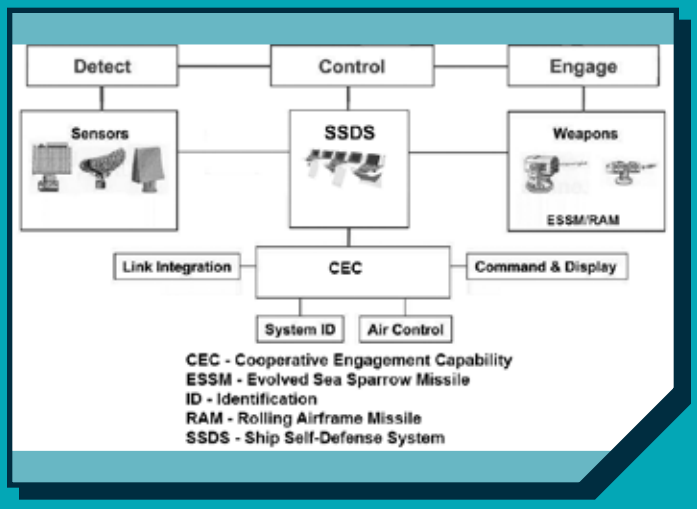
Ship Self-Defense System (SSDS) Mk 2 Integrated Combat Systems

The Navy needs to complete development of a T&E strategy to evaluate SSDS Mk 2 Integrated Combat System (ICS) performance on next generation and in-service SSDS-equipped ships. In addition, the Navy should continue to fund and execute planned repairs to the Self Defense Test Ship (SDTS) and install the appropriate combat system equipment on the SDTS to support adequate testing of the SSDS Mk 2 ICS.



System Description

For amphibious ships and aircraft carriers, the SSDS Mk 2 is the core combat system control element that integrates organic shipboard sensors, trackers, tactical datalinks, and weapons to provide a rapid detect-track-engage self-defense capability against anti-ship cruise missiles. The SSDS Mk 2 consists of a network of processors that host tactical programs, and hardware that provides an interface between SSDS and all connected processors and external systems.

The SSDS Mk 2 has six variants hosted on various surface ship classes: Mod 1 on CVN 68-class aircraft carriers, Mod 2 on LPD 17-class amphibious ships, Mod 3 on Landing Helicopter Dock (LHD) 1-class amphibious ships, Mod 4 on LHA 6-class amphibious ships, Mod 5 on Dock Landing Ship (LSD) 41/49 classes of amphibious ships, and Mod 6 on CVN 78-class aircraft carriers.

The Navy intends to upgrade all of the above SSDS Mk 2 Mods with new software and hardware known as the "Baseline 12" configuration. The Navy plans to deliver the SSDS Mk 2 Baseline 12 combat systems with LHA 6 Flight 1 (LHA 8) ships (Mod 4), LPD 17 Flight II ships (Mod 2), and CVN 79 (Mod 6). The Baseline 12 combat systems are also intended to be back-fit onto in-service ships with legacy SSDS configurations. SSDS Mk 2 Baseline 12 will integrate the following new and existing combat system elements in various configurations:

- SPY-6(V)2 and SPY-6(V)3 Enterprise Air Surveillance radars (EASR)
- SPQ-9B horizon search radar
- SPS-48 and SPS-49 air search radars
- Mk 9 Tracker Illuminator System
- Cooperative Engagement Capability (CEC)
- SLQ-32(V)6 equipped with the Surface Electronic Warfare Improvement Program (SEWIP)

- Rolling Airframe Missile (RAM) Block 2, 2A, and 2B
- Evolved SEASPARROW Missile (ESSM) Block 1
- Close-In Weapon System

Program

Several Major Defense Acquisition programs comprise the SSDS ICS on LHA 8, LPD 17 Flt II, and CVN 79 ships:

- SSDS — designated an Acquisition Category IC program in 2005 when the Navy transitioned to the Mk 2 variant that integrated the CEC
- CEC Block 2 — an Acquisition Category II program that achieved Milestone B approval in June 2020
- SEWIP Block 2 — an Acquisition Category II program that completed IOT&E in 2016
- RAM Block 2/2A/2B — an Acquisition Category II program; RAM Block 2 completed IOT&E in 2016
- ESSM Block 1 — an Acquisition Category II program that completed IOT&E in April 2003
- EASR — unique variants of the SPY-6 family of radars, which is an Acquisition Category IC program that has not yet undergone IOT&E

In 2018, DOT&E approved revision C of the SSDS Test and Evaluation Master Plan (TEMP) which encompassed FOT&E of Mk 2 capability for in-service ships. In addition to testing on CVN 78 and LHA 6, the TEMP revision included FOT&E test events for SSDS Mk 2 systems (retrofitted to replace SSDS Mk 1) on LSD 41/49 ship classes.

Major Contractors

- SSDS: Lockheed Martin – Moorestown, New Jersey.
- SPY-3 and SPY-4 (Dual Band Radar): Raytheon Integrated Defense Systems – Tewksbury, Massachusetts.
- EASR: Raytheon Integrated Defense Systems – Marlborough, Massachusetts.
- RAM and ESSM: Raytheon Missile Systems – Tucson, Arizona.
- CEC: Raytheon Integrated Defense Systems – St. Petersburg, Florida.
- SLQ-32 with SEWIP Block 1: General Dynamics Advanced Information Systems – Fair Lakes, Virginia.
- SLQ-32 with SEWIP Block 2: Lockheed Martin – Syracuse, New York.

Test Adequacy

In-service SSDS-equipped ships

The CVN 78 *Gerald R. Ford*-class Nuclear Aircraft Carrier article in this Annual Report summarizes the adequacy of the CVN 78 ICS testing conducted to date.

The Navy did not allocate funding to conduct the operational test campaign for LSD 41/49 ship classes as outlined in the approved SSDS TEMP Revision C. The LSD ships upgraded from SSDS Mk 1 to SSDS Mk 2 have deployed with a combat system that completed 1 of 9 planned operational tests.

Next-generation SSDS-equipped ships

The Navy agrees an unmanned sea-going test asset (e.g., SDTS) is required to adequately and safely test SSDS combat systems. The Navy committed to providing the resources required to retain this capability via a planned maintenance availability of the existing SDTS (e.g., *Paul F. Foster*), as well as the procurement and installation of the necessary combat system elements on the SDTS.

In April 2021, the Navy announced that they did not intend to update the extant SSDS Mk 2 TEMP to direct T&E of a fleet-wide SSDS Mk 2 upgrade and modernization program. Instead, the Navy proposed to develop a broader ICS test strategy across all SSDS-equipped ships intended to encompass SSDS and other ICS elements. DOT&E concurred with this approach. In May 2021, the Navy initiated development of an ICS operational test strategy. Through December 2021, the Navy generated cost and resource estimates to execute some future testing, but these estimates are inadequate because the Navy has not yet determined which ICS elements and their associated test programs will be included in the test strategy. Multiple combat system elements currently lack developmental and operational test programs to inform the overarching test strategy; some estimates of required test assets, such as live missiles, have been arbitrarily generated. Until developmental and

operational test strategies for SSDS Mk 2 and these major combat system elements are determined, the adequacy of ICS developmental and operational testing is at risk.

The Navy does not have an operational test strategy for testing of SSDS Mk 2 Baseline 12-equipped ships intended to be upgraded with either variant of the EASR. Currently, the Navy does not intend to develop an EASR TEMP, and has not yet determined how they will document for approval the developmental and operational testing required for the EASR variants on SSDS ships.

The Navy has not yet determined if they will have sufficient ESSM Block 1 missiles to support testing of CVN 78 and LHA 8. These missiles, required for combat system testing in FY25 and beyond, are no longer in production and will have to be taken from fleet inventories.

Performance

Effectiveness

The effectiveness of SSDS Mk 2 Mod 6 and the CVN 78 Integrated Combat System is discussed in the CVN 78 *Gerald R. Ford*-class Nuclear Aircraft Carrier article in this Annual Report.

Suitability

The suitability of SSDS Mk 2 Mod 6 is yet to be determined. SDTS is not an adequate platform to assess combat system suitability, and no operational testing has yet been conducted on board CVN 78.

Survivability

The Navy has not yet scheduled or resourced the SSDS Mk 2 Mod 6 cybersecurity testing aboard CVN 78 as outlined in the approved SSDS TEMP Revision C.

Recommendations

The Navy should:

1. Address combat system issues identified during CVN 78 ICS testing on the SDTS.
2. Fund the modeling and simulation suite required to support assessment of the CVN 78 Probability of Raid Annihilation requirement for subsonic targets.
3. Continue to fund the maintenance availability for the current SDTS (e.g., *Paul F. Foster*) to ensure its readiness to support future combat system testing.
4. Continue to fund the procurement and installation of the necessary combat system elements on SDTS.
5. Define the ICS elements to be included in the SSDS ICS TEMP.
6. Develop and resource adequate developmental and operational test strategies for all ICS elements in the SSDS ICS TEMP.
7. Determine how operational testing for EASR variants will be documented for DOT&E approval.
8. Determine if the remaining ESSM Block 1 inventory is adequate to support testing needs.
9. Develop plans for addressing incomplete testing in the 2018 SSDS TEMP Revision C.