

UNCLASSIFIED

FY 2008/2009 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET
Exhibit R-2

DATE: February 2007

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603782N
PROGRAM ELEMENT TITLE: MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY

COST: (Dollars in Thousands)

Project Number & Title	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
Total PE	34,542	25,324	26,840	33,877	33,107	33,075	35,284	37,691
2917 MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY	30,940	21,240	26,840	33,877	33,107	33,075	35,284	37,691
9999 CONGRESSIONAL PLUS-UPS	3,602	4,084	0	0	0	0	0	0

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program element primarily develops and demonstrates prototype Mine Countermeasures (MCM) and Expeditionary Warfare system components that support capabilities enabling Naval Forces to influence operations ashore. Third-world nations have the capability to procure, stockpile and rapidly deploy all types of naval mines, including new generation mines having sophisticated performance characteristics, throughout the littoral battlespace. Real world operations have demonstrated the requirement to quickly counter the mine threat. Advanced technologies must rapidly detect and neutralize all mine types, from deep water to the inland objective. This program supports the advanced development and integration of sensors, processing, warheads and delivery vehicles to demonstrate improved Naval Warfare capabilities. It supports the MCM-related and Urban Asymmetric/Expeditionary Warfare Operations (UAEO)-related Future Naval Capabilities (FNC) Enabling Capabilities (ECs). Within the Naval Transformation Roadmap, this investment will achieve one of three key transformational capabilities required by Sea Shield as well as technically enable the Ship to Objective Maneuver (STOM) key transformational capability within Sea Strike.

Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

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B. PROGRAM CHANGE SUMMARY:

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
FY 2007 President's Budget Submission	35,112	21,326	49,293	67,309
Congressional Action	0	4,100	0	0
Congressional Undistributed Reductions/Rescissions	-28	-102	0	0
Execution Adjustments	-36	0	0	0
Non-Pay Inflation Adjustments	0	0	-81	76
Program Adjustments	0	0	164	276
Program Realignment	0	0	-22,538	-33,797
Rate Adjustments	0	0	2	13
SBIR Assessment	-506	0	0	0
FY 2008/FY 2009 President's Budget Submission	34,542	25,324	26,840	33,877

PROGRAM CHANGE SUMMARY EXPLANATION:

Technical: Not applicable.

Schedule: Not applicable.

C. OTHER PROGRAM FUNDING SUMMARY:

Not applicable.

D. ACQUISITION STRATEGY:

Not applicable.

E. PERFORMANCE METRICS:

The overall metrics of this advanced technology program are the development of technologies supporting the Mine and Expeditionary Warfare challenges of reducing the MCM tactical timeline from months to days and eliminating the need for Navy divers and manned equipment to enter minefields. Another important metric is the scheduled transition of 6.3 advanced technology projects from the FNCs program into Navy and Marine Corps

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acquisition programs at agreed upon Technology Readiness Levels. Technology-specific metrics include: Mine warfare data fusion capabilities yielding a 10%-25% reduction in time and risk to mine hunting activities; Mine hunting sensors - Probability of Detection = 95%, Probability of Identification of Proud Mines = 90%, Probability of Classification of Buried Mines = 80%; Unmanned Systems for MCM sized for inclusion in the Littoral Combat Ship Mine Warfare Mission Package; MCM sensors sized, packaged and capable of 12 hour missions with a search rate greater than .05 square nautical mines per hour; Mine sweeping: Modular magnetic and acoustic influence sweeping systems packaged for deployment from Unmanned Surface Vehicles; Minesweeping single sortie coverage > 9.4 square nautical miles at 20 nautical miles per hour during a 4 hour mission up to Sea State 3; Surface-laid mine and obstacle breaching capability > 90% in the Beach Zone using unitary warheads, and > 80% in the Surf Zone.

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COST: (Dollars in Thousands)

Project Number & Title	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
2917 MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY	30,940	21,240	26,840	33,877	33,107	33,075	35,284	37,691

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project primarily develops and demonstrates prototype MCM and UAEO technologies that support a range of capabilities enabling Naval Forces to influence operations ashore. Third-world nations have the capability to procure, stockpile and rapidly deploy all types of naval mines, including new generation mines having sophisticated performance characteristics. Recent operations have demonstrated the requirement to counter the projected mine threat. Advanced technologies are required to rapidly detect and neutralize all mine types, from deep water to the inland objective. This project supports the advanced development and integration of sensors, processing, warheads and delivery vehicles. It supports the MCM-related and UAEO-related FNC ECs.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2006	FY 2007	FY 2008	FY 2009
MINE/OBSTACLE DETECTION	14,663	13,034	14,490	19,348

This activity focuses on developing and demonstrating technologies that support detection, classification, identification and multi-sensor data fusion of mine and obstacle data to speed tactical timelines and increase operator standoff. Efforts include: electro-optic sensors/systems to enable unmanned airborne vehicle (UAV) rapid minefield reconnaissance and precise mineline location from very shallow water (VSW) through the beach zone (BZ); sensors/systems to enable cooperating unmanned underwater vehicles (UUVs) to perform wide-area reconnaissance and assault lane reconnaissance/preparation from shallow water through the Surf Zone (SZ); sensor development for detection and classification of buried mines; technologies for MCM Mission Modules for the new Littoral Combat Ships (LCS); and sensor data fusion to enable a theater mine warfare common operating picture and own ship protection. This activity supports the development and transition of technologies for the MCM-related FNCs.

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The increase from FY 2008 to FY 2009 reflects the increased investment in the MCM critical S&T areas of Buried Mine Sensors and Processing; Undersea Cooperative Cueing (for UUVs); and MCM Sensors for the Littoral Combat Ship. The FY 2009 budget reflects the transition of 6.2 applied research into advanced technology development (6.3). Acquisition Programs of Record at NAVSEA have POM funding for the transition of these S&T products from 6.3 to 6.4.

This S&T investment supports the Joint Requirements Oversight Council of the Joint Chiefs of Staff and OPNAV-validated requirements for MCM. This S&T investment of Mine and Obstacle Detection provide critical S&T transitions to the Mine Warfare Mission package of the Navy's new Littoral Combat Ship. This investment in MCM S&T is reported as part of OPNAV's annual report to Congress in the MCM Certification Plan. This plan is reviewed and approved by OSD, and any deviations in ONR's reported S&T funding for MCM throughout the FYDP must be reported and justified through Navy and OSD. Further, the MCM S&T investment plan structure is reviewed and authorized by the Navy's Technology Oversight Group, who approves ECs, their supporting products, and funding profiles.

FY 2006 Accomplishments:

- Continued demonstration of capability to enable diver teams with UUVs to efficiently and accurately reacquire previously targeted areas and individual targets.
- Continued demonstration of integrated UUV search, marking, mapping of bathymetry, threat objects and gaps and report back in test-bed minefields in VSW environments.
- Continued development of multi-platform fusion from high-resolution mine hunting systems (e.g. AN/AQS-20) for improved mine detection and avoidance.
- Continued integration of Laser Scaler Gradiometer (LSG) into UUV and initiate field evaluation of LSG performance against buried mines.
- Continued transition of the small object avoidance processing string in the SQS-53C Integrated Peer Review (IPS) adjunct processing system.
- Initiated preliminary planning and testing of buried minehunting systems on UUV platforms.
- Initiated helo integration and conducted sea testing of Rapid Overt Airborne Reconnaissance (ROAR) sensor.
- Initiated development of ROAR multispectral laser, 3-D camera for tactical airborne VSW/SZ/BZ day/night mine/minefield/obstacle detection.

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FY 2007 Plans:

- Continue all FY 2006 efforts.
- Complete helo integration and sea testing of ROAR sensor and transition to PMS-495.
- Complete integration of LSG into UUV and field evaluation of LSG performance against buried mines.
- Complete transition of the small object avoidance processing string in the SQS-53C IPS adjunct processing system.
- Complete development of ROAR multispectral laser, 3-D camera for tactical airborne VSW/SZ/BZ day/night mine/minfield/obstacle detection.
- Demonstrate buried minehunting systems on UUV platforms with a combined LSG and dual frequency Synthetic Aperture Sonar sensor suite in a UUV in a Fleet exercise.
- Initiate multiple unmanned system MCM data fusion techniques for reduction in false alarms and reduction in tactical timelines.
- Initiate technology development, integration and early demonstration planning for MCM Mission Module systems for Advanced Flight LCS.
- Initiate advanced processing development for Low Frequency Broad Band to enable rapid detection, classification and identification of buried sea mines.
- Initiate development of buried minefield detection capability for Tactical Unmanned Aerial Vehicle (TUAV)-based SZ/BZ buried minefield detection.

FY 2008 Plans:

- Continue all FY 2007 efforts less those noted as completed above.
- Complete demonstration of capability to enable diver teams with UUVs to efficiently and accurately reacquire previously targeted areas and individual targets.
- Complete demonstration of integrated UUV search, marking, mapping of bathymetry, threat objects and gaps and report back in test-bed minefields in VSW environments.
- Initiate buried mine sensing identification processing.
- Initiate technology development for multiple UUV Undersea Cooperative Cueing and Intervention in support of MCM operations.

FY 2009 Plans:

- Continue all FY 2008 efforts less those noted as completed above.

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-Complete development of multi-platform fusion of high-resolution mine hunting systems (e.g. AN/AQS-20) for improved mine detection and avoidance.

-Complete multiple unmanned system MCM data fusion techniques for reduction in false alarms and reduction in tactical timelines.

	FY 2006	FY 2007	FY 2008	FY 2009
MINE/OBSTACLE NEUTRALIZATION	9,753	8,206	12,350	14,529

Mine and Obstacle Neutralization activity is focused on improving the capability to neutralize mines and obstacles from deep water through the beach exit zone. Efforts include the development of technologies for: stand-off breaching of mines and obstacles in the SZ/BZ; minesweeping and jamming of sea mines; and autonomous underwater vehicle (AUV) neutralization of sea mines. Stand-off breaching efforts demonstrate a mine and obstacle breaching capability that is enabled by precision weapon guidance and Intelligence, Surveillance, and Reconnaissance (ISR), and delivered by Naval Tactical Aircraft (TACAIR) and USAF Bombers. Tactical performance of existing unitary bombs is being demonstrated. Other efforts will demonstrate a tactical countermine dart and dispenser concept. The minesweeping effort develops a mission package for deployment on Unmanned Surface Vehicles (USVs). Also, efforts will focus on improving an existing breaching weapon fuze and developing a precision assault lane marking navigation capability. This activity supports the development and transition of technologies for the MCM-related FNC ECs.

The funding profile from FY 2007 through FY 2009 reflects the increased emphasis on developing FNC products in AUV technology for neutralization of sea mines, assault lane navigation and improvements to breaching weapons.

FY 2006 Accomplishments:

-Continued dart development activities: conducted 3rd Mine/Obstacle Defeat System (MODS) flight test with inert darts.

-Completed mechanical designs for neutralization of bottom and moored mines in VSW then implement and test.

-Continued USV sweep development by conducting a technology demo of mine influence sweep payload performance; conducting initial fleet demo of early USV sweeping capability from a LCS surrogate.

-Completed integration of Mk-84 bomb lethality data for proud and buried mines and obstacles into the Mine Warfare Environmental Data Library (MEDAL).

-Initiated activities supporting the transition of countermine dart warhead technology to PMS-495.

-Initiated countermine dart lethality optimization in coordination with PMS-495.

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- Initiated countermine dart dispensing optimization in coordination with PMS-495.
- Initiated development of low drag, low frequency sound source for mine influence sweeping.
- Initiated development of advanced mine influence sweeping payload for USVs, focusing on increasing swept path and endurance.

FY 2007 Plans:

- Continue all FY 2006 efforts less those noted as completed above.
- Complete development and demonstration of USV minesweeping module concept and begin transition to PMS-495.
- Complete countermine dart lethality optimization.
- Complete MODS dart development activities: plan live dart demo, fabricate live darts and complete live dart demo.
- Complete transition of countermine dart technology to PMS-495.
- Complete countermine dart dispensing optimization.
- Complete development of advanced mine influence sweeping payload for USVs, focusing on increasing swept path and endurance.
- Initiate development of an autonomous mine neutralization system for VSW MCM.
- Initiate development of advanced influence minesweeping module for unmanned surface vehicle mine sweeping in support of the MCM Mission Modules initiative.
- Initiate development effort to extend effectiveness of unitary warheads to greater depths and initiate planning of flight demo with Naval Special Clearance Team 1.
- Initiate technology development of precision navigation capability for targeting, safe navigation through assault lanes including lane marking.

FY 2008 Plans:

- Continue all FY 2007 efforts.
- Initiate development of an AUV system for neutralization of littoral mines.

FY 2009 Plans:

- Continue all FY 2008 efforts less those noted as completed above.
- Complete development of low drag, low frequency sound source for mine influence sweeping in support of the MCM Mission Modules initiative.

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	FY 2006	FY 2007	FY 2008	FY 2009
LITTORAL COMBAT	6,524	0	0	0

Within the Naval Transformation Roadmap, this investment supports achievement of transformational capabilities of STOM, a key transformational capability within Sea Strike. This activity develops and demonstrates prototype capability to enable Naval Expeditionary Forces to influence operations ashore. The goal of Littoral Combat is the application of technologies to enhance the ability of the Navy/Marine Corps team to execute the naval portion of a joint campaign in the littorals. This activity considers all the critical functions of warfighting: Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR), fires, maneuver, sustainment, force protection, and training. The funding profile from FY 2006 to FY 2007 reflects the reorganization of FNC Program investments into ECs. As a result of this reorganization, the funding for each EC has been aligned to Budget Activity 2 and Budget Activity 3 PEs as appropriate. This Activity reflects the alignment of investments for the following ECs: Hostile Fire Detection and Response Spirals 1 and 2, Improvised Explosive Devices Spirals 1 and 2, Modular Scalable Weapon, Advanced Naval Fires Technology Spiral 1, Position-Location-Information, Dynamic Target Engagement & Enhanced Sensor Capabilities, Global Information Grid (GIG)-Compliant Networking, and Marine and Unmanned Vehicle Tactical ISR.

Starting in FY 2007, investment for Littoral Combat is realigned to PE's 0603640M, 0603235N and 0603114N.

FY 2006 Accomplishments:

- Continued development of fires coordination and control system software/hardware for indirect fire weapons systems. (FY 2007 work continues in PE 0603114N)
- Continued development of advanced lightweight materials for weapon systems/platforms. (FY 2007 work continues in PE 0602114N and 0603114N.)
- Continued development of lightweight mission essential computational interfaces for weapons systems. (FY 2007 effort funded by PE 0603114N)
- Continued development of improved fire control technologies for weapon aiming and pointing systems. (FY 2007 effort funded by PE 0603114N)
- Continued development of Radio Frequency emitter identification and geolocation technology. (FY 2007 work continues in PE 0603640M)
- Continued integration, development and demonstration of secure mobile networks/secure wireless Local Area

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Network communication technologies. (FY 2007 effort funded by PE 0602131M and 0603640M)

-Continued advanced naval fires technology development Spiral 1. (Previous efforts funded by PE 0602131M and PE 0603640M; FY 2007 effort funded by PE 0603114N)

-Continued development of advanced ammunition packaging. (Previous and concurrent funding by PE 0602131M and PE 0603640M; FY 2007 effort funded by PE 0602114N and 0603114N)

-Continued hostile fire detection and response technology development (including Gunslinger). (Previous efforts funded by PE 0602131M) (FY 2007 work continues in PE 0602114N and 0603114N.)

-Continued development of enhanced remote sensor fusion Measurement and Signatures Intelligence capabilities. (Previous effort funded by PE 0603640M; FY 2007 effort funded by PE 0603114N)

-Completed development/testing/demonstration of Signals Intelligence visualization system technologies in support of STOM. (Previous efforts funded by PE 0603640M)

-Completed development of planar/phased array electronic attack antenna technology.

-Completed development of advanced sensing algorithms to derive maps using digital imagery and transition to Program of Record. (Previous effort funded by PE 0602131M)

-Initiated development of innovative tactical GIG-Compliant Networking technologies. (FY 2007 effort funded by PE 0603235N)

FY 2007 Plans:

Realigned to PE 0603640M, PE 0603235N, PE 0602114N and PE 0603114N.

C. OTHER PROGRAM FUNDING SUMMARY:

NAVY RELATED RDT&E:

PE 0601153N Defense Research Sciences

PE 0602131M Marine Corps Landing Force Technology

PE 0602747N Undersea Warfare Applied Research

PE 0602782N Mine and Expeditionary Warfare Applied Research

PE 0602435N Ocean Warfighting Environment Applied Research

PE 0603502N Surface and Shallow Water Mine Countermeasures

PE 0603513N Shipboard System Component Development

PE 0603640M USMC Advanced Technology Demonstration ATD

PE 0604373N Airborne MCM

PE 0604784N Distributed Surveillance System

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NON-NAVY RELATED RDT&E:

PE 0602712A Countermine Systems

PE 0603606A Landmine Warfare and Barrier Advanced Technology

D. ACQUISITION STRATEGY:

Not applicable.

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PROGRAM ELEMENT TITLE: MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY
PROJECT TITLE: Congressional Plus-Ups

CONGRESSIONAL PLUS-UPS:

	FY 2006	FY 2007
JEOD DIVER SITUATIONAL AWARENESS SYSTEM	0	1,793

This effort supports the development of a Joint Explosive Ordnance Disposal system for diver situational awareness.

	FY 2006	FY 2007
MODELING THE WARRIOR AS A COGNITIVE SYSTEM	1,655	0

This effort extended the Mobile Field Kit to deliver a web based system that serves the purpose of improving the educational process for the Advanced Improvised Explosive Device (AIED) School and the warfighter and provided them both with a portable web based system that can collect a variety of AIED training reference material.

	FY 2006	FY 2007
UPWARD LOOKING SENSOR	986	1,046

FY 2006: This effort supported the initial concept development of an inexpensive, disposable and unattended sensor system to detect the presence of threat submarines in relatively shallow water over a large area of ocean.

FY 2007: This effort will define the concept of small, autonomous sonar units randomly spaced on the floor of the ocean in relatively shallow water, less than 1000 feet.

	FY 2006	FY 2007
VISUAL INTEGRATED BRIDGE SYSTEM	961	1,245

FY 2006: This effort provided augmented reality research for the Landing Craft Air Cushion (LCAC) Bridge system and the Expeditionary Fighting Vehicle (EFV) Obstacle Avoidance system.

FY 2007: This effort will support the EFV Operational Requirements Document (ORD) goal for Light Detection and Ranging (LIDAR) data display.