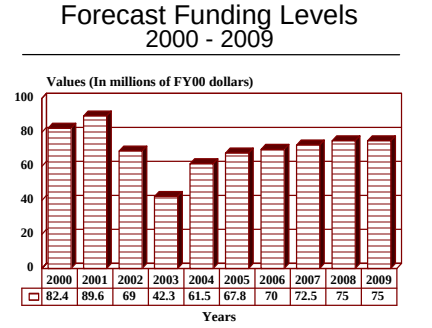
Surface and Shallow Water Mine Countermeasures - Archived 4/2001

Outlook

- Focus on developing the Near-Term Mine Reconnaissance System (NMRS) for immediate fleet use
- Long-Term Mine Reconnaissance System in development
- Limited number of prototypes for testing and development purposes
- Funding expected to fluctuate from year to year, as some concepts will be dropped and new initiatives added



Orientation

Description. This program provides for developments to combat the threat of known and projected foreign mines against US Naval and merchant shipping in harbors, channels, choke points, sea lines of communications, and amphibious, as well as other, fleet operating areas.

Sponsor

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Status. Ongoing research and development.

Total Produced. Limited number of prototypes for testing and development.

Application. Develop and support systems that will detect, localize, and counter moored, bottom, close-tethered, and buried mines in the areas of shallow water, very shallow water, surf zone, and beach landing craft zone in support of amphibious operations.

Price Range. Indeterminate

Technical Data

Characteristics. This program is designed to provide for developments to combat the threat of known and projected foreign mines against US Navy and merchant shipping in harbors, channels, choke points, sea lines of communications, and amphibious and other fleet operating areas. It develops and supports systems which will detect, localize, and counter moored, bottom, close-tethered, and buried mines for use in MCM-1 class, Mine Hunter Coastal (MHC)-51 class, and other surface ships. Systems for detecting, neutralizing and sweeping mines from shallow water, very shallow water, surf zones, and beach landing craft zones in support of amphibious operations are also supported. Surface and Shallow Water MCM and Unmanned Undersea Vehicle is composed of four projects: Project V2094 Unmanned Undersea Vehicle, Project Q0260 Remote Minehunting Systems, Project Q1233 Integrated Combat Weapons Systems, and Project Q2131 Assault Breaching Systems.

Variants/Upgrades

This section is not applicable to this report.

Program Review

Background. In the original PE#0603502N Surface Mine Countermeasures program (now titled Surface and Shallow Water MCM), most efforts in FY85 and FY86 concentrated on the SQQ-32 minehunting sonar. The design of the basic system was completed in FY85, with sea trials being completed in FY88.

Other mine neutralization efforts in FY87 and FY88 included acoustic signature tests of the SLQ-48 production vehicles. These systems entered operational service aboard MCM-1. The Navy held full-scale operational tests and evaluations of the SLQ-48 in FY88. Other efforts included development of a fiber-optics umbilical cable for the Mine Neutralization System to reduce electromagnetic interference (EMI) vulnerability and cable drag. FY91 efforts included continuing limited production for the SQQ-32, the completion of environmental qualification testing, and the development of documentation for the Remote Minehunting and Buried Mine Detection efforts.

NOTE: This program was restructured in FY95 to better define its subprojects. The individual project reviews are picked up from FY92.

Project V2094 Unmanned Undersea Vehicle. This project develops the Submarine Offboard Mine Search system (SOMSS) managed by the Navy's Unmanned Undersea Vehicle (UUV) Program Management. The objective is to provide the SSN-688 class submarines with an organic UUV capability to avoid mines and conduct autonomous/semi-autonomous mine field surveys.

The SOMSS concept is in response to the Navy's From the Sea initiative and supports littoral operations by submarines. The SOMSS concept was derived from analysis and tradeoff studies the Navy conducted in 1991 and 1992, resulting in a program Milestone decision and an Operational Requirement Document. The concept also calls for a submarine operating in potentially mined waters to deploy a UUV ahead of itself to detect and locate close-tethered and bottom mines. Additionally, the submarine can launch the UUV in either a purely autonomous mode or a semi-autonomous mode to conduct minefield surveys. Information is provided to the submarine in real time, allowing for mine-avoidance tactics. SOMSS is organized into four major subsystems: the shipboard interface (SOMSS equipment aboard the submarine), the UUV, mine search sensors, and the launch and recovery system.

The Navy's FY93 funding request was denied by Congress, which cited the joint Navy and ARPA prototype Mine Search System (MSS) program and the need to understand and evaluate the lessons learned from MSS before proceeding with SOMSS. This congressional act delayed the SOMSS program by one year. The MSS completed testing in FY93. In July 1993, Congress authorized the Navy to restart SOMSS, using available FY92 funds, to analyze the results of the MSS tests, to conduct a Cost and Operational Effectiveness Analysis, and to prepare the required Milestone I acquisition documentation. This study was completed in FY94.

The UUV project was completely restructured in FY94 in response to congressional direction provided in the FY94 Department of Defense (DoD) Appropriations Act. Specifically, the Office of the Secretary of Defense and the Navy were directed to establish priorities among various proposed UUV programs, focus on near-term mine countermeasures issues, and establish affordable, cost-effective programs. The Navy developed an overall UUV Program Plan, which was approved June 1994 and forwarded to Congress in the FY95 budget deliberations.

The UUV Program Plan establishes a clandestine, near-term mine reconnaissance capability as the Navy's top UUV priority; a long-term mine reconnaissance system as second priority; the conduct of surveillance, intelligence, and tactical oceanography missions as third priority; and the exploration of advanced UUV designs for the future as fourth priority.

FY95 congressional language complemented the Navy Plan and fully supported priorities one and two starting in FY95.

The UUV project funds development of a clandestine Near-Term Mine Reconnaissance System (NMRS) and a Long-Term Mine Reconnaissance System (LMRS), the Navy's two highest UUV priorities. The NMRS will be a minehunting UUV system launched and recovered from an SSN-688 class submarine and will be capable of mine detection, classification, and localization.

The UUV Program Plan calls for an NMRS operational prototype system to be delivered to the Fleet, but no timetable has yet been established. Since the NMRS is viewed as a stop-gap capability with a life expectancy of approximately six years, the LMRS will be developed to provide a robust, long-term, Fleet capability. The LMRS will replace the NMRS as the NMRS is retired.

Many of the UUV technologies planned for use in the canceled SOMSS program are applicable to the

priorities in the UUV Program Plan. Projected increases in NMRS prime contract costs necessitated an NMRS restructure in early FY95. Priority Three funds were reallocated to Priority One, government technical support was drastically cut and the in-water demonstration eliminated. Management of the NMRS contract continued through FY95 with preparation for Milestone 1. Additionally, preliminary and detailed designs of the prototype were completed and fabrication begun.

Contract work on the NMRS continued through FY96 with completion of the first prototype.

The Concept Exploration and Definition Phase for the LMRS was expected to be completed at this time, and a demonstration and validation contract was awarded to Lockheed Martin in August 1996.

Fabrication and system integration for NMRS was completed in FY97. At-sea testing of NMRS was scheduled for FY97 while development of the LMRS continued.

Plans for FY98 called for completing at-sea testing of NMRS and delivering the system to the Fleet for operational prototype use. LMRS work focused on awarding and executing up to two Detailed Design Contracts and commencing preparations for award of the LMRS development phase contract.

During FY99, the NMRS completed its SSN testing and achieved initial operational capability. Detail design work on the LMRS was completed and a critical design review undertaken to evaluate the program. As a result of this evaluation, the design and development phase of the LMRS is to be funded in FY00, while prototype operations will be undertaken in parallel using the NMRS.

Project Q0260 Remote Minehunt Systems. This concentrates primarily on improvements to the SQQ-32 variable-depth minehunting sonar for MCM-1 and MHC-51 ships; Buried Mine Detection system for the detection of mines buried in the sea bottom; and Remote Minehunting for remotely controlled minehunting systems for non-MCM platforms. In FY92, limited production on the SQQ-32 continued, while Buried Mine Detection and Remote Minehunting studies were under way. During FY93, TECHEVAL for the SQQ-32 was conducted on the MCM-1 class ships. OPEVAL was scheduled to be conducted in FY94; however, a delay occurred because of a lack of ships. Other work included completing a remote minehunting operational prototype and developing a remote minehunting advanced development model (ADM).

NOTE: The Buried Mines subproject was terminated in FY94 and the funding used to help finance FY95 efforts.

Project efforts in FY95 centered on using the FY94 finance asset from the terminated Buried Mine subproject. Work on the SQQ-32 color console replacement was completed and the development of the remote minehunting ADM continued. Also, upgrades to the Remote Minehunting System operational prototype were conducted. SQQ-32 development for FY96 focused on system hardware and software integration and test, with an at-sea system test conducted.

Development of a remote minehunting ADM continued through the year and was scheduled to be completed by the end of FY96. An engineering development model (EDM) contract toward the production of two prototype units was reportedly awarded during this period. The prototypes would serve as contingency systems to accelerate Fleet introduction. Development and testing of the two prototypes continued through FY98.

During FY99, the RMS(V3) program was closed out and its documentation completed. This allowed the initiation of work on the RMS(V4) stage of the program, the WLD-1(V). A single engineering development model of the WLD-1(V) will be produced. Work scheduled for FY00 includes the further development of this equipment and its integration into the DDG-51 Flight IIA program. A new integrated sensor suite will also be developed at this time.

Project Q1233 Integrated Combat Weapons Systems. This project develops the following: SSN-2(V) Precise Integrated Navigation; SLQ-53 modular mechanical Single Ship Deep Sweep (SSDS); SSQ-94 onboard Combat System Trainer for MCM and MHC ships; Closed Loop Degaussing (CLDG) to improve the survivability of MCM ships; a mechanical sweep Upgrade; and a Mission Package 3 upgrade to the SLQ-48 to destruct moored mines in place.

In FY92, Phase III on the SSN-2(V) was begun, Milestone II was conducted, A/N37U-1 contracts for SLQ-53 were awarded, design review for the SSQ-94 was completed, and program transition from CLDG was completed. Milestone III for the SSN-2 was reached in FY93, with winch and container development for the SLQ-53 continuing, and A/N37U-1 having been delivered. Much of the work begun in FY92 continued into FY93.

Container and winch development for the SLQ-53 continued through FY94. Also during the year, preliminary design reviews were conducted for the SQQ-32 while critical design reviews were completed

for the SSN-2. Other SSQ-94 work included installing and testing the SLQ-48 and scenario controller. Under CLDG subproject that improves survivability of mine countermeasures ships, preparation was made for a demonstration test, and a Memorandum of Understanding Amendment between the US and France was approved. The SLQ-53 winch and containers were delivered in FY95. Testing was conducted on all the various project elements. The SYQ-13 and SQQ-32 were installed and tested during FY96.

Upon completion of testing, these units will be introduced to the Fleet. OPEVAL and TECHEVAL for the SLQ-48 were slated to be conducted during FY97 and completed by the end of FY98.

Software development continued throughout FY99. Additionally, according to the program schedule, TECHEVAL and OPEVAL were extended to accommodate ship schedules and ascertain whether range frequency threshold and goal have been set. Also, a contract for ICWS Block 1 design is to be awarded.

Project Q2131 Assault Breaching Systems. Designed to provide for a combination of joint Navy and Marine Corps, this project plans to counter the threat to amphibious landing forces from known and projected foreign land and sea mines and obstacles in the shallow water, very shallow water, and surf zone approaches to amphibious assault areas. It includes the craft landing zone for the amphibious assault vehicles.

This project also develops systems for mine reconnaissance, mine hunting, mine sweeping and explosive mine clearances. FY92 activities consisted mainly of initiating concept explorations. During FY93 these explorations were completed and demonstration and validation begun. This effort continued through FY94. Engineering and manufacturing development was also started in FY93.

The High Speed Remote Influence Sweep (HSRIS) effort was terminated in FY95. The Distributed Explosives Technology (DET) project focused on conducting preliminary Multipurpose Craft Air Cushion integration tests, as well as an array of stability tests in the surf. The Shallow Water Assault Breach System (SABRE) subproject concentrated on platform integration testing.

DET and SABRE work in FY96 centered on reaching Milestone II with the fabrication of demonstrating test hardware. A DET/SABRE Landing Craft Air Cushion interoperability test was scheduled for FY97. A second SABRE LCAC demonstration and operational test was scheduled for FY98.

Plans for FY99 called for SABRE integration tests and procurement of the autonomous craft controller component.

Funding

US FUNDING

	FY99		FY00(Req)		FY01(Req)		FY02(Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E (US Navy) PE#0603502N Surface and Shallow Water MCM:	-	88.2	-	82.4	-	89.6	-	69.0

	FY03(Req)		FY04(Req)		FY05(Req)		FY06(Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E (US Navy) PE#0603502N Surface and Shallow Water MCM:	-	42.3	-	61.5	-	67.8	-	N/A

All $ are in millions.

Source: US Defense of Department FY1998/1999 Biennial RDT&E Descriptive Summary

Recent Contracts

Although many of these R&D projects are not fully classified, much of the information pertaining to them, including contracts, is heavily censored, thereby making it difficult to identify specific contracts for these programs. Some contract information pertaining to specific systems can be found in other MCM reports, as well as reports covering those particular systems. Below are some relevant contracts, but they are by no means the only ones.

Contractor	Award ($ millions)	Date/Description
Westinghouse	12.5	Aug 1994 – A maximum priced contract for a Near-Term Mine Reconnaissance System (NMRS) and demonstration. (N00024-94-C-6168)
Westinghouse	43.4	Feb 1995 – CPAF contract for the NMRS operational prototype. This amount includes the $12.5 million previously announced for a maximum priced contract. (See above contract.) Contract was expected to be completed by January 1998. (N00024-94-C-6168)
Raytheon	31	Feb 1995 – Modification to previously awarded contract N00024-94-C-6361 to exercise an option for SQQ-32(V)2 Minehunting Sonar sets, including maintenance assist modules, support and test equipment, onboard repair parts, installation and checkout kits, and spares and engineering services. Contract was expected to be completed by June 1999. (N00024-94-C-6361)
Raytheon	9.1	Mar 1995 – A not-to-exceed provisioned item order under previously awarded contract N00024-94-C-6361 for various spare parts for the SQQ-32 Minehunting Sonar program. Contract completed August 1996. (N00024-C-6361)
Alliant Techsystems	7.4	Aug 1995 – FFP contract for a Forward Area combined Degaussing and Acoustic Range (FACDAR). The FACDAR is designed to analyze the mine countermeasure capabilities of the Navy by determining whether Navy ships meet magnetic signature requirements, and to analyze the vulnerability of ships to mines. Contract completed May 1997. (N00167-95-D-4010)
Lockheed Martin	11.9	Aug 1996 – CPAF contract for engineering and manufacturing development (EMD) of the Remote Minehunting System (RMS) (V)3 which uses acoustic sensors to detect, classify, and localize mine-like objects and capable of over-the-horizon operations. This contract includes operations which, if exercised, will bring the cumulative value of this contract to $31.5 million. Contract is expected to be completed by September 2001. (N00024-96-C-6322)
ARINC/Annapolis	16.6	May 1997 – CPFF contract for MCM engineering support services. Contract is expected to be completed by May 2002. (N61331-97-D-0031)
Boeing North American	9.8	Oct 1997 – Modification to previously awarded contract for the follow on procurement of the detailed design for the Long-Term Mine Reconnaissance System and related data. Contract is expected to be completed by August 1999. (N00024-96-C-6122)
Northrop Grumman	9.5	Oct 1997 – Modification to previously awarded contract for the follow-on procurement of the detailed design for the Long-Term Mine Reconnaissance System and related data. Contract is expected to be completed by August 1999. (N00024-96-C-6121)

Timetable

Month	Year	Major Development
	FY94	SOMSS terminated, UUV program restructured to focus on NMRS and LMRS
Aug	1994	NMRS development contract awarded to Westinghouse
	FY95	HSRIS effort terminated
	FY96	SLQ-53 Milestone III and OPEVAL
Aug	1996	Lockheed Martin awarded NMRS prototype contract
Aug	1997	SQQ-32 EDM contract
	1997	NMRS and SQQ-32 at-sea tests
	FY98	CLDG OPEVAL
Jan	1998	SLQ-53 full operational test and evaluation
	FY99	CLDG Milestone III
May	1999	SQQ-32 production contract award
	2003	Long Term Mine Reconnaissance Systems procurement scheduled to start

Worldwide Distribution

These are **US Department of Defense** and **US Navy** research and development programs. However, selected Mine Warfare technology issues are coordinated with efforts addressed by the Mine Warfare Panel of the Technical Cooperation Program with Australia, Canada, New Zealand, and the United Kingdom. Coordination is also maintained with data exchange arrangements involving Italy, France, Denmark, the Netherlands, Germany, Norway, Spain, Belgium, South Korea, and Japan. Additionally, NATO comparative testing programs on AIOS (SSN-2 Phase II Tactical Displays) were undertaken with France in December 1990.

Forecast Rationale

Recent geopolitical events such as those in Bosnia and Iran, and the increasingly aggressive nature of North Korea, have created a number of possible low-intensity regional conflict scenarios, forcing the US Navy to prepare for a projected Third World mine threat. To do so, the US Navy will need advanced technologies to rapidly detect and neutralize the many different types of mines, especially those in the shallow water and surf zones. To this effect, the US Department of Defense (DoD) Science and Technology Strategy has identified three major mine countermeasures (MCM) thrusts: Surf-Zone Clearance, Shallow-Water MCM, and Mine Detection/Avoidance.

The Surf-Zone Clearance Thrust develops distributed explosives, weapon deployment, and minefield obstacle breaching technologies, culminating in a surf zone critical technology demonstration.

The Shallow-Water MCM Thrust supports the sweeping of mines in the brown water environment. Advanced very shallow water technologies will be integrated to support demonstrations.

The Mine Detect/Avoidance Thrust includes sensor technologies integrated with advanced UUV technologies for conducting rapid mine reconnaissance operations.

Only in the past few years has the US Congress become truly interested in the US Navy's plans to increase its mine countermeasures capabilities, especially in future regional conflicts where the US Navy will conduct operations against a hostile shore. In testimony before the US Congress, US Navy officials outlined major mine warfare deficiencies in the following manner:

- First, a single flag officer with authority over, and responsibility for, mine warfare forces is needed. This has resulted in the establishment of a Commander, Mine Warfare Command (COMINEWARCOM) billet.
- Second, the training and readiness of MCM forces was poor. COMINEWARCOM will coordinate future training and readiness needs. In addition, the Navy plans to develop a command, control, and support ship devoted solely to MCM forces and procurement of a heavy-lift capability for surface MCM ships.
- Third, US intelligence collection against Iraqi mining operations was poor, primarily a result of the faulty presumption that minelaying activities would be overt and easily detected. Subsequently, there is a wider appreciation for the problems that

mines can cause for power projection and sea control forces. Finally, the Navy learned that the mine and obstacle problem in shallow water and the surf zone restricts the ability to conduct amphibious assaults. The Navy's investment strategy now includes programs to solve this problem.

MCM technology development is now placing emphasis on sensors, mine delivery, and advanced minefield concepts. Additionally, a great deal of significance is being placed on the detection and neutralization of mines, especially in the shallow water area.

Although funding in these program areas has been in progress for over a decade, the US Navy is still not fully prepared to deal with sea mines. The growing involvement of US naval forces in littoral operations is likely to result in fluctuations in MCM funding. The changing up-and-down year-to-year budgets reflect the Navy's desire to get some effective MCM systems into operational service for immediate use, while still trying to develop long-term systems to deal with the mine warfare threat.

NOTE: Because this is strictly a research and development program designed to come up with concepts and technologies, year-to-year funding fluctuates a great deal. Much of this is due to some ineffectual concepts being terminated, while other ideas that do prove successful are transitioned to full programs in their own right. For this report, funding totals begin with FY92 (after some hard lessons learned in the Persian Gulf War), as this was when the Navy realized it was in serious need of upgrading its shallow water MCM capabilities.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR FUNDING ($ in millions)

			High Confidence Level				Good Confidence Level			Speculative			
Designation	**Application**	**Thru 99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**Total 00-09**
SURFACE/SHALLOW WATER MCM	MINE COUNTER-MEASURES (US NAVY)	477.10	82.40	89.60	69.00	42.30	61.50	67.80	70.00	72.500	75.00	75.00	705.10
Total Funding		477.10	82.40	89.60	69.00	42.30	61.50	67.80	70.00	72.50	75.00	75.00	705.10