

# Lessons Learned from Prototype Assembly Reduce Distortion Rework, Save Time, and Avoid Cost

**Status:** Transitioned and Implemented

## PROBLEM / OBJECTIVE

Distortion of ship structures due to welding of heavy plates results in assembly and outfitting problems. This Navy Metalworking Center (NMC) project developed fabrication parameters to produce CVN-21 innerbottom assemblies that meet flatness requirements and avoid costly and time-consuming rework. NMC also assessed the applicability of weld distortion modeling for predicting distortion in large structures of interest to the shipbuilding industry.

## ACCOMPLISHMENTS / PAYOFF

### **Process Improvement:**

This project developed, calibrated, upgraded, and validated fabrication parameters that are being used to produce CVN 78 production innerbottom assemblies that meet flatness requirements. This was achieved through the analysis, fabrication, and subsequent measurement of HSLA steel prototype innerbottom assemblies. The project also assessed the applicability of commercially available software packages for predicting weld distortion by comparing computational results with the distorted measurements of a generic ship innerbottom.

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

By working closely with NGNN and PMS 378, the technology developed under this project was directly implemented in the production of CVN 78, with the fabrication of the first production units in January 2007. The prototype assembly produced in this project was delivered to the Navy and was used for additional testing.

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Generic ship innerbottom for comparison of distortion with computational results

### **Expected Benefits:**

- 22% reduction in weld joint volume in the thick plate weld joint resulted in a validated savings estimate of \$140,000 per hull
- Simplified construction practices by eliminating pre-cambering
- Reduced cost and schedule impact associated with rework of production assemblies
- Availability of the prototype assemblies for additional testing and evaluation
- This technology may be applicable to other Navy surface ships that contain HSLA-65 and -100 welded structures.

## TIME LINE / MILESTONE

Start Date: February 2004

End Date: August 2007

## FUNDING

Total ManTech Investment: \$3.79M

Cost Share (PEO Carriers): \$250K

## PARTICIPANTS

PEO Aircraft Carriers  
NAVSEA Technical Codes  
NSWCCD  
NGNN  
CTC/Navy Metalworking Center  
Battelle Memorial Institute  
ESI North America  
Optimal, Inc.