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PHOTO CREDITS:

Cover
The littoral combat ship Independence (LCS 2) underway during builder's trials.
U.S. Navy photo courtesy of Dennis Griggs General Dynamics/ Released

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CVN Reality Capture Images
Photos courtesy of Newport News Shipbuilding

Robotic Welding VCS Major Assemblies
Photo courtesy of Electric Boat

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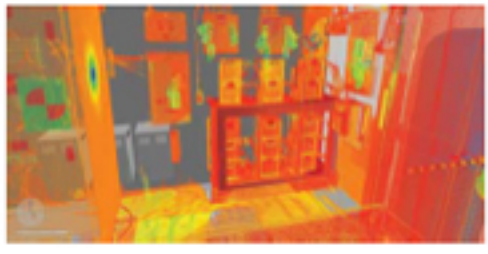
Proposed Measurement Technology System Design
Photo courtesy of Naval Surface Warriors Surface Warriors via Flicker

Regular ferrule, fluxed ferrule and stud
Photo courtesy of EWI

Back Cover
Sea, Air, Space 2014 & FMMS Announcements.
Photos courtesy of Sea, Air, Space 2014 and FMMS 2014

NNS Evaluates Laser Scanning Technology

The Office of Naval Research has awarded the aircraft carrier-focused CVN Reality Capture project to the Center for Naval Shipbuilding Technology (CNST-a Navy ManTech Center of Excellence). The project's objective is to develop the processes needed to transition 3D scanning and design technologies into Newport News Shipbuilding (NNS) engineering planning production activities. These updated technologies and processes will lead to a potential cost reductions in required maintenance and repair planning while adding capability to accurately develop engineering products within a 3D design environment.



NNS is executing this 13-month project using an iterative process that will lead to incremental implementations. The NNS team has evaluated current scanning technologies, including those based on laser and infra-red light, capable of capturing 3D shipboard configurations and narrowed the field of shipcheck applicable laser scanners based on safety, form factor, scan speed, level of accuracy, integration of digital photography, and operation in harsh environments. NNS has completed a laser scanning proof of concept feasibility study to support the conceptual processes related to the capture of shipboard reality for utilization during composite modeling and later during shipyard planning and execution. A separate study was conducted to evaluate the effectiveness of using hand-held, infra-red based devices to acquire data unable to be captured using laser scanning techniques, such as areas above, below, and behind objects.

To accomplish project goals, NNS is conducting a shipcheck trial to develop processes and procedures, develop 3D assets libraries, prototype tools and processes during the initial CVN73 shipcheck. The results will enable NNS to refine processes as necessary. Recognizing that line-of-sight is important to successful reality capture within a space utilizing laser scan technologies, NNS will also test the use of hand-held infra-red based reality capture solutions during CVN73 shipcheck as part of this project. This technology, once implemented, could reduce maintenance and repair labor and material costs by 43% or an estimated $860K per CVN repair planning evolution.

Electric Boat Explores Expanded Use of Welding Systems

The Office of Naval Research has awarded the VIRGINIA Class Submarine (VCS)-focused Robotic Welding of Major Assemblies project to the Center for Naval Shipbuilding Technology (CNST-a Navy ManTech Center of Excellence). The team of General Dynamics Electric Boat (EB) and Edison Welding Institute (EWI) are investigating the use of automated welding systems to improve the accuracy of weld preparations, component assembly and fit-up, welding processes, and equipment, as well as increased use of fixtures, positioning devices, automation, and mechanization. The team's overall goal is to develop an engineered robotic welding cell specifically designed with fixtures, turning devices, and various types of automated welding and back-grinding systems to fabricate major structural assemblies for the VCS hull.

The EB/EWI/CNST team kicked off the 24-month project in November 2013, executing Phase I of this two-phased effort. In Phase I, the team is the developing requirements/specifications needed to select the optimum robotic welding cell. A significant part of the requirements development includes the development of required welding processes, in collaboration with NAVSEA technical authorizes to enable expedient implementation. Phase II, expected to begin in November 2014, will develop stud welding and back-grinding processes for full penetration welds on major assemblies. This project has several aggressive cost reduction targets: welding hour reduction of 40%, fitting hour reduction of 5%, and a 30% reduction in welding and fitting labor for services and support labor—all contributing to an estimated savings of $1.04M savings per VCS hull.

Marinette Marine Works to Reduce LCS Costs

The Office of Naval Research awarded the FREEDOM Class LCS-focused Producibility Optimization Handbook project to the Center for Naval Shipbuilding Technology (CNST-a Navy ManTech Center of Excellence). The Marinette Marine Corporation team (MMC) is executing this 'Mega Rapid Response' project, with the goal to develop a systematic process for optimizing production of ship's structure during the functional design stage and to compile this information in a design for producibility handbook to be used by both design and manufacturing engineers.

By embracing advanced 3-D design software and state-of-the-art Finite Element Design programs, engineers have the ability to economically develop easily producible designs that are more efficient and cost effective. The FREEDOM Class LCS construction strategy is based on traditional scantling design and subsequent panel fabrication, driven by the software tools and manufacturing processes that were available in the 1990's. Conventional techniques/tools included early 2-D Computer Aided Design (CAD) systems and structural analysis programs. The advent of sophisticated Engineering Design Systems combined with the improvement of manufacturing equipment and advanced materials allows conventional design(s) to be more sophisticated. In addition, many scantling design approaches were based on conventional concepts of best engineering practices of the time. This led to configurations of stiffeners that had limited basis in efficiently resisting the hydrostatic or dynamic loads that they were meant to resist.

As part of the collaborative effort, the MMC project team is compiling and validating a much–needed handbook documenting the best practices/approaches toward developing affordable, readily-producible design, to capture the benefits associated with the latest software and manufacturing equipment available today. This handbook will provide engineering decision-making processes to be implemented during the functional design of hull structures, considering efficient alternatives and optimizing the best tools to ensure that the most efficient designs are developed for a FREEDOM Class LCS type craft in the future. Once approved and implemented, use of the 'Handbook' could potentially save an estimated $200K per FREEDOM Class LCS hull.

Ingalls Shipbuilding Investigates Expanded Use of Stud Mounting

The Office of Naval Research awarded the DDG-51 focused Improved Studs Fixturing Processes project to the Center for Naval Shipbuilding Technology (CNST-a Navy ManTech Center of Excellence). The CNST, Ingalls and Edison Welding Institute project team is investigating the use of studs in place of traditional equipment mounting methods. US Navy ships currently have hundreds of welded foundation structures that use bolts to fasten equipment/hardware throughout the hull form, with many structures designed into the ship simply to provide mounting surfaces. The project team is testing several use cases that once proven feasible, could potentially reduce acquisition costs related to the installation of over 3,000 components and mounting applications. The Ingalls team considered the current limitations of stud sizes, shipboard configuration requirements and all applicable Navy specification ship requirements to establish the candidate pool for this innovative approach.

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. This project's 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 team is executing a two-phase project to develop and demonstrate the 'improved stud fixturing' process. The first phase was the development of technical requirements for expanded applications for stud mounting. The second phase, currently underway, is testing and analyzing expanded applications specifically for DDG-51.

This technology, once implemented, could potentially save over $2.1M per DDG-51 Hull. These 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 could accrue to all US Navy ships, which will experience similar cost savings depending on the size of the ship and amount of equipment to be installed.

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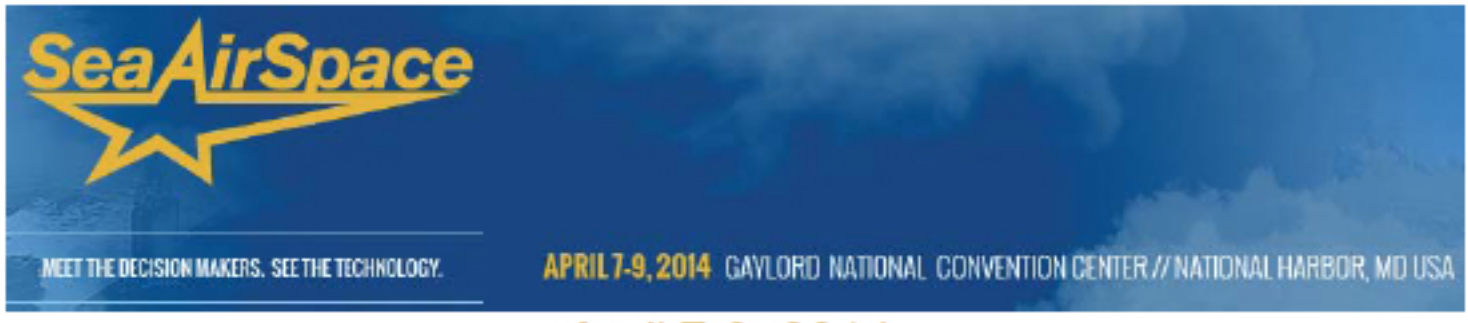

April 7-9, 2014
Gaylord National Convention Center, National Harbor, MD

September 9-10, 2014
Virginia Beach Convention Center, Virginia Beach, VA

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