

Advanced SEAL Delivery System (ASDS)

Executive Summary

- The Navy developed a new Advanced SEAL Delivery System (ASDS) Lithium-Ion battery and a new titanium and composite material tail section for the ASDS designed to correct two critical ASDS deficiencies.
- The ASDS experienced a propulsion related mission failure during Follow-on Operational Test and Evaluation (FOT&E). The Navy decertified the ASDS from test and is investigating the causes of the failure.
- U.S. Special Operations Command (USSOCOM) and the Navy are restructuring the ASDS program to correct reliability deficiencies on ASDS 1, and to conduct verification testing of improvements before restarting operational testing.
- USSOCOM and the Navy delayed ASDS Milestone C.

System

- The ASDS is a battery powered submersible for transporting Special Operations Forces (SOF) clandestinely to their mission area.
- Crew consists of a pilot, co-pilot, and fully equipped SOF team.
- The ASDS is capable of long distance transport, anchoring, loitering, and submerged lock-out/in of the team.



- The system utilizes modified *Los Angeles*, *Virginia*, or *Ohio* SSGN submarines to transport the ASDS and for mission and logistical support.
- System includes a full communications suite; a deployable periscope and communications mast; forward-looking, side scanning, reconnaissance, and navigation sonars; and intelligence, surveillance, and reconnaissance equipment and recorders.

Mission

The Special Operations Commander uses ASDS to enable clandestine:

- Transport of SOF personnel and their equipment to and from direct action mission areas
- Collection of intelligence, surveillance, and reconnaissance

Activity

- DOT&E approved the ASDS Test and Evaluation Master Plan (TEMP) Revision B on May 2, 2005. The TEMP covers two phases of FOT&E to verify correction of the 2003 Operational Evaluation (OPEVAL) deficiencies and verify ASDS performance and acoustic thresholds.
- The Navy completed development of a replacement Lithium-Ion battery to resolve a significant OPEVAL deficiency that existed with the previous silver-zinc battery. The improvements should improve ASDS turn-around time, battery life, and availability.
- The Navy completed development of a redesigned tail section and propeller shroud to extend the ASDS's tail assembly service life in the presence of unsteady flows caused by high speed host submarine transits.
- The Navy deployed the ASDS for an exercise. A casualty to the ASDS hydraulic system prevented accomplishment of mission objectives.
- USSOCOM and the Navy implemented an ASDS Reliability Action Panel (ARAP) composed of Navy and industry experts to identify reliability and maintainability issues, and to develop process and product improvements for ASDS.
- The Navy attempted FOT&E in October 2005, per a DOT&E-approved test plan, to verify the correction of ASDS

OPEVAL deficiencies. During the test, an ASDS propulsion motor anomaly caused the propeller hub to rub against the stator hub. Investigation revealed the ASDS propulsion motor thrust bearing lock-nut had loosened allowing axial movement of the propeller shaft and hub-to-hub contact. The Navy is investigating the root causes of the failure and pursuing design improvements and post-repair testing to verify corrective action.

- On November 30, 2005, USSOCOM and the Navy began restructuring the ASDS program to fully identify and correct reliability deficiencies and to complete system testing with ASDS 1.
- USSOCOM and the Navy delayed Milestone C.
- DOT&E reviewed the ASDS draft Vulnerability Assessment Report. The Navy adjudicated and incorporated DOT&E's comments into the final report.

Assessment

- The ASDS continues to experience component failures that result in operational failures. During the first OPEVAL, the ASDS motor controllers grounded during the test and deficiencies with battery recharge performance and reliability prevented thresholds from being met. The Navy twice

deployed the ASDS and twice experienced operational failures. Another mission related failure occurred during FOT&E with the propeller hub rubbing on the stator hub. Failure investigations identified assembly problems, improperly manufactured components, unsteady flow at the aft end of the ASDS that caused vibration and premature component cracking failures, recurring failures of critical system components, and commercial off-the-shelf (COTS) equipment with low reliability performance and insufficient factory testing.

- The Navy completed redesign and replacement of the ASDS main battery and the tail section to correct two significant OPEVAL deficiencies. Other deficiencies from OPEVAL have been addressed with component redesigns or improved maintenance procedures. However, due to funding constraints, correction of problems with the ASDS hydraulic system, periscope system, environmental control systems, etc., were delayed. Often these systems were COTS technology that did not meet the required performance, acoustic, or reliability expectations.
- Some components on the ASDS are one-of-a-kind or no longer commercially available. Also some critical ASDS systems

(hydraulics, environmental control, etc.) required redesigned components to meet ASDS noise, performance, or reliability specifications.

- Survivability of the ASDS relies on its inherent stealth. Testing to date indicates detecting and attacking ASDS is a significant challenge; however, if ASDS is attacked, results of modeling indicate there are problems with hull mounted components and crew protection.

Recommendations

The Navy should:

1. Identify systems and components that are critical to mission success. Deficient components and systems should be repaired and have design improvements incorporated and performance verified before recertifying the ASDS for FOT&E.
2. Evaluate the selection and test processes for COTS systems for applications in submergence systems. ASDS components are exposed to environmental conditions and have performance requirements different than most commercial systems. The number of ASDS component redesigns or repairs indicates the selection and developmental test process for COTS systems requires improvement.