

## Littoral Combat Ship (LCS)

### Executive Summary

- The Navy is pursuing purchase of 13 Flight 0 ships instead of the original four.
- The Navy should pay particular attention to the crew size and manning policies to ensure they meet Littoral Combat Ship (LCS) needs.
- The LCS is designed to meet only Level 1 (minimal) survivability standards. This is the standard for logistics ships. Other combatant ships meet Level II standards.

### System

- The LCS is a new class of ship designed to accommodate a variety of individual warfare systems (mission modules) assembled and integrated into interchangeable Mission Packages (MPs).
- There are two different basic ship (seaframe) designs, one each from the Lockheed-Martin and General Dynamics teams.
  - Lockheed-Martin design is a steel monohull.
  - General Dynamics design is an aluminum tri-mararan.
- Both designs use combined diesel and gas turbine engines with waterjet propulsors.
- More than a dozen individual program of record sensor and weapon systems along with other off-board vehicles have been chosen to be LCS mission modules.



- The designs propose different combat systems for self-defense against anti-ship cruise missiles.

### Mission

- The Maritime Component Commander can employ LCS to conduct focused missions of either Mine Warfare, Anti-Submarine Warfare, or Surface Warfare, based on the MP fitted into the seaframe. MPs are designed to be interchangeable allowing the Maritime Component Commander flexibility to reassign missions.
- LCS can be employed in a maritime presence role regardless of the MP based on capabilities inherent to the seaframe.
- LCS can be deployed alone or in company of other ships.

### Activity

- The Navy conducted an Early Operational Assessment (EOA) of the Lockheed-Martin Flight 0 LCS ship design and the Mine Warfare MP from March 2005 to June 2005 under a DOT&E-approved test plan. The EOA report was issued on September 6, 2005.
- The LCS program conducted technology risk reduction activities using Engineering Development Models of systems planned for inclusion into the Mine Warfare MP. Use of surrogate platforms such as High-Speed Vessel 2 and Sea Fighter (formerly called X Craft) to assist in mission module development continues.
- The Lockheed-Martin and General Dynamics teams have both conducted underwater explosion testing of sample materials as part of the Live Fire testing program.

### Assessment

The EOA testing was adequate for this stage of development. It highlighted several high-risk areas for the Lockheed-Martin design with the Mine Warfare MP, including:

- Inadequate integration of several combat system elements with the COMBATTS-21 combat management system. This is an issue due to the small number of personnel that

will be assigned. Automation will be necessary to prevent watchstander overload.

- Unknown performance capability of the chosen surface and air search radar in a littoral environment.
- Execution of the Mine Warfare mission will depend on several Acquisition Category II and lower programs, the schedules of which do not appear well synchronized with the first seaframes. This may preclude testing a viable Mine Warfare capability until the later hulls.
- Integrated Logistic Support planning is inadequate for both the seaframe and Mine Warfare MP.
- Personnel safety concerns were identified in analysis of equipment designed for launch/recovery and control of off-board vehicles.
- The EOA report also raised concerns that planned LCS crew size may be inadequate to support maintenance and operation of the seaframe, aviation assets, and the Mine Warfare MP. Projected manning is 40 personnel for the seaframe, 20 for the aviation detachment, and 15 for the MP (75 total). There will be very little extra capacity for personnel beyond the 75 projected. No specific analysis was presented to confirm that

75 is the right number of personnel rather than the desired number.

The Navy is considering design trade-off studies to assess options that preserve or increase survivability while remaining at or below the planned unit cost of \$220 Million. LCS is currently designed to have only Level 1 (minimal) survivability. This is the standard for logistics ships. Other combatant ships meet Level II standards.

DOT&E approved a Test and Evaluation Strategy document for LCS based on a planned procurement of four (two Lockheed-Martin and two General Dynamics) Flight 0 ships. The Navy is now planning to buy as many as 13 Flight 0 ships. This change in acquisition strategy requires reevaluation of OT&E and LFT&E plans.

The Navy has not identified all of the necessary instrumented shallow water testing ranges and facilities needed to evaluate LCS and support training.

## **Recommendations**

The Navy should:

1. Reassess the level of combat system integration to be sure missions can be accomplished with a small number of

watchstanders. Closely evaluate personnel training and assignment policies to be sure they will support keeping appropriately trained people available for LCS. Conduct appropriate analysis to ensure 75 is in fact the appropriate number of personnel necessary to accomplish LCS missions.

2. Examine ashore support infrastructure to ensure its consonance with LCS manning policies; of particular concern is proper maintenance support.
3. Assess the risks to be sure Level 1 survivability is sufficient for a 13-ship class of small combatants.
4. Perform analysis to determine the minimum number of the various Mine Warfare mission module program of records that will be sufficient to provide genuine Mine Warfare capability.
5. Identify and resource all necessary instrumented shallow water testing ranges and facilities.