

Fabricating LCS Component with Alternative Material is Expected to Save Significant Structural Weight

Status: Pending Implementation

PROBLEM / OBJECTIVE

Reducing weight on the Freedom-Class Littoral Combat Ship (LCS) is a high priority to meet performance objectives. One potential area for achieving weight reduction is the main gas turbine exhaust ducting (uptakes). The uptakes are currently comprised of an INCONEL® Alloy 625 interior wall that is exposed to high temperatures, a layer of thermal insulation, and a stainless steel exterior. The overall goal of this project was to reduce weight and fabrication costs of the uptakes on LCS.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

The project team successfully demonstrated that using an alternative material and simplified uptake wall configuration could reduce fabrication costs and 18,000 to 22,000 pounds in structural weight on LCS. To offset the higher cost of the alternative material, the project team demonstrated that high-speed, hot-wire Gas Tungsten Arc Welding (GTAW) decreased welding fabrication time. The design of the uptakes was modified to exploit the alternate material properties, further reducing part count and construction labor costs.

Implementation and Technology Transfer:

A full-scale section of the uptake was manufactured and delivered to Naval Surface Warfare Center, Philadelphia, for a test stand trial using a gas turbine engine where a majority of the operational profiles will be carried out. The uptake will be inspected at selected time intervals, and assuming that no damage is observed, the design will be released for manufacture and insertion on a future LCS.

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Using an alternate material to fabricate a critical LCS component will save 18,000 to 22,000 pounds in weight and construction costs. Titanium Fabrication Corp. photo

Expected Benefits and Warfighter Impact:

- 18,000 to 22,000 pounds in structural weight reduction due to lightweight gas turbine exhaust uptakes
- The reduced weight will benefit the warfighter through enhanced flexibility in mission modules.
- Cost reduction due to single wall design, use of net-shape technology, and new breakthroughs in high-speed, hot-wire GTAW of the alternate material
- Life-cycle cost savings due to corrosion resistance of the alternate material

TIME LINE / MILESTONE

Start Date: June 2010
End Date: March 2012

FUNDING

Navy ManTech Investment: \$1.4M

PARTICIPANTS

PMS 501
Lockheed Martin Mission Systems & Sensors
Gibbs & Cox
Titanium Fabrication Corporation
Marinette Marine Corporation
Naval Surface Warfare Center, Carderock Division
American Bureau of Shipping
Navy Metalworking Center