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Winter 2017

A Publication of the Naval Shipbuilding & Advanced Manufacturing Center

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REDUCING THE COST AND TIME TO BUILD & REPAIR **NAVY** PLATFORMS

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315 Sigma Drive
Summerville, SC 29486

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Photo Courtesy of Huntington Ingalls Industries

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Photo Courtesy of Sikorsky

screen grab
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Newport News Shipyard Leveraging ManTech Tool to Pilot Material Tracking Technology

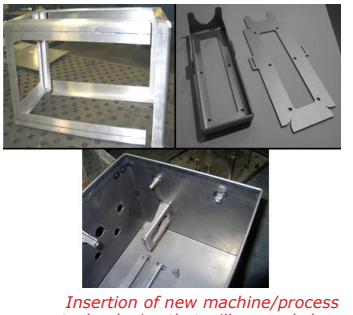
Replacing a manual tracking process with an electronic system for staged shipboard equipment

Significant effort is required to locate and assess readiness/availability of various types of shipboard components and production assets used in construction of the U.S. Navy's largest ships. These items include, but are not limited to, shipboard components that require routine preventive maintenance, in-process fabrications/assemblies, mobile production equipment, jigs, fixtures, etc. The dynamic in-process movement and storage of these items relies on a combination of paper, stand-alone databases and other tools to identify and track inventory. Organizations responsible for these items depend on manual efforts to locate, track and record required activities.

The *Geospatial Component Location, Identification & Condition* technology will provide team members the ability to address both Navy and Huntington Ingalls – Newport News Shipbuilding (NNS) needs by replacing the current paper-based manual process with a more efficient electronic location process that will save both time and money. The objective of this project is to establish an equipment location tool which is sophisticated enough to include part/component attributes. The project team is defining the steps, methods, and key deliverables for the design and process steps for implementing a tracking system. The implemented system will include component information such as grid/GPS location coordinates, unique identifier, last known condition/maintenance performed (type and when) and next scheduled work as applicable.

Once proven, NNS will have an 'app style', user interfaced, electronic system to replace the current manual process for completing, signing, tracking and storing of preventive maintenance activities. Data from the project will supplement the existing inventory location information with the necessary level of detail to efficiently identify components. The gained process improvements will complement existing databases with tracking and status reporting completed in the field using location/identification hardware and software. Providing the ability to work remotely with real time information and electronic on demand support information significantly increases efficiency and improves record keeping accuracy. NNS plans to deploy the solution in its target environment after initial acceptance tests are complete and engage affected individuals/groups/organizations to ensure the solution satisfies documented needs and expectations. The Geospatial Component Location, Identification and Condition technology has an estimate savings of $2.6M over 5 years per FORD Class Aircraft carrier and $342K over 2 years per VIRGINIA Class submarine.

Electric Boat Pursuing Sheet Metal Shop Efficiencies



Insertion of new machine/process technologies that will expand shop capabilities and reduce span time

The recently ONR-awarded and NSAM-managed *'Sheetmetal Modernization'* project with General Dynamics Electric Boat (GDEB) will optimize the sheet metal shop by maximizing benefit in shop efficiency, new and proficient designs, and an error proofing system. The first objective is to reduce the touch time required by the lofting group who assigns appropriate "sketch details" to assist in the manufacturing of parts on Build Authority data. The second objective is to make shop floor improvements that will increase efficiencies. Models and/or analysis methods to evaluate the impact of proposed shop changes do not currently exist and are needed to validate the current and future states of the sheet metal shop. Lastly, machine technologies and capabilities will be evaluated and compared to existing equipment resulting in a plan that will expand shop capabilities and reduce span time. The project will focus on, but not be limited to, sheet metal assembly, cutting and punching technologies, and forming and bending capabilities.

The rise in VIRGINIA Class Submarine (VCS) production rate, now with the VIRGINIA Payload Module (VPM) construction, and upcoming COLUMBIA Class (CLB) construction will increase required volume of production for the GDEB Quonset Point Sheetmetal Fabrication Shop. The increased production rate will impact the overall shipbuilding schedule, so the GDEB team is evaluating the legacy sheetmetal shop for modernization in preparation for the increase in work. Initially, the GDEB team is focusing on the sheet metal fabrication process, looking for areas that can be streamlined with implementation of automated manufacturing engineering tool(s) and

the development of manufacturing product data from the 3D product model.

The *'Sheetmetal Modernization'* project intends to develop manufacturing engineering tools to streamline sheet metal fabrication. Such tools could support the manual functions in use at GDEB and likely throughout the shipbuilding industry:

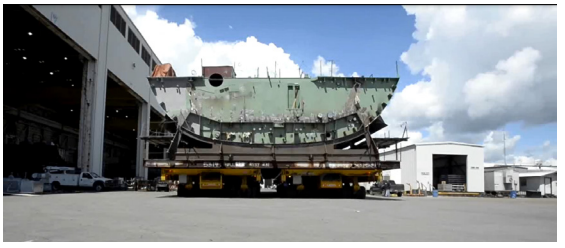
- Automation of product manufacturing information (PMI) generation in pre-defined model views within the sheet metal product model
- Reduction in touch time in support and services for sheetmetal applications
- Development of machine-specific manufacturing data for proposed shop equipment

This increase in efficiency is anticipated to reduce lofting and support services for the CLB Class by 10% resulting in a one-time savings of $1.8M and a $90K savings per hull. In addition, the project's shop floor improvements will provide a 3% reduction in man-hours resulting in a savings of $270K per VCS Hull, $324K per VPM hull and $405K per CLB hull.

Ingalls Shipbuilding Evaluating Upstream Unit Testing

The shipbuilding industry continues to expand its use of equipment and machinery packaging to improve construction cost and outfitting schedules. Over the last several decades, world-class shipyards have been able to dramatically reduce cost by exploiting build strategies that enable equipment packaging. Benefits include:

- Moving work off the ship and into a less costly shop environment
- Easier access to package components
- Opportunity to build packages in parallel with unit construction
- Allow for early testing and system/component validation



Machinery packaging enables system/component level testing prior to transporting and landing on the ship.

Ingalls Shipbuilding, a division of Huntington Ingalls Industries (Ingalls), is aggressively pursuing machinery packaging opportunities. These packages range in size and complexity from combining multiple pieces of equipment on a common skid to large machinery spaces fully outfitted with distributive systems and integrated into rigid grating foundations. Machinery packaging enables system/component level testing prior to transporting and landing on the ship. Ingalls strategy for machinery package testing includes accomplishing as much shipboard installation inspections and testing as possible prior to the package leaving the shop.

The Ingalls team commenced work in August 2017, with the project's objective being to evaluate industry 'best practices' to determine the optimal level and type of testing that can be performed on equipment packages. It will determine specific requirements that enable early testing, perform pilot on an existing unit to evaluate construction requirements, evaluate support equipment requirements needed for early testing, and assess support equipment options that capitalize on efficiencies achieved by testing in a controlled environment.

The results of this project will develop shop environment testing of packaged units/structures downstream or late stage shipboard testing. This technology and process, once implemented, could potentially save an estimated $476K per DDG-51 hull and extend to other platforms under construction at Ingalls.

Measuring Up Cost Savings through Non-Contact Metrology Effort

For decades, the shipbuilding industry has utilized traditional metrology practices in the construction of high-quality US Navy warships. These traditional metrology practices, though being very robust, have limitations that could prevent shipyards from keeping up with the ever-increasing demand of the US government. Huntington Ingalls Industries – Newport News Shipbuilding (NNS) has identified non-contact metrology technologies as one key an opportunity to not only keep up with shipbuilding demands, but also improve current metrology practices and provide higher quality deliverables.

Successful integration of non-contact metrology technologies into the shipbuilding industry provides the opportunity to reduce the time, cost, and effort required of traditional and even advanced metrology processes, including laser trackers

NNS recognized the development of non-contact metrology hardware and software has outpaced the development of the standards necessary to control the technology's application within the shipbuilding industry. The *Non-Contact Metrology in Shipbuilding* project was executed by NNS and NSAM to develop the proper standards and processes required to successfully integrate non-contact metrology technologies into the current product lines while maintaining the accuracy, tolerances, and repeatability achieved through traditional practices. The development of an integration process and standards for the use of non-contact measurement solutions has grounded the technology and ensured those using it do not venture beyond the technology's limitations. The standards developed through the Non-Contact Metrology effort provide an integration process enabling assessment of each device's applicability towards a particular evolution without the use of pilot or mock up jobs, which is essential to remove disruptions to production schedules. Over the course of the project, The Non-Contact Metrology project developed five specific standards governing the use and integration of non-contact metrology technologies in NNS production lines, including Integration, Pre-Planning, Data Collection, Data Analysis, Modeling, and Storage, and Data Reporting standards. The standards were utilized to identify 636 CVN (17%) and 150 VCS (10%) metrology applications where the application of non-contact metrology is expected to provide significant benefits over the legacy process. Through the execution of three separate pilot evolutions, the project provided a 30% labor reduction per evolution while using the Non-Contact Metrology Standards, which resulted in a reduction of Accuracy Control labor reductions of 6,641 CVN man-hours and 2,174 VCS man-hours.

The standards have proven to benefit NNS shipbuilding and metrology practices and are expected to be fully implemented during early 2018. NNS anticipates an estimated per hull savings of $691K per CVN hull and $232K per VCS hull resulting in a combined five-year savings of over $3M for the two platforms. Additional savings are anticipated for the COLUMBIA Class Submarine.

This document was prepared under Contract N00014-14-D-0377 to the Office of Naval Research as part of the Navy ManTech Program.

NAVAIR Improving 3D Technical Data Management

Sikorsky CH-53K King Stallion

The recently ONR-awarded and NSAM-managed '3D Data Exchange' project with PMA-261 will configure and improve the Product Lifecycle Management (PLM) system production environment for technical data that is being delivered from Sikorsky's ENOVIA PLM system to the PMA-261 ENOVIA PLM system. This data can be pushed to or pulled from program partners, both external such as the original equipment manufacturer (OEM), U.S. Navy Naval Supply Systems Command (NAVSUP), Defense Logistics Agency (DLA), and internal, such as Fleet Readiness Center East. Program Offices, such as the H-53 Heavy Lift Helicopters program office (PMA-261), transitioning to Model Based Enterprise (MBE) processes require a method of verifying/validating thousands of complex 3D models in a short time period. Also needed is the ability to generate production-quality model-based documents and Technical Data Packages (TDP) that provide non-computer-aided design (CAD), non-engineers, and other downstream consumers with the detailed engineering and manufacturing information required for effective model-based communication and collaboration.

There is excessive variation and a lack of technical integration in the manner NAVAIR Technical Data Packages (TDP) are developed, acquired, accepted, distributed, controlled and utilized, resulting in missing or unusable data, numerous reverse engineering/translation/healing efforts and scrapped parts. The '3D Data Exchange' project intends to develop the architecture to:

- Streamline the technical data receipt, verification, validation and migration into the PLM
- Provide a secure 3D Data Exchange System for non-engineers such as Logistics, DLA and NAVSUP to consume 3D Product Data
- Demonstrate a secure capability to import, validate, export and execute movement of data to provisioning and sustainment functions such as NAVSUP and DLA

Streamlining and increasing automation is anticipated to reduce the amount of reverse engineering requirements for creation/verification/validation of data, reduce labor associated with healing of CAD data, reduce the amount of rework due to incorrect technical data, and reduce the requirements for TDP Engineering Support Requests caused by programs using full model based definition in lieu of 2D drawings. These translate to a cost savings of $9M annually for the CH-53K program.

(NAVAIR Public Release 2017-1018. DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.)

NSAM Did You Know:

NSAM will be attending *Sea Air Space* on April 9-11, 2018 at the Gaylord National Convention Center located just outside of Washington, D.C. They will be in booth #1314.

SeaAirSpace
The Navy League's Global Maritime Exposition

APRIL 9 - 11, 2018
GAYLORD NATIONAL CONVENTION CENTER
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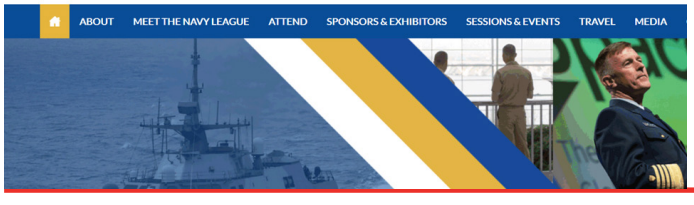

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Developing Advanced Manufacturing Technologies

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Deploying them in U.S. Manufacturing facilities

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Funding Projects that Drive Improvements

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Reducing the Cost and Time to Build and Repair Navy Platforms

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To date, NSAM project efforts have led to over $500M in total savings, measured as "per hull" cost reductions across several U.S. Navy platforms.