

# GDEB 'Robotic Welding of VCS Interim Products' Effort Advances Robotic Manufacturing Technologies for Shipbuilders

Status: **Implemented**

## PROBLEM / OBJECTIVE

Welding at shipyards remains a large cost-driver in the construction of US Navy ships. This is particularly evident with the VIRGINIA Class Submarine (VCS), where there are hundreds of thousands of structural weld joints that require strict adherence to a welding technique defined for the specific application. The objective of this project was to develop the requirements for, and implement a robotic welding cell for the manufacturing of the VCS part family (PF) and interim product (IP) subassemblies that are currently welded manually. This is a unique situation where a robotic welding cell will be used for heavy welding for high mix, low volume assemblies that consist of curved web-to-flange, heavy inserts/penetrations, and various other PF and IP subassemblies that are too complex to be welded with a mechanized process.

## ACCOMPLISHMENTS / PAYOFF

### **Process Improvement:**

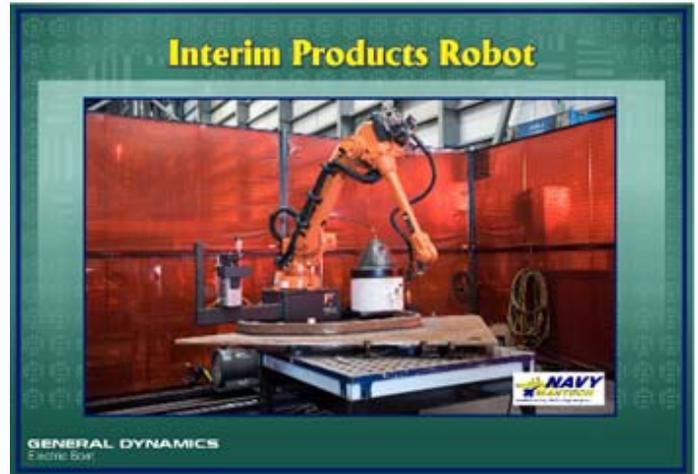
Phase I was successfully executed with the procurement of the robotic welding cell and initial weld process development for PFIP assemblies. In Phase II Electric Boat installed the robot at General Dynamics Electric Boat (GDEB) Quonset Point (QP), created a detailed implementation plan (with business case) for the selected methods, provided data needed to support welding qualifications, and trained GDEB personnel to program and weld with the robotic cell.

Shipyards evaluations have shown savings for both the fitting and welding times greater than the 30% estimated at the onset of this task. The first article assemblies have proven the capability for a fully outfitted robotic welding cell to reduce the fitting and welding cost of interim product assemblies. These savings will result from enabling discrete planning of welding small assemblies within existing planning systems and increasing the percent of first time quality. Additionally, findings from this project can be applicable and beneficial to construction activities for the OHIO Replacement Program and at other major shipyards.

### **Implementation and Technology Transfer:**

GDEB received "Supervisor of Shipbuilding Groton" approval and implemented robotic welding of Interim Product assemblies at the GDEB Quonset Point Facility. Welders have been trained, passed their qualification tests, and are using the robotic welding cell, having fabricated the first production structural assembly in early December 2015, a part for use on the SSN-791 hull.

S2459 Robotic Welding of VCS Interim Products  
Rev B (DEC15)



### **EB robot welding First Article Assembly at Quonset Point Expected Benefits and Warfighter Impact:**

- Reduce welding time for complex subassemblies up to 50%
- Improve first time quality
- Estimated cost savings: \$1.2M/VCS Hull

## TIME LINE / MILESTONES

Start Date:	Jul 2012
End Date:	Aug 2015

## FUNDING

Navy ManTech Investment:	\$2.067M
--------------------------	----------

## PARTICIPANTS

ONR Navy ManTech  
PEO Submarines (PMS 450)  
General Dynamics Electric Boat  
Naval Shipbuilding and Advanced Manufacturing Center  
EWI