

LPD-17 *San Antonio* Class Amphibious Transport Dock

Executive Summary

- The Navy began IOT&E in February 2007 and a number of key test events remain outstanding prior to completion. Testing thus far has demonstrated that the ship possesses considerable amphibious lift capacity; aviation support; command, control, communications, computers, and intelligence (C4I) capabilities; and habitability improvements.
- Operational testing revealed reliability problems with critical ship systems; self-defense and Information Assurance shortcomings; Chemical, Biological, Radiological Defense (CBRD)-related vulnerabilities; and significant hull, mechanical, and electrical (HM&E) problems. The Navy's Board of Inspection and Survey identified similar HM&E problems in their inspections of follow-on ships in the class.
- Completion of IOT&E has been delayed by deficiencies in the ship's material condition, deferred self-defense testing, unaccomplished developmental testing, and planning and coordination difficulties.
- The Navy completed the Full Ship Shock Trial on LPD-19 and the Total Ship Survivability Trial on LPD-18 in September 2008. The LFT&E analyses of the data to assess vulnerability and survivability of the LPD-17 class will continue into FY09. The conduct of these trials highlighted some survivability improvements; however, the trials were impeded by reliability issues with critical ship systems.

System

An LPD-17 class ship is diesel engine powered and designed to embark, transport, and deploy ground troops and equipment. The troops and equipment move ashore by air-cushion landing craft (LCAC), displacement utility landing craft (LCU), amphibious assault vehicles (AAVs), MV-22 tiltrotor aircraft, or helicopters.

- A floodable well deck is used for LCAC, LCU, and AAV operations.
- A flight deck and hangar accommodate Navy and Marine Corps helicopters and MV-22s.
- Installed C4I facilities and equipment support Marine Corps Landing Force operations.
- For air warfare ship self-defense, the Ship Self-Defense System Mark 2 Mod 2 (SSDS Mk 2 Mod 2) with Cooperative Engagement Capability (CEC) is the combat system that integrates Rolling Airframe Missiles, the AN/SLQ-32B (V)2

Activity

- The Navy resumed LPD-17 class IOT&E in November 2007 in conjunction with an SSDS Mk 2 Mod 2 FOT&E event. Due to poor weather, one of the two planned missile-firing events was not completed.



(with Mk 53 NULKA electronic decoys) electronic warfare system, and radars (AN/SPQ-9B horizon search radar and AN/SPS-48E long-range air search radar).

- Two Mk 46 30 mm gun systems and smaller caliber machine guns provide defense against small surface threats.
- The Shipboard Wide Area Network (SWAN) serves as the data backbone for all electronic systems. LPD-17 is the first ship built with a fully integrated data network system.

Mission

A commander will employ LPD-17 class ships to conduct Amphibious Warfare. In this role, the ship will:

- Transport combat and support elements of a Marine Expeditionary Unit or Brigade
- Embark, launch, and recover LCAC, LCUs, and AAVs for amphibious assault missions
- Support aerial assaults by embarking, launching, and recovering Marine Corps aircraft
- Carry and discharge cargo to sustain the landing force
- Conduct non-combatant evacuation operations and other crisis response missions

Prime Contractor

- Northrop Grumman

NAVY PROGRAMS

- The Navy deployed LPD-19, the third ship of the LPD-17 class, to support fleet operations before the completion of the program's IOT&E. DOT&E provided an Early Fielding Report to Congress in May 2008 regarding the demonstrated performance of LPD-17 based on the Navy's testing to date. LPD-17 also deployed in August 2008 as part of the USS *Iwo Jima* Expeditionary Strike Group, and LPD-18 deploys in January 2009 with the USS *Boxer* Expeditionary Strike Group.
- The Navy conducted LPD-17's IOT&E phases for amphibious warfare, surface warfare, and air warfare between February 29 and March 27, 2008. Several planned events not completed during this underway period were later completed during subsequent scheduled training events.
- Testing of LPD-17's combat system onboard the Self-Defense Test Ship (SDTS) is scheduled to continue in 1QFY09 against threat representative ASCM targets.
- IOT&E continued onboard LPD-18 in September 2008 to assess "soft-kill engagements" using the NULKA electronic decoy system against ASCM surrogates.
- The final IOT&E phase is a modeling and simulation effort to support an assessment of the ship's capability to defend against an attack by multiple ASCMs. This phase is expected to complete in FY09.
- The Navy completed two major LFT&E tests, the Full Ship Shock Trial and the Total Ship Survivability Trial, in September 2008. Analyses of the results are expected in FY09.

Assessment

Although the IOT&E is not yet complete, the following are DOT&E's observations from preliminary data and assessments:

- LPD-17 provides considerable amphibious lift. The ship is able to meet its amphibious lift requirements for landing force vehicles, cargo, personnel, fuel, hangar space, well-deck capacity, and flight-deck landing areas.
- The ship is capable of supporting C4I requirements in an Expeditionary Strike Group (ESG) environment; however, reliability problems observed in the SWAN and the Interior Voice Communications System degraded command and control of Marine forces. The Navy still needs to validate Information Exchange Requirements per the approved IOT&E test plan, and pursue a formal Information Support Plan approved by the Joint Staff.
- Information assurance testing revealed vulnerabilities to LPD-17 systems and networks, and the ship was unable to effectively demonstrate network detection, reaction, and restoration until installation of a shipboard Intrusion Detection System designed to help defend against network attacks.
- The ship is vulnerable against specific air and surface threats likely to be encountered by LPD-17 class ships. Testing also identified integration deficiencies with the AN/SPS-48E radar in the Advanced Enclosed Mast Structure as well as other SSDS combat system elements.
- The lack of interface between the real-time SSDS Mk 2 tactical display and the near real-time displays from the Amphibious Assault Direction System and Global Command

- and Control System-Maritime degrades situational awareness and increases the likelihood of misclassified contacts and potential blue-on-blue engagements.
- Major elements of LPD-17's SSDS Mk 2 Mod 2 combat system collectively have a large number of high severity software trouble reports, increasing the likelihood of occurrence of one or more during operations.
- During the amphibious warfare phase of the IOT&E, the ship experienced system failures that significantly affected its operations and survivability.
 - The SWAN experienced faults, one of which resulted in a loss of the crew's capability to control and monitor ship equipment including navigation, propulsion, and steering in the normal mode for approximately 18 hours. Off-ship contractor technical assistance was necessary to restore the system.
 - The engineering control system (ECS) and fire detection alarm system exhibited excessive false alarms and completely failed twice, resulting in the need to man additional engineering watch stations until restoration. The requirement for the crew to man additional watch stations revealed manning and training shortfalls that have implications on the ship's capability to sustain combat operations.
 - The electrical distribution system exhibited uncommanded opening of breakers and experienced a total loss of electrical power. This highlighted a continuing problem with uninterruptible power supplies, which do not provide power when required.
- The Navy's CBRD In-Service Engineering Activity documented significant design and installation deficiencies with the Collective Protection System and Casualty Decontamination Stations. Realistic CBRD testing has not yet been accomplished.
- LPD-17 has yet to complete dynamic interface testing for the AV-8 Harrier and is therefore unable to conduct operational testing or receive certification to land and service the aircraft.
- The survivability of the *San Antonio* class ships appear to be improved over the LPD class ships they will replace. However, problems encountered with critical systems during testing (particularly with the SWAN and ECS) may offset some of the survivability improvements and have highlighted serious reliability shortcomings.

Recommendations

- Status of Previous Recommendations. Two recommendations made in FY07 are being addressed; however, the modified target (GQM-163A Coyote) intended to represent the high-diver ASCM threat has not been flight-tested.
- FY08 Recommendations. The Navy should:
 1. Complete remaining IOT&E elements, including: modeling and simulation effort to support an assessment of the ship's probability of raid annihilation requirement, an end-to-end test of the ship's CBRD capabilities, and a demonstration of the ship's capability to satisfy its information exchange requirements. A test of the ship's interoperability with AV-8

NAVY PROGRAMS

- aircraft should be conducted as FOT&E after completion of prerequisite developmental testing.
2. Continue installing the AN/SPS-48E radar antenna corrective shroud on remaining ships of the class and complete operational testing needed to demonstrate the radar's effectiveness inside the Advanced Enclosed Mast Structure.
 3. Conduct comprehensive information assurance testing during FOT&E, including testing to address privilege escalation and an assessment of LPD-17's susceptibility to internal threats. Additionally, the Navy should re-examine protection, detection, reaction, and restoration capability after installation of an Intrusion Detection System.
 4. Develop, test, and field fixes to critical systems including the SWAN, ECS, and fire detection and alarm systems.
 5. Review the problems repeatedly identified in the Navy's Board of Inspection and Survey inspections of the LPD-17 class ships to establish which problems are design issues and which are quality assurance failures and develop corrective action plans for both.
 6. Review the impact of the ship's manning, training, and logistics support on the reliability and maintainability of ship systems.

NAVY PROGRAMS