



National Shipbuilding Research Program Advanced Shipbuilding Enterprise

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For Immediate Release

April 22, 2008

NSRP EXECUTIVE BOARD SELECTS 10 NEW SHIPBUILDING R&D PROJECTS

The Executive Control Board of the National Shipbuilding Research Program Advanced Shipbuilding Enterprise (NSRP ASE) has announced selection of 10 new research projects as part of the Navy/Industry co-funded portfolio specifically designed to save taxpayers money in Navy shipbuilding and ship repair. This action occurred during the Board's April 10 meeting in Charleston, S.C. The Navy's continued sponsorship of the Program is a reflection of their ongoing commitment to cost reduction in building and maintaining the fleet. The 10 new projects, valued at approximately \$18 million including industry cost share, were in response to the latest NSRP solicitation released in November 2007. A brief description of each project with a list of participants and funding information follows.

Development of Manufacturing and Assembly Technology for Low Cost Pultruded Composites

Description: This proposal responds to Navy interest in researching and adapting advanced materials and designs to reduce weight, realize greater fuel economy and increase lifespan in future Naval ships, as expressed by the Program Executive Officers who oversee Navy shipbuilding programs. To realize the reduced maintenance cost and weight savings associated with composites, this effort will build on the promising results of the ongoing NSRP pultrusion joining project which has demonstrated the rapid assembly of flat panels with integrated edge joints. This follow-on effort will apply the same labor saving methodology to other joints needed in complex structures, including four joints (flat, "L", "T", and cruciform), plus a panel edge feature, which will be designed to mate with any of the four joint configurations. Standardized pultruded joints will essentially permit the manufacturing process to more closely resemble snapping the panels together to make the structure. Finite Element Analysis will be performed and each joint will be compared to the corresponding joint constructed using the current standard Vacuum Assisted Resin Transfer Molded process.

Participants: Northrop Grumman Shipbuilding—Gulf Coast, Material Sciences Corporation, West Virginia University, KaZak Composites

Program Funding: \$1.1M **Industry Cost Share:** \$1.1M

Practical Applications of Design for Producibility

Description: In response to Program Executive Officer interest in Parts Commonality/Standardization, this project will develop the capability of creating standard assemblies with appropriate material identification and build sequences, in a manner that they can be instantiated into a design within ShipConstructor 3D ship design software. In addition, the team plans to develop the capability for distributed systems support in the ShipConstructor product. Efficiencies developed through this project will benefit Navy programs such as the Littoral Combat Ship and the Joint High Speed Vessel.

The current ship design process utilizes many ship parts which could be considered standard assemblies located and used in many different places within the ship. Common examples are hatches, doors, ladders, and rails. Current practice is to create each of these assemblies in the ship design model uniquely for its use. In addition, there are many pipe hangers and distributed system supports (e.g., cableway hangers) that are currently left to shipyard installers to fabricate and install. In both of these cases, the proposers state that they now have no mechanism or capability to model standard assemblies, generate Bills of Material or assign these components to relevant portions of a build sequence.

Participants: Bollinger Shipyards, VT Halter Marine, Northrop Grumman Shipbuilding—Gulf Coast, Marinette Marine, ShipConstructor Software, ShipConstructor Software USA, Genoa Design International

Program Funding: \$1.3M **Industry Cost Share:** \$1.5M

Shipbuilding Partners and Suppliers (SPARS) 701

Description: The project team proposes to add new functionality to the SPARS system that is currently implemented and realizing cost reductions in several shipyards engaged in building Navy surface combatants, aircraft carriers and submarines. Twelve SPARS production processes are currently implemented at five shipbuilders resulting in cost reductions of approximately \$2M per process per implementing yard. SPARS directly supports the DDG-51, DDX/DDG-1000, LPD-17, Virginia Class Submarine, and LHA-6 programs. The new business processes proposed in SPARS 701 are:

- 1) **Supply Chain Management** - centralize and automate the data collection and updating of required supplier information, which reduces shipyard labor content, cycle time, and error rates for the gathering and maintaining of required supplier business information.
- 2) **Information Security Requirements** - update the previously developed software with new security requirements imposed by NAVSEA and DoD.
- 3) **SPARS Pilot Test Bed** - provides for the continued operation of the Pilot Test Bed with which shipyards can analyze previously developed modules for potential implementation, without installing them on their mainstream information technology systems.

Participants: SPARS Consortium, Bath Iron Works, Electric Boat, Northrop Grumman Shipbuilding—Newport News, Northrop Grumman Shipbuilding—Gulf Coast, National Industrial Information Infrastructure Protocols, IBM

Program Funding: \$985K **Industry Cost Share:** \$1.1M

Large Scale Computer Simulation Modeling System for Shipbuilding

Description: In response to Program Executive Officer interest in Modeling and Simulation/Design Tools, this project will develop and deploy a yard-wide computer simulation modeling system that will enable analyses of the effects of current and new ship production work on the shipyard's operations. This project is innovative as it will develop a "yard-wide" simulation modeling system versus current simulations that are typically focused on individual work centers or processes. The system will also support a broad user base of planners, managers and analysts rather than a small group of highly trained specialists. It will include: (1) a yard-wide simulation model application, (2) user utilities to easily define facilities, schedules, processes/routings and interim products, and (3) automated links to product design and planning/scheduling data. Expected benefits are time and cost reductions in analyzing how new/different ship programs will impact production within the shipyard, and how process/facility automation and other changes will impact overall productivity within the shipyard. Ultimately this will lead to reduced cost and risk to Navy ship production programs.

Participants: NASSCO, Atlantec Enterprise Solutions, Bender Shipbuilding & Repair, ShipConstructor Software USA, TranSystems/Automation Associates

Funding: \$1.4M **Industry Cost Share:** \$1.1M

Advanced Systems Development for a Remote Climbing Robot for Automating Welding Processes in the Shipbuilding Industry

Description: This project proposes to significantly advance automation in the shipbuilding process through development of a mobile, autonomous, robotic welding platform. The proposers project that this robotic welding system will replace fixed-track-based devices resulting in a substantial savings in time, set-up requirements, safety and overall cost (50-70% cost savings per job for typical erection joint welds). The proposers have recently developed a climbing robot technology for remote inspection in the coal-fired electric power industry, and plan on leveraging this success in the shipbuilding industry. The scope of this project is to significantly enhance the prototype mobile welding platform by developing and integrating a non-contact tracking and sensor system coupled with a novel navigation and welding control algorithm. This system will also provide a significant enhancement to torch motion control and autonomous control of weld seam patterns for optimal welding conditions. It can provide real-time tracking of conditions and provide fault recognition to improve weld quality. Taken together, these activities will result in a mobile robotic welding system capable of semi-autonomous welding in the shipbuilding environment.

Participants: Robotic Technologies of Tennessee, Bath Iron Works, Tennessee Technological University

Program Funding: \$126K **Industry Cost Share:** \$186K

Smart “As-Built” Model Modification

Description: The objective of this project is to create a useable model for ship repair based on pre-existing computer-aided design (CAD) models, along with metrology devices and software, to create an “as-built” model that includes all manufacturing and installation data for use in repair planning and design. It responds to Program Executive Officer interest in expanding the utility of modeling tools to reduce costs associated with both current ship design and enterprise management. This new process will add production and Common Parts Catalog metadata to current “As-Built” CAD models using the individual preexisting CAD models as a “local parts library.”

The team plans on creating the model using Light Detecting and Ranging (LIDAR) and Photogrammetry systems. These systems will obtain 3D data on the ship to be repaired and relate this data to a library of preexisting CAD models which have the necessary associated meta-data. Algorithms will be created that will best fit the CAD models from the library to the 3D data. Lessons learned from the NSRP Ship Check Data Capture projects completed in 2006 will be used as reference.

Participants: Bender Shipbuilding & Repair, Electric Boat, Foto-G Measurements, Trimble, ShipConstructor Software, Catia, University of New Orleans

Program Funding: \$639K **Industry Cost Share:** \$666K

Modern Shipbuilding Design

Description: This follow-on project is responsive to Program Executive Officer interest in Workforce Interoperability. It also complements the on-going NSRP Shipyard Design Tool Enhancement project, which has successfully developed an introductory marine design course, Applications of Modern Shipbuilding Design, that will be provided at two universities this Fall. The team proposes to develop 4 additional advanced marine design courses — Structure, Piping & HVAC, Electrical, and Design for Manufacturing and Producibility. These courses will help ensure consistency and quality in training across the industry while taking advantage of the latest technologies to significantly enhance second-tier shipyards’ capabilities as a competitive global force. This curriculum will provide the student with the training to effectively enter the shipyard workforce ready to start developing discipline-specific designs well beyond what a CAD operator is capable of performing. This program will be developed for both classroom and on-line educational development.

Participants: Bender Shipbuilding & Repair, Bollinger Shipyards, Genoa Design International, Gibbs & Cox, Murray & Associates, ShipConstructor Software, Art Anderson & Associates, University of Wisconsin-Marquette, University of South Alabama

Program Funding: \$700K **Industry Cost Share:** \$855K

Virtual Welding – A Low Cost Virtual Reality Welder Training System

Description: This effort proposes to develop an affordable virtual welding system for training and personnel evaluation aimed at reducing welder training cost by as much as 50%. The concept is to reduce the cost of these virtual systems through innovative uses of: 1) a robust artificial intelligence technology, 2) a new real-time processing system which was developed partly under previous NSRP work, and 3) new, low cost, wired and wireless sensor technology. This system will be able to “teach” various weld styles and positions by virtually providing visualization and sound, and will provide immediate quality feedback through LED lights inside the welding hood. A reduction in ship construction costs will be realized through increased new-hire productivity, reduced training budgets and a reduction in consumables expended during training.

Participants: Bender Shipbuilding & Repair, Electric Boat Corp., N.A. Tech

Program Funding: \$1.7M **Industry Cost Share:** \$316K

Customization of Web-Based Planning and Production Engineering to Support Integrated Shipyard Work Flow

Description: This project plans to develop and implement innovative planning and production engineering technologies to improve the planning and execution at mid-tier shipyards. The core of the technical approach is to adapt to the shipyard environment an existing web-based tool to integrate planning, design, production control, material control, and daily scheduling with production processes. The tool systematically schedules, controls, measures and improves workflow throughout a project or production process. Its single database aligns workflow from a production to master level, eliminating the need for multiple schedules and associated coordination problems. Based on actual results stemming from

the construction industry's use of this software, the team is conservatively expecting to realize a 10% total project cost saving, as well as significant cycle time and throughput improvement.

Participants: Bollinger Shipyards, Atlantic Marine, Hepinstall Consulting Group, CBS Consulting, Strategic Project Solutions

Program Funding: \$542K **Industry Cost Share:** \$530K

Improved Methods for Generation of Full Ship Simulation/Analysis Models 2

Description: This award continues ongoing work to expand the use of modeling and simulation tools to reduce costs associated with current ship structural testing and analysis - a key area of interest of Navy Shipbuilding/Repair Program Executive Officers and Program Managers. The team proposes continued engagement with the Navy's Full Ship Shock Trial Integrated Process Team and the Computational Research and Engineering Acquisition Tools and Environments (CREATE) program, while also expanding modeling and simulation domains beyond shock to include structures, acoustics, electromechanical and fluid mechanics analyses. The current project, scheduled for completion this month, will result in demonstrated modeling and simulation framework prototypes implemented at two major shipyards. The proposed effort will expand this technology and provide for insertion and interaction with the multi-year CREATE program and provide shipyard test and evaluation of the developed tools. This proposed interaction will ensure that processes and tools developed as part of the NSRP modeling and simulation efforts and CREATE can be installed, implemented, and executed at major shipyards.

Participants: Electric Boat, Northrop Grumman Shipbuilding—Gulf Coast, Product Data Services, Engineous Software, TechnoSoft

Program Funding: \$1.1M **Industry Cost Share:** \$1.1M

NSRP is a collaboration of 12 U.S. shipyards working with government, industry, and academia to achieve the continuous product and process improvements necessary for the U.S. shipbuilding industry to reduce the cost of ship construction and repair. NSRP's mission is to manage and focus national shipbuilding and ship repair research and development funding on technologies that will reduce the cost of warships to the U.S. Navy by leveraging commercial practices and improving the efficiency of the U.S. shipbuilding and ship repair industry. NSRP also provides a collaborative forum to improve business and acquisition processes. NSRP is sponsored by the U.S. Navy and managed through the Naval Sea Systems Command.

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