

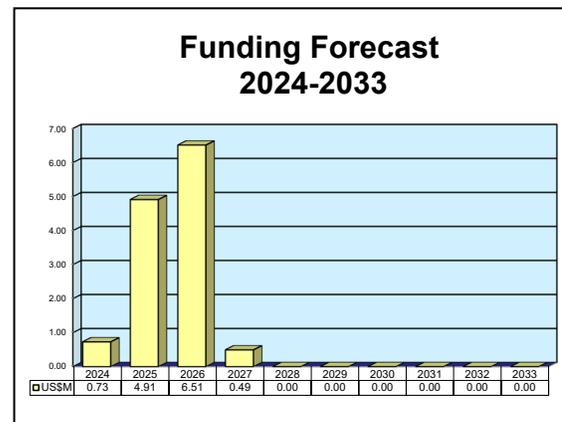
ARCHIVED REPORT

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Surface Ship Torpedo Defense

Outlook

- Because the U.S. system was not as capable as hoped, prototypes were pulled from aircraft carriers
- U.S. Navy evaluating other methods of torpedo defense
- U.K. Royal Navy continues its own path of development
- Australia evaluating SSTD systems
- Other navies focusing on expendable decoys and anti-torpedo torpedoes



Orientation

Description. The Surface Ship Torpedo Defense (SSTD) program develops soft- and hard-kill anti-torpedo weapons and countermeasures systems. This program was originally a joint effort of the U.S. Navy and U.K. Royal Navy.

The U.K. eventually developed its own SSTD using the technology base of previous systems.

Sponsor

U.S. Navy

Naval Command, Control, and Ocean Surveillance
 Center
 RDT&E Division
 San Diego, CA
 USA
 (Lead laboratory)

U.K. Ministry of Defence

Navy Department
 Whitehall, London
 England, U.K.
 (U.K. RDT&E)

U.K. Defence Research Agency (DRA)

Farnborough, Hampshire
 England, U.K.
 (RDT&E)

Status. The U.S. continues working on an integrated SSTD comprising various torpedo defense-related systems.

SSTD system in operation with U.K. Royal Navy.

Total Produced. The U.S. Navy produced engineering development models (EDMs) that were installed and tested on CVN (aircraft carrier) and CLF (supply ship) class ships. The U.S. SSTD program fielded five Anti-Torpedo Torpedo Defense System (ATTDS) EDM systems on CVNs. Each EDM system consisted of one Torpedo Warning System (TWS) with a loadout of a maximum of eight Countermeasure Anti-Torpedoes (CATs). Production of the systems was accelerated due to the lack of hard-kill torpedo defense on high-value units (HVUs). The systems provided a hard-kill torpedo defense capability.

The program installed one hybrid prototype system in FY13 on USS *George H.W. Bush* (CVN 77). The next prototype was delivered in FY14; this system was delivered in a roll-on/roll-off (RORO) configuration and installed on USS *Theodore Roosevelt* (CVN 71). The next two installs occurred in FY15: one additional RORO on USS *Eisenhower* (CVN 69) and one EDM on USS *Harry S. Truman* (CVN 75). The fifth system was purchased in FY16 and was installed on the USS *Nimitz* (CVN 68). The CVNs with EDM systems were

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equipped with ROROs by the end of FY18. The prototypes proved less capable than hoped and were pulled off the test ships.

The U.K. Royal Navy has an estimated 65 ships that can use the system and was believed to have acquired at least 16 systems that will be stored in a pool to be installed on ships as needed.

Platform. Various surface ships.

Application. Detection, deception, and/or destruction of anti-surface ship torpedoes.

Price Range. The price of the U.S. Navy's SLQ-25A variant was estimated at \$0.936 million per unit, based on cost averaging of a 2004 contract. Adjustment for inflation puts the estimated per-unit price at \$1.32 million in 2021 dollars.

The rough estimate for the first 16 units for the U.K. Royal Navy was \$1.131 million per unit, based on cost averaging of the August 2002 contract awarded to Ultra Electronics. Adjustment for inflation puts the estimated per-unit price at \$1.97 million in 2023 dollars.

Contractors

Prime

Argon ST, (a Boeing Company)	http://www.argonst.com , 12701 Fair Lakes Circle, Ste 800, Fairfax, VA 22033 United States, Tel: + 1 (703) 322-0881, Fax: + 1 (703) 322-0885, Prime
Booz Allen Hamilton	http://www.boozallen.com , 8283 Greensboro Dr, McLean, VA 22102 United States, Tel: + 1 (703) 902-5000, Consortium Member
Ultra Maritime	http://www.ultra.group/gb/our-business-units/maritime/ , 115 Bay State Dr, Braintree, MA 02184-5203 United States, Tel: + 1 (781) 841-3400, Fax: + 1 (781) 843-2153, Consortium Member

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; rich.pettibone@forecast1.com

Technical Data

The U.S. Navy's PE#0603506N Surface Ship Torpedo Defense was initially composed of two projects: Project V0225 SSTD and Project V2045 Joint U.S./U.K. SSTD. The two projects were merged into a single effort in 1995.

Project V0225 Surface Ship Torpedo Defense.

The U.S. National SSTD program initially provided defense for aircraft carriers (CV/CVN) and amphibious assault ships (LHD/LHA class ships) against torpedo attack. Phase I of the program took the form of an improved SLQ-25 NIXIE, the standard U.S. towed torpedo countermeasures device or noisemaker. The improved device, designated SLQ-25A, incorporated a soft-kill countermeasures capability. Phase I was expanded to include all NIXIE-equipped ships. Phase II added torpedo detection and an expendable countermeasures subsystem in the form of the SLR-24 detection and classification subsystem. The Lockheed Martin SLR-24 consists of a towed array and a shipboard signal-processing suite. The expendable

countermeasures system uses a modified Mk 46 torpedo, turning it into an anti-torpedo torpedo (ATT) that engages incoming weapons, especially wake-homing torpedoes developed and exported by Russia. A third system, the SLQ-36, is a towed system designed to divert torpedoes before they strike a ship.

Project V2045 Joint U.S./U.K. SSTD.

This joint project sought to design, develop, and produce a 360-degree anti-torpedo self-defense capability for U.S. Navy and U.K. Royal Navy combatant, amphibious, and auxiliary surface ships. It expanded upon the U.S. National SSTD program and provided advanced detection, classification, localization, and countermeasures capabilities. It was a layered defense system composed of soft- and hard-kill countermeasures to provide defense in depth. The U.S./U.K. SSTD system maximized the use of existing ship equipment and was modular in design to readily fit various ship classes.

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Variants/Upgrades

Sea Sentor (Sonar 2170). A commercial off-the-shelf-based open-architecture torpedo defense system made by Ultra Electronics and used by the U.K. Royal Navy. It includes highly sensitive acoustic sensors that are towed some distance behind a ship, where they can identify and pinpoint the location of an incoming torpedo. The Sonar 2170 is the U.K. domestic model, while the Sea Sentor is the name of the export version.

SLQ-25A. A digitally controlled, modular design, electro-acoustic softkill countermeasure decoy system. It employs an underwater towed-body acoustic projector, which is deployed astern by a fiber-optic tow called the Littoral Fiber-Optic Tow Cable. The SLQ-25A features dual tow capability and enhanced torpedo countermeasures. The system defends ships

against wake homing, acoustic homing, and wire-guided torpedoes.

SLQ-25B. Upgraded variant.

SLQ-25C. Upgraded variant.

SLQ-25X. Upgraded variant previously identified as SLQ-25D.

SLQ-61 Lightweight Tow (LWT) Torpedo Defense Mission Module (TDMM). Considered a variant of the SLQ-25 (although more likely just loosely based on it), the SLQ-61 is being developed for the U.S. Navy's Littoral Combat Ship (LCS) and other small combat vessels.

Program Review

Background. The purpose of the U.S. Navy's Surface Ship Torpedo Defense program is to reduce the susceptibility of all surface ships to detection and targeting by acoustic means, reduce ship detection by active sonar devices, and improve the overall sonar performance of ships. SSTD started as a U.S. Navy research and procurement program under which various anti-torpedo countermeasures were developed and systems such as the SLQ-25 NIXIE towed torpedo countermeasures system were procured. (The NIXIE, a successor to the Fanfare system, is towed behind a ship. It simulates propeller noises to lure an acoustic torpedo away from a ship's propellers.)

In October 1988, a Memorandum of Understanding (MoU) was signed between the U.S. and the U.K. establishing a joint program to develop torpedo countermeasures.

The original program consisted of three principal phases. The first two phases were purely U.S. efforts, while the third phase was the joint U.S./U.K. program. The SSTD program looked into both soft- and hard-kill measures; the former involved decoying a torpedo away from a surface ship, while the latter entailed the actual destruction of the torpedo. Among the soft-kill measures were upgrades to the SLQ-25 NIXIE towed countermeasures device. Hard-kill measures included the use of an ATT, which was the subject of both U.S. and U.S./U.K. investigations.

The U.S. Navy first satisfactorily tested various systems against a stationary torpedo testbed during FY85. Through FY88, the Navy continued to evaluate alternative design concepts and test certain launch platforms. Installation of SSTD Phase I systems was

then initiated, and the Navy exercised a full-scale development option for certain subsystems.

Joint Program. In October 1988, the U.S. and U.K. signed an MoU for the joint development of SSTD systems. Several companies in each nation formed consortia: one consisted of GE, Alliant TechSystems Inc, and Marconi Underwater Systems Ltd; the other included Westinghouse, AT&T, Dowty Maritime, and Ferranti Naval Systems. In addition, the U.S. Navy and U.K. Royal Navy each formed a project office to coordinate efforts.

U.S. and Britain Team Up to Protect Ships

During the late 1980s, the U.S. Navy commenced development of the SLR-24 and SLQ-36. The SLR-24 is a towed passive sonar that detects and identifies enemy torpedoes. The SLQ-36 is used to divert a torpedo from a ship. Prior to this development, all systems were being designed to lure a torpedo away from a ship. The SLR-24 was tested aboard the USS *John F. Kennedy* (CV 67) and USS *Nimitz* (CVN 68).

By the end of 1990, the test and evaluation master plan had been completed and approved. The Joint SSTD system performance specifications were completed as well. The U.S. Navy then released the Request for Proposals (RFP) to the consortia.

Project V0225 Surface Ship Torpedo Defense. SSTD engineering development models were delivered during FY91, and launch systems were installed aboard TECHEVAL ships. Also, environmental, safety, and acceptance testing of an ordnance alteration kit was

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conducted, and ORDALT was integrated into the EDMs. The development of support equipment was then completed. Finally, the functional configuration audit of the SSTD detection, torpedo, and launch systems was conducted, as was the production readiness review (PRR) of the detection system.

SSTD TECHEVAL began in FY92. Also, preliminary physical configuration audits of the SSTD detection system and Mk 46 ORDALT were conducted, the PRR was completed, and the maintenance demonstration and logistic review audit of the SSTD system were conducted. In FY93, SSTD TECHEVAL and certification for OPEVAL were completed.

Project V2045 U.S./U.K. SSTD. Initial work under this joint venture program progressed rapidly. In FY91, the concept evaluation phase was completed. In FY92, risk mitigation (RM) study contracts were awarded to two consortia. The first team was headed by Lockheed Martin and the second by then-Westinghouse Electric. Among new efforts, detection, classification, and localization trials and analyses were conducted, and studies of the feasibility of expendable acoustic decoys were launched, as was a cost and operational effectiveness analysis (COEA). In FY93, RM countermeasures studies were conducted and the COEA was completed. Demonstration and validation (D&V) contract options were exercised in FY94.

Projects Consolidated. In 1995, the National SSTD and Joint SSTD projects were consolidated. The merged program was said to combine the best aspects of the two projects. In December 1994, Westinghouse was awarded a \$29.2 million D&V options contract, which was hotly contested by Lockheed Martin, causing delays in the program. Problems also arose with development of the Mk 46 anti-torpedo torpedo and were resolved by dropping it from the effort. However, development of the Mk 46 had not been totally abandoned by the U.S. Navy, which transferred the effort to its Advanced Technology Demonstration Project in FY97.

The D&V phase subsystem development and analysis test was conducted during FY96, as was the test and evaluation of the Torpedo Alertment Processor. Development and integration of the Torpedo Alertment Processor was completed by the end of that fiscal year. By the end of FY97, the Torpedo Alertment Processor had been integrated.

The U.S. Navy's FY98 budget request contained no funding for the SSTD program. However, in FY99, an additional \$5 million was allocated for the joint U.S./U.K. effort to address some of the issues uncovered during the D&V phase. No further direct U.S. funding appears to have been allocated beyond this effort.

During FY99, the SLQ-25A winch and tow were upgraded to improve performance in littoral and shallow water operations. In FY00, additional funding in the amount of \$640,000 was allocated for the SLQ-25A winch and tow upgrade.

The lack of further funding for the SSTD program inhibited the ability of the Navy to capitalize on the achievements of the joint U.S./U.K. D&V program. Instead, the U.S. focused its attention on production of the SLQ-25A, for which a contract was issued in October 2000 for procurement by both the U.S. and Canadian navies. To confirm its commitment to the SLQ-25A, the U.S. Navy awarded a contract modification to SenSyTech in August 2004 for the production, test, and delivery of 11 additional SLQ-25A units.

Currently, this program uses an evolutionary acquisition strategy of providing incremental SSTD capability by implementing it first on cruisers and destroyers (CRUDES) already equipped with sonar systems, fire control systems, and launchers. A draft specification for a CRUDES torpedo detection, classification, and localization system was drawn up in FY09. This followed at-sea demonstrations of Torpedo Detection Classification and Localization (TDCL) systems, conducted from FY06-FY09.

At-sea testing of the EDM-1 design of the ATT variant of the Common Very Lightweight Torpedo (CVLWT) was conducted from FY07-FY09. Design of the EDM-2 (second test unit) was completed in FY10. The ATT was to be shipped and launched from an all-up-round canister known as the Countermeasure Anti-Torpedo (CAT).

Also in FY10, an EDM of the CRUDES ship system was developed. The system included a command and control system with a user interface, a modified Surface Vessel Torpedo Tube launcher, and a canistered ATT. The TDCL system utilized a sensor set that was added to the SLQ-25 NIXIE system, as well as the hull-mounted sonar already employed on these ships. The development of the ATT was the first derivative of the CVLWT as an acquisition program. CAT and TDCL development was closely linked with Office of Naval Research (ONR) Sea Shield Future Naval Capability (FNC) programs. These programs provided advanced technology inserts at key transition points.

Argon ST Contracted to Complete EDM

In June 2009, Argon ST received a \$6.2 million award for engineering development in support of the U.S. Navy's SSTD program. The award, a modification to an existing contract, was received from the Naval Sea Systems Command to complete the EDM design,

through Critical Design Review, for the SSTD program's SLQ-25D system.

Since 2006, Argon has served as the lead contractor in designing, developing, and fielding the SLQ-25 Torpedo Countermeasures Transmitting Set, commonly referred to as NIXIE. Argon was initially contracted to design and field the SLQ-25C, a passive, electro-acoustic decoy system used to provide deceptive countermeasures against acoustic-homing torpedoes. The company has been developing the upgrade for this system.

Contract work is primarily being done at Argon's Lemont Furnace, Pennsylvania, facility, with support from the corporate headquarters in Fairfax, Virginia, and the Smithfield, Pennsylvania, production facility.

Shift in Focus of U.S. Program

The president's FY11 budget request indicated that the U.S. SSTD program had been changed. The previous program developed the Anti-Torpedo Torpedo Defense System (ATTDS) for cruisers and destroyers. For this program, Initial Operational Capability (IOC) was planned for 2015. The FY11 request shifted the focus to first providing torpedo defense capability to HVUs.

Through two new development programs, the project uses technologies developed under the previous ATTDS program to provide a detect-to-engage hard-kill torpedo defense capability. The CAT program develops a canisterized ATT as part of the ACAT II program. The Torpedo Warning System program develops the required ship systems as part of the ACAT III program. Like the ATTDS, the new TWS will require fielding of the SLQ-25D NIXIE as a tow point for the TWS towed sensors.

The first increment of the TWS will be installed on one CVN and one CLF ship (both HVUs); IOC was scheduled for 2017. The first increment of the CAT was to be installed on HVUs in 2021. Additionally, the program would develop two SSTD prototype systems (TWS/CAT) and field them on two CVNs. The U.S. Defense Department had intended to request "prior approval reprogramming" funding of approximately \$38 million in FY11 to accomplish this effort. The effort was to be completed 33 months after the funds were received.

At-sea demonstrations of the TDCL systems conducted from FY06 through FY09 led to a CRUDES TDCL draft system specification in FY09, which was being modified to accommodate installation of a system for HVUs. Additionally, in FY10, prototype TDCL systems were tested at sea to collect data for use in characterizing the ability of towed active and passive sonar arrays to detect and track threat targets both

actively and passively in adverse conditions. The target date for delivery was FY17.

At-sea testing of the EDM-1 design of the ATT capability was conducted from FY06 through FY09, facilitating completion of the EDM-2 design in FY11. The ONR's development work and testing provided the technology readiness required for the CAT program to achieve Milestone B.

The program was redirected a bit in FY13 and FY14, with development of the SLQ-25X canceled when a more cost-effective technical solution to interfacing the TWS to the NIXIE system was found.

The program developed six SSTD prototype (TWS/CAT) EDM systems and fielded them on CVNs. Each prototype consisted of one TWS and eight CATs. The six systems were accelerated due to the lack of torpedo defense on HVUs, a problem that has been exacerbated by real-world events and evolving threats. The systems provide a hard-kill torpedo defense capability in advance of IOC as part of the program of record.

To accomplish this effort, the U.S. Department of Defense reprogrammed \$9.9 million of FY10 funds, \$6.1 million of FY11 funds, and \$6.4 million of FY12 funds. Furthermore, the department received prior approval for the reprogramming of an additional \$7.9 million of FY10 funds.

The program delivered one hybrid prototype system in FY13 on USS *George H.W. Bush* (CVN 77). The next prototype was delivered in FY14; this system was delivered in a roll-on/roll-off configuration and installed on USS *Roosevelt* (CVN 71). One additional RORO system and one EDM were delivered in FY15. Two additional EDMs were delivered in FY16.

In FY17, the ATTDS program reportedly awarded a contract (unconfirmed) to validate the CAT technical data package, which was to lead to production of the proof of manufacturing (POM) units before the end of FY18. The program also performed first article testing on the TWS.

Plans for FY18 called for continuing land-based reliability testing on returning deployed ATTs; continuing engineering changes on CAT materials, plus CAT software upgrades; the performance of safety certifications prior to two FY18 CVN deployments; the delivery of "ready for issue" CATs for two FY18 CVN deployments; the support of software maintenance through Program Trouble Reports (PTRs); the conduct of a quick reaction assessment of SALVO software; and the conduct of a Contractor Test (CT-5). Much of this work continued through FY19.

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Originally, a full-rate production contract was scheduled to be awarded in FY20, but the U.S. Navy halted development of the ATTDS portion of the SSTD around September 2019 due to poor performance and removed the prototypes from its aircraft carriers. Apparently, while the system did work in principle, it was not considered reliable enough for operational use.

U.S. Navy plans for the program call for restoring the SLQ-25 NIXIE back to something similar to its original mission so it can continue to support U.S. aircraft carriers. Although the ATTDS didn't pan out, the TWS portion of the SSTD system remains in development for future mission capabilities.

Compact Rapid Attack Weapon. The U.S. Navy is evaluating the feasibility of using a Compact Rapid Attack Weapon (CRAW) as a surface ship defense weapon. At about one-third the weight of the current lightweight ASW weapon, the CRAW is projected to cost less while performing at least as well. The successful performance testing of the CRAW against submarine targets will validate the weapon and increase its potential as a candidate for weaponizing multiple platforms.

U.K. SSTD. In 1999, Northrop Grumman was awarded a subcontract from Alenia Marconi Systems to develop part of a submarine acoustic warfare control system for the U.K.'s torpedo defense system. The subsystem was delivered by the end of 2001. In August 2002, Ultra Electronics was awarded a \$78.1 million contract to begin the second phase of development, along with the production of 16 SSTD systems.

Originally, all major U.K. Royal Navy surface warships were to be outfitted with the SSTD system; however, it appears that the 16 SSTD units are being placed in inventory and only being installed on designated ships when considered necessary. Remaining ships will be outfitted for quick SSTD transfer and installation if or when needed. In February 2005, the Type 23 frigate HMS *Westminster* became the first Royal Navy vessel to be equipped with the SSTD system.

More Countries to Try Their Hand at Ship Defense

International SSTD. Six NATO countries (France, Germany, Italy, the Netherlands, Norway, and Spain) participated in NATO Project Group 37 to develop an SSTD system after having been denied access to the U.S./U.K. SSTD feasibility study completed in summer 1997. In more recent activity, STN Atlas Elektronik is said to be working on a German version of the SSTD system known as Torpedoabwehr Überwasserschiffe (TAÜ). It is believed to be an offshoot of the U.S./U.K.

and NATO SSTD efforts, and is run by the NATO Naval Armaments Group that ran initial feasibility studies completed in 1998. Since then, several countries have pursued national or joint development programs. Italy and France were reportedly collaborating on the Systeme de Lutte Anti-Torpille (SALT), while Germany went at it alone with the TAÜ.

General Dynamics Canada Completes Torpedo Defense Demonstration

In November 2011, General Dynamics Canada and Defence Research and Development Canada Atlantic demonstrated a torpedo defense enhancement that would increase the level of protection for Canadian Navy ships. The Multisensor Torpedo Detection, Classification, and Localization Technology Demonstration Program (TDP) was initiated in 2006 by DRDC Atlantic to develop and demonstrate advanced concepts in multisensor automated torpedo warning for application on Halifax-class patrol frigates. The potential lethality of even a single torpedo hit underpins the need for this type of detection capability. As the prime contractor, General Dynamics Canada supported DRDC Atlantic by providing analysis, design, development, installation, and support services, culminating in the development of a prototype underwater warfare system called Pleiades.

Over the course of the five-year TDP, the Pleiades system was used in realistic operational trials on several Halifax-class patrol frigates to respond to more than 100 live, unscripted torpedo firings.

General Dynamics Canada was the original manufacturer of the anti-submarine sonar systems currently in use on the patrol frigates and was selected through a competitive process for the recent project.

The technology developed during the demonstration uses an open hardware and software architecture and a modular and flexible system design. Moving this technology from a demonstration prototype to an operational adjunct system would enable future enhancements and a quicker transition of technology from the research lab to the fleet. DRDC Atlantic plans to do further research into the development of new techniques for reliable auto-detection of torpedoes.

Russia Providing Warships with Torpedo Defense

According to a May 2019 TASS report, Russia is equipping its surface combatants with a torpedo defense system. The advanced Paket-NK torpedo defense system is being installed on the Russian Navy's Project 11442 cruisers. The Research and Production

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Enterprise Region, which is part of Tactical Missiles Corporation (TMC), is providing this upgraded system.

In addition, the Russian Navy will reportedly install this system on its new-construction Project 22350 frigates and Project 20380 corvettes.

A different version of the Paket system is fitted to each warship, but all are equipped with the MPT torpedo and AT anti-torpedo.

Australia to Evaluate SSTD Systems

In November 2020, media sources reported that the Royal Australian Navy is looking to evaluate ship torpedo self-defense systems for its ANZAC class frigates and Hobart class destroyers, and possibly its future Hunter class frigates.

U.S. to Upgrade Four MMSC Ships for the Hellenic Navy

In December 2021, the U.S. State Department approved a possible Foreign Military Sale to the government of Greece of Multi-Mission Surface Combatant (MMSC) ships and related equipment for an estimated cost of \$6.9 billion. The Defense Security Cooperation Agency delivered the required certification notifying Congress of this possible sale.

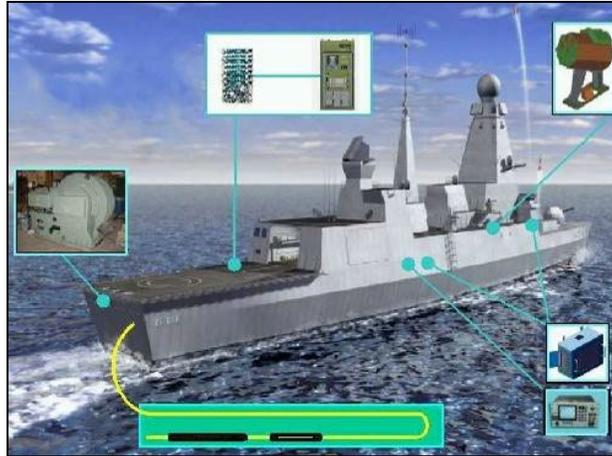
Greece has requested four MMSC ships equipped with various combat systems and equipment, including the NIXIE SLQ-25.



U.S. Surface Ship Torpedo Defense System

Source: U.S. Navy

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U.K. Royal Navy SSTD System

Source: U.K. Ministry of Defence



Sea Sentor SSTD System

Source: Ultra Electronics

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Controls for Ultra Electronics' SSTD System

Source: Ultra Electronics



SLQ-25A Torpedo Defense System

Source: U.S. DoD

Funding

The U.S. is no longer directly funding or developing a totally independent/new SSTD system; instead, the U.S. Navy integrates the SLQ-25(V) and other existing systems into one overall SSTD system. The British SSTD effort has been funded by the U.K. Royal Navy and the U.K. Defence Procurement Agency (DPA).

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U.S. FUNDING

	FY22 <u>QTY</u>	FY22 <u>AMT</u>	FY23 <u>QTY</u>	FY23 <u>AMT</u>	FY24 <u>QTY</u>	FY24 <u>AMT</u>	FY25 <u>QTY</u>	FY25 <u>AMT</u>
PE#0603506N (U.S. Navy)								
Surface Ship Torpedo Defense	-	8.573	-	0.473	-	0.730	-	4.912
	FY26 <u>QTY</u>	FY26 <u>AMT</u>	FY27 <u>QTY</u>	FY27 <u>AMT</u>	FY28 <u>QTY</u>	FY28 <u>AMT</u>	FY29 <u>QTY</u>	FY29 <u>AMT</u>
PE#0603506N (U.S. Navy)								
Surface Ship Torpedo Defense	-	6.514	-	0.494	-	0	-	0

All \$ are in millions.

Source: U.S. Department of Defense FY24 RDT&E Budget Item Justification (R-2)

Note: The Surface Ship Torpedo Defense (SSTD) program provides a detect-to-engage layered torpedo defense capability. The four (4) major efforts that comprise SSTD are the AN/SLQ-25 (NIXIE) system, Torpedo Warning System (TWS), the Countermeasure Anti-Torpedo (CAT), and Acoustic Device Countermeasure (Surface ADC MK2).

The ATTDs provides a hard kill torpedo defensive capability on High Value Units (HVU's). The SSTD program has developed and fielded five (5) ATTDs Engineering Design Models (EDMs) systems on CVNs. Each EDM system is one (1) TWS with a load out of a maximum of eight (8) CATs. In FY20, the ATTDs Program commenced sundown efforts to return the five (5) CVNs to their original configuration. Two (2) system removals completed in FY22, with one (1) more scheduled for FY23. FY23 and FY24 funding will provide minimal support to the 2 remaining CVN installations with system preservation the primary focus.

Research and development in torpedo defense of new technologies and capabilities developed under the Future Naval Capabilities (FNC), Small Business and Innovative Research (SBIR), and other Research, Development, Test & Evaluation (RDT&E) initiatives are evaluated to determine their effectiveness and impact on improving ship survivability. Evaluations of new and emerging torpedo defense hardware and software in representative acoustic environments, against projected threats using both digital and hardware-in-the-loop simulations is performed. The AN/SLQ-25 (NIXIE) program has built an ECP package for technical refresh designated as the AN/SLQ-25E. This ECP is a form-fit-function replacement of the AN/SLQ-25C, which is widely fielded across the surface fleet. The AN/SLQ-25E is more modular, maintainable, and will meet all current and future cybersecurity requirements. The modular and Commercial-Off-The-Shelf (COTS) design of AN/SLQ-25E will allow for future capability growth to outpace the threat in torpedo defense. Two (2) FY22 Congressional adds support research and development of new torpedo defense capabilities specifically on the 25E effort, as well as improve the safety and reliability of the 25E towed winch and reel system.

Contracts/Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Argon ST	11.6	Oct 2017 – A modification to a previously awarded contract (N00024-12-D-6216) for the procurement of eight SLQ-25A/C countermeasure decoy systems and spares in support of the Undersea Defensive Warfare Systems Program Office. Work was performed in Smithfield, PA, and completed by Sep 2019. Fiscal 2016 and 2017 Shipbuilding and Conversion (Navy) funding in the amount of \$11,691,997 was to be obligated at time of award. The Naval Sea Systems Command, Washington, DC, was the contracting activity.
Ultra	186.4	Dec 2020 – A cost-plus-fixed-fee, cost-reimbursable, indefinite delivery/indefinite quantity contract for the SLQ-25E NIXIE electro-acoustic towed torpedo countermeasure system. This contract includes options which, if exercised, would bring its cumulative value to \$268,514,278. Work will be performed in Braintree, MA (58 percent); Manchester, NH (25 percent); Lititz, PA (13 percent); and Huntington Beach, CA (4 percent), and is expected to be completed by Dec 2026. Fiscal 2020 Other Procurement (Navy) funding in the amount of \$2,200,000 would be obligated at time of award. This contract was competitively procured via the Federal Business Opportunities website, with two offers received. The Naval Undersea Warfare Center Division, Keyport, WA, is the contracting activity. The contract award number is N00253-20-D-0002.

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Worldwide Distribution/Inventories

This program started as a joint venture between the **United States** and **United Kingdom**. A U.S./U.K. SSTD Joint Project MoU was signed on October 26, 1988, by the undersecretary of defense (acquisition) for the U.S. and the chief of defense procurement for the U.K. It covered aspects related to D&V, engineering development modeling, and production/deployment, and also involved cost-share arrangements and a determination of exchange rates and industry participation levels. The MoU required each country to seek national approvals and formally declare its intent to continue with the program prior to each phase. The U.S. stopped its direct work on the joint venture SSTD in favor of continuing with the SLQ-25(V). Work on SSTD-related subsystems continues.

The SLQ-25(V) NIXIE torpedo defense system is currently in service worldwide, including in **Australia, Canada, France, Greece, Japan, New Zealand, Portugal, South Korea, Spain, Turkey, and the United States**.

Forecast Rationale

The only thing sailors seem to hate more than sharks is torpedoes.

The U.S. Navy's Surface Ship Torpedo Defense (SSTD) program provides a detect-to-engage layered torpedo defense capability. The four major systems that comprise the U.S. SSTD are the SLQ-25 NIXIE system, the Torpedo Warning System (TWS), the Countermeasure Anti-Torpedo (CAT), and the Acoustic Device Countermeasure (Surface ADC Mk 2). CAT and TWS are development programs.

The CAT program develops a canisterized anti-torpedo torpedo (ATT).

The TWS program develops the torpedo detection, classification and localization systems required to employ CAT.

The TWS and CAT systems make up the Anti-Torpedo Torpedo Defense System (ATTDS).

The U.S. Navy halted development of the ATTDS portion of the SSTD around September 2019 due to poor performance and removed the prototypes from its aircraft carriers. Apparently, while the system did work

in principle, it was not considered reliable enough for operational use.

The SLQ-25 NIXIE is a towed acoustic and non-acoustic countermeasure system. The SLQ-25 program develops countermeasure technologies and capabilities to improve ship survivability against future torpedo threats. The system has undergone several commercial-off-the-shelf (COTS)-based enhancements with all existing SLQ-25(V)s being now being upgraded to the latest SLQ-25E variant.

Additionally, this NIXIE technology was used as a foundation to build the SLQ-61 Lightweight Tow (LWT) Torpedo Defense Mission Module (TDMM) for the Littoral Combat Ship as well as other small combat vessels such as the Constellation class frigates.

With the submarine threat increasing each day, the U.S. Navy is likely to forge ahead with SSTD development even if it has to revamp the entire original system concept. Perhaps the U.S. Navy will follow the routine of several of the world's other leading navies and focus more heavily on expendable decoys and anti-torpedo torpedoes.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR RDT&E FUNDING (in millions US\$)												
Designation or Program	High Confidence					Good Confidence			Speculative			Total
	Thru 2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
Argon ST (Prime)												
SSTD <> United States <> Navy <> U.S. Navy Program Not To Be Confused With U.K. Royal Navy SSTD Effort												
	699.61	.73	4.91	6.51	.49	.00	.00	.00	.00	.00	.00	12.65
Total	699.61	.73	4.91	6.51	.49	.00	.00	.00	.00	.00	.00	12.65