

# Improved Manufacturing Processes for VCS Weapons Cradles to Save Costs

**Status:** Partial Implementation

## PROBLEM / OBJECTIVE

Virginia class submarines (VCS) use weapons cradles to handle weapons shipboard prior to launch. General Dynamics Electric Boat (EB) and Newport News Shipbuilding (NNS) have encountered significant issues maintaining the very close dimensional tolerances for this long, thin structure manufactured with extensive welding. Any rework or scrapping is very costly to the program. The objective of this Navy Metalworking Center (NMC) project was to improve the producibility of weapons cradles.

## ACCOMPLISHMENTS / PAYOFF

### **Process Improvement:**

The Integrated Project Team successfully met its objective to reduce VCS weapons cradle manufacturing costs, rework, and scrap by applying design for manufacturability and assembly principles. NNS has implemented a template for base plate pads and several manufacturing improvements that have resulted in less rework and scrap. Two additional recommendations that are pending implementation are single-piece, forged end blocks and balanced weld joint. The team also developed a modified cradle design that removes 16 gussets and eliminates secondary machining from the remaining gussets (Design U), and produced an Engineering Report that details the welding sequence and manufacturing changes for prototype manufacturing of Design U. The VCS Program Office has expressed potential interest in continuing development of the Design U cradle for future VCS blocks as well as for Ohio Replacement.

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

The first improvements were implemented into production at NNS during phase one of the project on SSN 781 starting in May 2010, with additional improvements incorporated on SSN 782–784 as part of phase two, beginning in October 2011. The single-piece, forged end blocks and balanced weld joint are expected to be implemented at NNS on future hulls.

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Manufacturing improvements for weapons cradles will save costs for the VCS and Ohio Replacement Programs.  
U.S.Navy photo

### **Expected Benefits:**

- EB and NNS estimate cost savings of \$332K per submarine shipset.
- Total savings for the VCS program over five years is projected to be \$3.3M. The cost savings increases to \$13.2M when the remaining VCS and Ohio Replacement hulls are included.
- Scrapping of cradles due to welding / fabrication issues has been virtually eliminated.
- NNS has documented a 42 percent reduction in fitting and welding labor hours per cradle. A 50 percent reduction is expected with implementation of the one-piece, forged end blocks with balanced welding improvements.

## TIME LINE / MILESTONE

Start Date: April 2008  
End Date: September 2014

## FUNDING

- Total ManTech Investment: \$5.0M

## PARTICIPANTS

PMS 450 EB  
NUWC, Division Newport NNS  
NAVSEA 05 NMC  
Naval Surface Warfare Center, Carderock Division  
Lincoln Electric, Cecil Peck and other industry partners