

## Littoral Combat Ship (LCS)

### Executive Summary

- The Navy is pursuing purchase of at least 15 baseline configuration or “Flight 0” ships through FY09, up from 13 reported in FY05.
- The Test and Evaluation Strategy is inappropriate for the proposed acquisition strategy.
- Early Operational Assessment (EOA) reports indicate high-level risks in systems integration, manning, and survivability.

### System

- The Littoral Combat Ship (LCS) is a new class of ship designed to operate in the more shallow waters of the littorals in which larger ships cannot maneuver as well. It can accommodate a variety of individual warfare systems (mission modules) assembled and integrated into interchangeable mission packages.
- There are two competing basic ship (seaframe) designs:
  - The Lockheed Martin design is a steel monohull.
  - The General Dynamics design is an aluminum tri-maran style hull.
- The designs propose different combat systems for self defense against anti-ship cruise missiles.
- Both designs use combined diesel and gas turbine engines with waterjet propulsors.
- More than a dozen individual programs of record, involving sensor and weapon systems and other off-board vehicles, have been chosen to be LCS mission modules. All but three are Acquisition Category (ACAT) II and ACAT III programs.



### Mission

- The Maritime Component Commander can employ LCS to conduct Mine Warfare, Anti-Submarine Warfare (ASW), or Surface Warfare (SUW), based on the mission package fitted into the seaframe. Mission packages 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 mission package based on capabilities inherent to the seaframe.
- LCS can be deployed alone or in conjunction with other ships.

### Activity

- The Navy conducted an EOA of the General Dynamics Flight 0 LCS ship design and the ASW and SUW mission packages from February to June 2006. The test was conducted in accordance with a DOT&E-approved test plan. The EOA report was issued in October 2006.
- Integrated Test Teams have been working to coordinate test objectives and events to maximize the efficiency of individual mission module and seaframe/mission package testing.
- 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 latest proposed acquisition strategy profile calls for at least 15 Flight 0 ships of both designs through FY09. This effectively nullifies the approved test and evaluation strategy that was based on going to a new, Flight 1 design after the first four Flight 0

ships. The Navy has not proposed a test and evaluation strategy that allows acquisition decisions to be informed by timely reporting of adequate operational test results. DOT&E will not approve the Test and Evaluation Master Plan for a Milestone B decision in early 2007 with this disconnect.

The EOA testing for the General Dynamics design with the ASW and SUW mission packages was adequate for this stage of development. The report highlighted risks to operational effectiveness and suitability. Several high-risk areas were found to be similar to those identified in a Lockheed-Martin EOA conducted in FY05, though the specific equipment or systems may be of different vendors. Risk areas include:

- Inadequate integration of several combat system elements to reduce susceptibility to inbound high-speed airborne threats; automation will be necessary to prevent watchstanders from being overtasked

- Uncertain capability and coverage of the proposed surface and air search radar in a littoral environment
- Inadequate integration of the mission packages with the core combat system to efficiently conduct missions with the intended manning
- Inadequate integrated Logistic Support planning and shore infrastructure for the seaframe and mission packages
- Personnel safety concerns, as identified in analysis of equipment designed for launch/recovery and control of off-board vehicles
- Survivability concerns as a result of manning levels that may be too low to support battle damage repairs
- Lack of automation of many damage control elements that would be critical to rapidly recover in the event of battle damage; it is not certain this design will meet the minimal survivability standards envisioned for this class of ship

DOT&E previously recommended the Navy assess the risks to be sure Level 1 survivability is sufficient for a class of small combatants. Level 1 calls for minimal survivability features and is the standard for auxiliary vessels. Most combatant ships are Level 2. The Navy maintains its intent for LCS to have Level 1 survivability.

DOT&E also previously recommended the Navy conduct analysis to ensure 75 is the appropriate number of personnel necessary to accomplish LCS missions. The Navy conducted some manpower studies, but did not determine by analysis that 75 personnel is the correct number with which to man LCS. Initial conclusions indicate manning levels do not portend success in a stressing mine warfare scenario. Unanticipated damage control efforts and other contingencies may lead to excessive fatigue and failure to accomplish tasks.

The Navy intends to deploy LCS 1 within nine months of taking delivery. This self-imposed urgency led to a post

delivery schedule for LCS 1 that omits significant events normally associated with lead ships. These events include acoustic, magnetic, infrared, and radar cross-section signature measurement; analysis of performance characteristics; and sensor accuracy testing. The schedule does not allow time for an adequate IOT&E to make informed decisions.

## Recommendations

- Status of Previous Recommendations. The Navy fully addressed two of the five prior recommendations and is making progress on another. The following recommendations from FY05 remain valid:  
FY05 #2: Examine ashore support infrastructure to ensure its consonance with LCS manning policies; of particular concern is proper maintenance support.  
FY05 #4: Perform analysis to determine the minimum number of Mine Warfare mission module programs of record that will be sufficient to provide genuine Mine Warfare capability.
- FY06 Recommendations. The Navy should:
  1. Revise the test and evaluation strategy to conduct IOT&E on the lead ships of each design. Doing so will align the testing and evaluation strategy with the proposed acquisition strategy.
  2. Revise LCS lead ship post delivery schedules to include test events such as signature measurement, analysis of performance characteristics, and sensor accuracy to determine basic performance baselines before deployment.
  3. Continue detailed manning analyses to determine the appropriate number of personnel necessary to man LCS, with mission packages, given its level of automation and systems integration.