair activities to identify levels of specific hazardous metals, such as lead (Pb), chromium (Cr), and cadmium (Cd). The data is used to ascertain applicability of Occupational Safety and Health Administration (OSHA) regulations to production activities scheduled for each specific area of the ship. Testing of up to 500 samples per carrier and 200 samples per submarine may be required. Turnaround time for laboratory testing, data review, and approval can take up to two weeks with retests requiring additional time. Production schedules and worker safety are dependent on these results.

Portable X-Ray Fluorescence (XRF) analyzers are commercially available that are capable of measuring Pb, Cr, and Cd in powdered paint at levels below 50 ppm. These analyzers can be used on-site (ship-side) and will provide results within ten minutes after on-site sample preparation.

The objective of this project was to evaluate and validate a portable commercial-off-the-shelf (COTS) XRF analyzer for the ship-side analysis of lead, chromium, and cadmium in paint with the end results being (1) reduction in ship repair scheduling delays, (2) minimized sample turnaround times, and (3) streamlined sample tracking and custody issues.

Payoff

Implementation of portable XRF analyzers will allow for on-site analysis of paint samples during both “pre-availability” and “availability” time-frames. On-site analysis will enable access to the heavy metal results immediately after sampling and testing, thereby reducing or eliminating current scheduling delays for the initiation of repair and production activities due to waiting for laboratory test results. Preliminary data indicates that the cost for laboratory testing is $140/sample, while the cost using a portable XRF Analyzer is targeted to be $10/sample for a significant reduction in cost.

Implementation

In order for ship-side heavy metals analysis to be successfully implemented in the shipyards, each shipyard will conduct additional shipyard method validation, obtain necessary shipyard and OSHA approvals, define modified shipyard work processes and flows, conduct training of personnel on the new analysis procedure, and purchase at least one XRF analyzer.

Data and findings from this project will directly aid in the transition and implementation in the shipyards. Engineering, production, Occupational Safety and Health and Environment (OSHE), radiation safety, and laboratory personnel from all four naval shipyards have been involved throughout this project to facilitate transition to and implementation in the shipyards as early as 2013.

Improved Inspection Technology to Reduce Maintenance Costs for Ground Combat Vehicles

C2477 — Crack Detection in USMC Vehicles

Objective

The inability to detect cracks without disassembly and paint removal results in wasted time and funds. Currently, the depots completely disassemble the vehicle and remove camouflage, topcoat, and primer paint to inspect for cracks. The objective of this project is to define and implement a new or modified nondestructive evaluation / non-destructive testing (NDE/NDT) capability for inspection of large assembled and painted U.S. Marine Corps (USMC) combat vehicles and other deployable vehicles assigned to the depot The U.S. Marine Corps 2014 Strategic Plan includes refurbishing 925 Light Armored Vehicles (LAVs) and approximately 1,500 MRAP-All Terrain Vehicles (M-ATVs). Each of those vehicles, using the current inspection procedure, would require all paint removed prior to nondestructive evaluation. The goal of this effort is to potentially avoid paint removal by detecting structural cracks other than by rote removal of paint. If no cracks are detected, no structural or protective repair should be necessary.

Recent review of inspection reports for 123 LAVs, revealed approximately 20% of the vehicles had one or fewer cracks per vehicle. Also, fifty percent (50%) of the cracks discovered were in 5 easily accessible locations on the exterior hull of the LAVs. Therefore the implemented inspection technology will provide the vehicle-specific structural assessment to be determined for improved depot repair and re-paint process logistics.

The USMC Maintenance Directorate and the Multi-Commodity Maintenance Center Depot at MCLB Albany, GA have requested iMAST assistance in evaluating NDE/NDT technologies for detecting damage (cracks) under paint on USMC Ground Combat vehicles.

Payoff

Eight hundred vehicles are processed through USMC Maintenance Depots per year. The proposed crack detection inspection process may only require removal of paint from damaged area. Assuming 25% of vehicle area will need paint removal and repaint due to damage – savings are estimated at $4.23M per year for a five-year return on investment of more than 47:1.

Qualitative benefits from this project include: improved production planning, improved painting throughput, reduced hazardous waste stream (less paint and blast media), and flexible pre-repair planning for material acquisition.

Implementation

A Technology Transition Plan (TTP) has been approved and signed by USMC personnel. Implementation, iterative demonstrations of an NDT technology including relative NDT calibration standards, will begin at MCLB Albany during FY13. The Technical Warrant Holder (TWH), MCLB Albany Engineering, will have go/no go decision authority after the initial depot tests per the TTP and Project Plan. An iMAST project team will support initial training for MCLB personnel to assure transition and implementation.

PERIOD OF PERFORMANCE:
January 2012 to December 2014

PLATFORM:
REPTECH

AFFORDABILITY FOCUS AREA:
Metals Processing and Fabrication

CENTER OF EXCELLENCE:
iMAST

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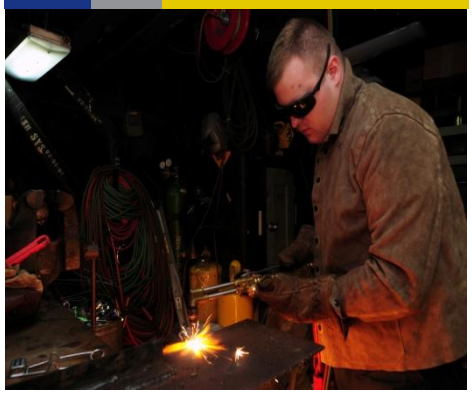
STAKEHOLDER:
MARCOR
LOGCOM

TOTAL MANTECH INVESTMENT:
$470,000



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DOD ManTech Projects

Note: The projects included in this section are projects funded not out of the Navy ManTech line but out of the Manufacturing Science and Technology (MS&T) Program (the DOD ManTech line).

The Defense-wide Manufacturing Science and Technology (MS&T) Program was mandated by Congress in Section 241 of the National Defense Authorization Act of 2006, under the authority of Section 2521 of Title 10, to identify and transition advanced manufacturing processes and technologies that would achieve significant productivity and efficiency gains within the defense industrial base. The program complements the Service and Agency Manufacturing Technology programs by focusing on multi-service DOD priorities which are identified and ranked through roadmapping and data call activities conducted in collaboration with DOD and industry manufacturing representatives.

Improved Manufacturing of Prosthetics Results in Reduced Cost, Increased Performance, and Restoration of the Warrior's Quality of Life

PERIOD OF PERFORMANCE:
August 2008 to December 2012

PLATFORM:
DOD ManTech

AFFORDABILITY FOCUS AREA:
Composites Processing and Fabrication

CENTER OF EXCELLENCE:
CMTC

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STAKEHOLDER:
Walter Reed Army Medical Center

TOTAL INVESTMENT:
$2,799,000

J2256 — Prosthetics and Orthotics Manufacturing Initiative (POMI) Phase 1

Objective

In the current engagement, more Warriors are surviving injuries and living with amputations. The capabilities of our military care system are strained by the increased numbers of amputations, and by the functional demands to which our young Warriors wish to be restored. While the current care systems are providing excellent care, new opportunities are available to improve the processing and manufacturing of prosthetic systems to increase durability and comfort and to provide medical personnel the tools to care for our most deserving heroes. The objective of this project is to dramatically improve the quality and comfort of sockets for lower-extremity prosthetic systems by shifting away from the current experience-based design and production paradigm. This project will leverage the Prosthetics & Orthotics Manufacturing Initiative (POMI) Phase Zero effort allowing intelligent design decisions, informed by both load requirements and soft tissue reactions. With the design in hand, the socket will be produced using an advanced technique developed for the aerospace and defense industries, namely, braiding. This will allow for a socket with spatially-variable properties to be produced with a high degree of automation and with superior quality, and will also produce sockets strong enough to withstand extreme uses, such as may be experienced by warriors returning to combat. The project will implement resins developed in other areas into the field of prosthetics to enable local modifications of the composite structure that might be required during the fit process and during use as the residual limb either changes volume or experiences heterotopic ossification (abnormal bone growth). Additionally, socket cooling will be evaluated as well.

Payoff

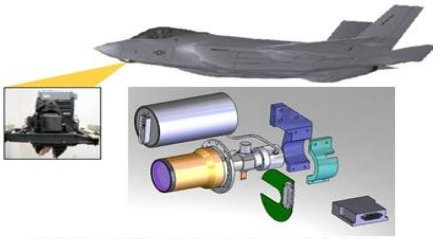
The project's end result will enable prosthetists at military and commercial hospitals to produce lighter, more comfortable, and more intelligently designed sockets in less time, using automated processes, thus freeing prosthetic specialists to spend more time on patient care and less time with socket production. Sockets will have longer service lives with reduced production and life-cycle costs and will restore the warrior's quality of life.

Implementation

Automated braiding was successfully developed and provides approximately 40% savings over traditional fabrication methods. An industry partner has signed agreements to serve as a distributor for the braiders to all customers. Two central fabrication facilities, which supply components directly to the government and commercial markets, have purchased braiders. Further purchases are anticipated from academic institutions interested in training future medical personnel. In addition, a new sensor system for measuring the pressure exerted on the residual limb by the socket has been commercially launched. This system has been initially adopted by both clinical and research users.

Improving Producibility and Reliability of Mid-Wave Infrared Focal Plane Arrays and Integrated Dewar Cooler Assemblies to Meet JSF EOTS Program Production Rates and Cost Targets

Z2495 — JSF Electro-Optical Targeting System (EOTS) Productivity Task



JSF Electro-Optical Targeting System (EOTS): Improving manufacturing readiness and reducing costs of Infrared FPAs and associated IDC technology

Objective

Current production of the Joint Strike Fighter Electro-Optical Targeting System (JSF EOTS) Focal Plane Array (FPA) sensing element and Integrated Dewar Cooler (IDC) assembly suffers from low yield and inefficient production, unable to meet F-35 Joint Strike Fighter Program cost and production rate targets. Investments in yield and automated manufacturing technologies are required in order to meet these targets.

Penn State Electro-Optics Center (the Navy ManTech COE for Electro-Optics) and Santa Barbara Focalplane are working with the Manufacturing Technology Division in the Air Force Research Laboratory Materials and Manufacturing Directorate (AFRL-RXM), the Defense-Wide Manufacturing Science and Technology Program (OSD DMS&T), and the JSF Joint Program Office (JSF-JPO) to improve the manufacturing readiness and reduce costs of these infrared FPAs and associated IDC technology.

The objective of this effort is to define, design, and qualify automated and semi-automated IDC and FPA manufacturing processes, tools, and equipment to reduce touch labor, increase yields, and improve reliability to meet JSF EOTS program production rates and cost targets. A total of 21 process improvements, 18 process change, and 3 Class II design changes are planned in the areas of: (1) Improving the final bake / integration process, (2) Automation of the IDC Cold Stack process, (3) Streamlining the IDC test process, (4) Bake time reductions, (5) FPA process improvements, (6) FPA yield improvements, and (7) Automated FPA to Motherboard process improvements.

Payoff

This project will qualify and implement IDC / FPA manufacturing processes and technologies to increase production rates / yields and reduce per unit acquisition costs while meeting JSF technical performance requirements. The manufacturing readiness shall be improved from MRL 5 to MRL 7/8. FPA and IDC manufacturing technologies developed and qualified will be implemented and directly applied to ongoing (LRIP 5-7) and future delivery lots (LRIP 8 and beyond) resulting in approximately $28.2K in savings per unit. Assuming procurement of 2,874 units (LRIP 8 and beyond), the acquisition affordability savings are expected to total over $81M with a return on investment of 16.6X.

Implementation

Implementation of the 21 production improvements, consisting of 18 process changes and 3 Class II design changes, will be incremental throughout the project, occurring as each production change is qualified and approved by the requisite change board. It is anticipated that 12 of the 21 improvements will be transitioned to production by December 2013. Manufacturing cut-in of the remaining processes will be fully achieved by the end of the technical phase of the project; January of 2015.

PERIOD OF PERFORMANCE:
March 2012 to June 2015

PLATFORM:
DOD ManTech

AFFORDABILITY FOCUS AREA:
Electronic Processing and Fabrication

CENTER OF EXCELLENCE:
EOC

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STAKEHOLDER:
JSF Program Office - DOD

TOTAL INVESTMENT:
$4,620,000

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