



Project Fact Sheet

Program

2009 Ultra-Deepwater Program

Project Number

09121-3300-05

Start Date

September 2010

Duration

18 Months

RPSEA Share

\$2,305,000

Cost Share

\$1,380,000

Prime Contractor

Lockheed Martin

Participants

Chevron ETC

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Reports and Publications

Technology Status Assessment

"Autonomous Inspection of Subsea Facilities - A New Reality," Ocean News & Technology, v17, issue 3, pp1-4, Apr 2011

Phase 1 Final Technical Report

Phase 1 Final Test Report

Phase 2 Final Technical Report

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9-17-13

Autonomous Inspection of Subsea Facilities

Research Objectives

The primary goal of this research was to develop, integrate and test technology for autonomously conducting a pre/post hurricane inspection of an offshore facility. Key objectives included: 1) Conducting a local offshore demonstration to test the autonomous underwater vehicle (AUV) and increase operator confidence of AUV facility inspection capabilities for use in a deepwater field environment, achieving TRL 4; 2) Demonstrating autonomous inspection of a production platform in the Gulf of Mexico using an AUV including: baseline inspection / generation of 3D model and introducing changes to the 3D model and re-inspect / detect changes; and 3) Demonstrating DnV TRL5 capability, including: mission planning & execution, operational safety, ability to operate in typical Gulf of Mexico conditions, autonomous inspection, autonomous change detection, feature based navigation, post-inspection analysis, and launch and recovery from a typical support vessel.

Approach

These objectives were achieved by applying Lockheed Martin's (LM) robust systems engineering process beginning with defining the system and subsystem level requirements and selecting the appropriate sensors and integrating perception, response, and control system autonomy software for deployment on the Lockheed Marlin™ AUV. After the design and fabrication was completed Lockheed Martin conducted rigorous simulation, integration, and test in the lab, followed by dockside and local offshore testing, and finally full-scale testing on representative platforms in the Gulf of Mexico.

Accomplishments

Lockheed Martin successfully completed the entire program on schedule and within budget achieved 100 percent of the planned objectives. Two production platforms were inspected multiple times and under varying environmental conditions, validating the performance objectives. The ability to conduct post-hurricane structural surveys on downed structures was also demonstrated.

Significant Findings

The advanced autonomy developed by Lockheed Martin coupled with the mature Marlin™ AUV provides industry with a commercial capability to complete subsea inspections in hours instead of days, and it provides accurate 3D geo-registered models within hours of completing the inspection. Autonomous detection of structural changes in real-time is achievable, providing industry with an on-site assessment of platform structural integrity and/or a post-storm damage assessment.

Future Plans

Lockheed Martin is commercializing an Autonomous Underwater Vehicle Platform Inspection system and will offer a Structural Survey capability in the Fall of 2012.

Acknowledgements

LM gratefully acknowledges the support and guidance of Chevron Energy Technology Company.



Marlin™ Launch prior to Platform Inspection



3D Structural Model within 1 hr of Vehicle Recovery