• NSAM partners with Northrop Grumman Aerospace Systems to reduce F-35 cost by improving quality process

• Ingalls Pursuing Optimized Build Strategy with Modular Outfitting/Packaged Units Project

• ‘Mobile Computing Design-Build Process’ is creating lean tablet-based work packages

• Resource Availability Tool will enhance lifting and transportation activities
NSAM partners with Northrop Grumman Aerospace Systems to Reduce F-35 Cost by Improving Quality Process

The Integrated Assembly Line (IAL) at Northrop Grumman’s Palmdale, CA facility is a highly automated final assembly line with numerous automated systems that assist in the production of the F-35 center fuselage. Systems such as the Inlet Duct Robotic Drilling (IDRD) system automate production functions such as drilling, metrology and assembly. While IAL automation is state of the art for aerospace assembly operations and capable of identifying and documenting out-of-spec conditions, the IAL lacks an integrated, electronic way to sort, prioritize and resolve quality issues without significant manual labor to review, address, and disposition identified quality issues.

The Naval Shipbuilding and Advanced Manufacturing Center (NSAM) has teamed with defense industry partner, Northrop Grumman, to develop manufacturing technologies that will improve IAL quality processes. An example of this strategic goal is the Assembly Metadata Integration project. The primary focus of Assembly Metadata Integration is to design an integrated process to extract quality information from key automation such as the IDRD on the IAL, to automate and eliminate the tedious effort of dispositioning quality issues. The integrated system will receive quality data across the automated systems on the IAL, classify it into actionable instructions, and route the appropriate response to downstream model-based manufacturing instructions. It is envisioned that the improved process will gradually reduce unnecessary oversight of non-critical quality non-conformances while providing enhanced visibility of critical quality issues to end users with visualization tools that display relevant and required information. The integrated process intends to reduce the number of man-hours currently utilized for addressing quality issues by automating as much as 46% of manual calculations associated with recurrent manufacturing defects from automated IAL systems such as the IDRD.

Once implemented, the system will improve downstream assembly processes, enhance first-time quality, and ensure efficient operation of the IAL that are critical for NGC’s to continue meeting cost and schedule commitments for the F-35. With a scheduled implementation in early 2018, Assembly Metadata Integration will have immediate benefits on the F-35 in meeting production rate and quality goals.
Mobile Computing Design-Build Process’ is Creating Lean Tablet-Based Work Packages

The General Dynamics-Electric Boat Corporation (GDEB) ‘Mobile Computing Design-Build Process’ project will create a lean paperless work package built from legacy VIRGINIA Class Submarine (VCS) product model. The project will create tools and processes to enhance Electric Boat’s lean work package, structural fabrication, and outfitting system. These tools and processes would support shift level work instructions delivered on a tablet in PDF form (including PDF + 3D JT), for the Electric Boat Quonset Point facility using legacy VCS data. The Mobile Computing project will focus primarily on work instructions for structural fabrication. However, the expected outcomes will be applicable to other disciplines. The processes and tools developed in this project will be used in a large-scale prototype illustrating the versatility of the Total Schedule-style authoring and changing of build plans and integration with OR lean work instructions.

VCS legacy data does not contain the level of data that is contained in OHIO Replacement (OR) Program product design. When VCS data is migrated/translated to NX some of the VCS data may be lost. This project will create a lean paperless work package built from the legacy VCS product model that will allow for all data to be maintained. The lean work packages would include only the operations, material, joints and views needed for a particular unit of work. This will enable a ‘shift-sized’ work instruction package that will be able to support variable sized units of work. Configuration management of this data is critical.

For the VCS Program, legacy work instructions come with traditional engineering drawings that contain much more information than is needed for any particular task. One of the principal goals of this project will be the lean paperless work package with graphics geared only to the work at hand. Conversion of the legacy VCS design data will allow for the creation of Build Authority views and models. Build Authority models will provide graphical views that represent build (as opposed to design) geometry.

Once implemented, GDEB anticipates that the ‘Mobile Computing Design-Build Process’ will provide a 2.5% improvement of 30% of the employees/trades personnel at their daily activities. These savings would be distributed across multiple functional areas such as Operations, Planning and through automated processes with an estimated cost savings of $910K per VCS hull.

Diagram Courtesy of Electric Boat Corporation

Providing immediate visibility to the location/performance of all lifting resources and the ability to optimally forecast those resources. Photo Courtesy of blog post on AL.com.
NSAM Did You Know:

Recent NSAM project successes:

- The “CAD/CAM Interface for Steel Processing” project with General Dynamics-Electric Boat (GDEB) developed an interface to feed GDEB’s shape processing machine (called a Voortman™), with cutting, footprint marking and coping information, fed directly from the Computer Aided Design (CAD) product model without manual intervention. The interface tool is adaptable as it uses a standards-based format; this saves time and money by automating a cumbersome manual process and also reduces the probability of human errors. The interface advances the state of manufacturing technologies for shipbuilders because it automates CAD to Computer Aided Manufacturing (CAM) interface for structural steel shapes. GDEB estimates that this technology can potentially save $518K per OH/0 Replacement hull. The VCS savings is approximately $26K on hulls with VIRGINIA Payload Modules.

- The “Advanced Ultrasonic Testing Method for NDT of Hull Welds” project (also with GDEB) validated use of phased array ultrasonic technologies (PAUT/ ToFD) to achieve a 20% reduction in inspection costs for hull butt welds is to implement, where practical, the use of next generation PAUT/ToFD in lieu of radiographic testing (RT) and conventional ultrasonic testing methods (UT). The recommended resultant procedure will be safer, faster, easier and more cost effective than the current Conventional UT and RT process, with an expected savings of $317K per VCS hull and $476K per OR hull. The GDEB project team (including EWI and the NSWCDD Code 61 Technical Authority) presented the data to the NDT&F Technical Warrant Holder for review and once accepted, are positioned to begin implementation activities.

- The “Trade Friendly Locating Dimensional Techniques” project with GDEB researched and applied advanced metrology technologies to production-level tradesmen activities. The project team worked to replace or enhance common mechanical measurement tools, reduce repetitive measurement, and reduce structural layout and attachment locating times (the resulting technology now provides ‘xyz’ locating coordinates instantly). Implementation activities are underway, initially estimated to result in about $860K in cost savings for both VIRGINIA Class and OHIO Replacement hulls, the GDEB project team identified additional labor reductions, increasing the potential cost savings to nearly $1.72M per hull once fully implemented.

- The DDG-51 focused “Mobile Yard Inspector” project with Huntington Ingalls Industries-Ingalls Shipbuilding (Ingalls) provides a mobile platform to assess real-time impacts of actual ship module/unit placement, by leveraging the “Capacity Planning Automation” tool that resulted from a previous ManTech project at Ingalls. The “Mobile Yard Inspector™” enables Ingalls’ capacity planning team to pair mobile devices with the HII-Ingalls developed Automated Real Estate Allocation System (AREAS), to assess ship module and unit placement and optimize space allocation and footprint utilization. The Ingalls team can use mobile devices to perform real-time, shipyard condition surveys to determine production schedule impacts. Ingalls can document deviations from the build plan and provide real-time data to analysts that include annotated photographs, actual unit placement location, rotation and orientation information, material blockages and more. This on-demand information provides a quick and efficient means to respond to constantly changing conditions. The Ingalls team has already realized a 10-12 labor hour reduction per week for Ingalls surveyors, an estimated annual savings of nearly 1,700 hours (about $125K). Ingalls expects the savings number to grow as the users become more familiar with the system.

- The DDG-51 focused “Machine Readable Material Transaction” project at Ingalls has resulted in early, partial implementation. Ingalls is already using the project’s handheld devices to capture material receipt transactions to feed their yard-wide material tracking and planning systems. The new processes have increased their receipt inspection rates (8% faster per person) and improved Quality inspection efficiencies by reducing the time to correct discrepancies and deficiencies noted. The Supply Management team is able to identify and address more non-conformances than in previous inspections, with issues being detected and resolved before items leave the warehouse. Ingalls is planning to expand that implementation by using the technology in other warehouses. The Ingalls project team successfully demonstrated the system during a recent on-site project review and confirmed their estimated cost savings of $2.8M per DDG-51 hull.

- The LHA focused “Modular Outfitting/Package Units” project with Ingalls developed a build strategy assessment tool that enables the shipyard to examine the build sequences of outfitting activities in detail, identifying possible changes that could result in cost savings. The Ingalls team selected three structural candidates and validated the tool’s use to support changing specific build strategies in a structured, cost effective manner. Using only the three candidates, Ingalls conservatively estimates the LHA cost savings at over $2.3M per LHA hull, with potential for use on each HII-Ingalls’ built platform (DDG-51, LPD, NCS).

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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 $460M in total savings, measured as “per hull” cost reductions across several U.S. Navy platforms.

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