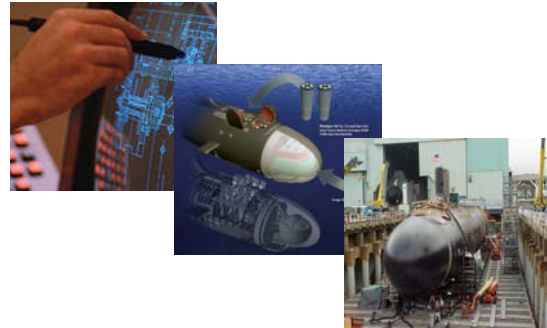


EB's Design-for-Production Efforts Pay Off with VIRGINIA Construction Cost Savings

The General Dynamics Electric Boat Corporation (EB) was recently awarded the next block of ships for the VIRGINIA-Class Submarine (VCS) construction program. This Block III build contract for eight additional submarines with a number of new design features was influenced by the builder's corporate-wide focus on its Design for Production (DfP) initiatives. EB has completed four successful CNST-managed DfP projects that contributed at least \$2M per hull in cost savings, with potential to add as much as \$4.8M more.

Though the VCS design is considered mature, EB embraced the challenge to increase cost savings, driving toward the goal of building two VCS hulls per year while reducing the cost to \$2B per hull. With the four CNST projects, Electric Boat's DfP Core Team developed a unique set of DfP processes and tools to enhance the design/build process. They have realized significant cost reduction benefits by educating the design/engineering community on the product-specific shop floor work cell capabilities, processes, and best practices. The EB team identified the DfP principles that, when applied during design development, will result in production cost savings. The DfP principles are based on lean manufacturing, assembly, installation, testing, and maintenance and repair activities. EB has implemented DfP tools focusing on three key DfP areas: Design Standards and Rules, Seamless Deliverables, and Cost-Based Design Methodologies.



EB's Implemented Design for Production Initiatives Reduce the Cost to Build

EB first had to establish and validate the DfP process methodology to provide the DfP process improvement structure. Once that was in place, a team developed a proof of concept knowledge database; a reusable repository that provides on-demand access to DfP approved standard designs and rules, and the related manufacturing cost data. In parallel, another EB team successfully prototyped the new seamless deliverable based on 3D isometric views to support the shop floor tradesmen, a job-specific product manufacturing deliverable and integrated work order instructions, eliminating the cumbersome (from the shop floor users perspective) traditional 2D drawings. The fourth project captured the best lean manufacturing capabilities and transformed them into cost metric tools and design standards and rules, and made them available to designers during initial and ongoing design development activities. The EB team extracted cost based design drivers by manufacturing shop, assembly area, and test activity for use during each design phase. They collected work cell specific manufacturing best practices and preferences as candidates for design standards or rules and finally integrated key cost drivers and standards into current DfP tools and methods to support the overall DfP mission.

EB is continuing its DfP efforts, identifying nearly 100 more potential applications of the DfP process in support of on-going VCS construction activities. Recently EB held a DfP event to change the design for the submarine crewmember's berthing area, specifically the bunk tray and pan locker. The initial goal was to find ways to take full advantage of the production capabilities of Quonset Point's Light Metal Fabrication facility (TRUMPF). The EB Team included crewmembers from the USS HAWAII (SSN 776) and the Supervisor of Shipbuilding (Groton and Quonset Point), and this unique opportunity provided end-user feedback directly to the design engineers and is expected to yield a cost savings as much as \$400K per submarine.

About CNST

CNST is a Navy ManTech Center of Excellence, chartered by the Office of Naval Research (ONR) to identify, develop and deploy, in U.S. shipyards, advanced manufacturing technologies that will reduce the cost and time to build and repair Navy ships. For additional information on this and other CNST projects, please visit www.cnst.us.

