FY 2007 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2006
Exhibit R-2

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

COST: (Dollars in Thousands)

Project Number & Title	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total PE	36,364	35,112	21,326	49,293	67,309	74,699	74,727
2917 MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY	33,760	31,412	21,326	49,293	67,309	74,699	74,727
9999 CONGRESSIONAL PLUS-UPS	2,604	3,700	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:

	FY 2005	FY 2006	FY 2007
FY 2006 President's Budget Submission	35,255	31,897	34,554
Congressional Action	0	3,700	0
Congressional Undistributed Reductions/Rescissions	-27	-485	0
Execution Adjustments	230	0	0
FY 2005 SBIR	-431	0	0
GWOT Counter IED Efforts	1,330	0	0
Program Adjustments	7	0	0
Program Realignment	0	0	-13,191
Rate Adjustments	0	0	-37
FY 2007 President's Budget Submission	36,364	35,112	21,326

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 applied research program are the development of technologies which focus on the Expeditionary Warfare challenge of speeding the tactical timeline and removing personnel from minefields. Another important metric is the transition of 6.3 advanced technology projects into acquisition programs. Example metrics include: a. MCM sensor data fusion = 10%-25% reduction in time and risk; b. buried mine sensor

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- probability of detection = .95, probability of classification = .8; packaged in 12 inch x 72 inch vehicle during a 12 hour mission with a search rate greater than .05 square nautical mines per hour; c. mine sweeping - magnetic/acoustic influence sweeping; single sortie coverage greater than 9.4 square nautical mines at 20 nautical miles per hour, 4 hour mission; and d. advanced sonars and processing - automated target recognition accuracy speed greater than 5 times faster than trained sonar analyst against a B-2 bottom.

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PROJECT NUMBER: 2917 PROJECT TITLE: MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY

COST: (Dollars in Thousands)

Project Number & Title	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
2917 MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY	33,760	31,412	21,326	49,293	67,309	74,699	74,727

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project primarily develops and demonstrates prototype Mine Countermeasures (MCM) and Urban Asymmetric/Expeditionary Warfare Operations (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 Future Naval Capabilities (FNC) Enabling Capabilities (ECs).

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2005	FY 2006	FY 2007
MINE/OBSTACLE DETECTION	16,325	15,163	13,120

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 (E-O) 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 (SW) 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 Mine Countermeasure (MCM)-related FNC Enabling Capabilities.

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The funding profile from FY06 to FY07 reflects the reorganization of Future Naval Capabilities (FNC) Program investments into Enabling Capabilities (ECs). As a result of this reorganization, the funding for each EC has been aligned to a Budget Activity 2 and Budget Activity 3 PE as appropriate. This Activity reflects the alignment of investments for the following ECs: Mine Countermeasures Capacity Spiral 1 and 2; and Mine Countermeasures for Maneuver Spiral 1 and 2.

FY 2005 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 integration of Laser Scaler Gradiometer (LSG) in UUV.
-Continued development of multi-platform fusion of high-resolution mine hunting systems (e.g. AN/AQS-20) for improved mine detection and avoidance.
-Completed component integration and demonstrated, at-sea, the small object avoidance processing string in the SQS-53C sonar Integrated Peer Review (IPS) adjunct processing system and prepared for transition.
-Completed integration of dual frequency small Synthetic Aperture Sonar (SAS) into UUV for reconnaissance and initiate field evaluation.
-Completed development of Rapid Overt Airborne Reconnaissance (ROAR) multispectral laser, 3-D camera for tactical airborne VSW/SZ/BZ day/night mine/minefield/obstacle detection.
-Initiated at-sea testing of ROAR sensor and began helicopter integration.

FY 2006 Plans:

-Continue all FY 2005 efforts less those noted as completed above.
-Complete at-sea testing of ROAR sensor for tactical airborne VSW/SZ/BZ day/night mine/minefield/obstacle detection and initiate transition to PMS-495.
-Complete integration of LSG into UUV and initiate field evaluation of LSG performance against buried mines.
-Complete transition of the small object avoidance processing string in the SQS-53C Integrated Peer Review (IPS) adjunct processing system.
-Initiate system development for Over-the-Horizon (OTH) deployment of UUV systems by Autonomous Surface Vehicles (ASVs) and large UUVs.

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-Initiate development of buried minefield detection capability for Tactical Unmanned Aerial Vehicle (TUAV)-based SZ/BZ buried minefield detection.
-Initiate preliminary planning and testing of buried minehunting systems on UUV platforms.

FY 2007 Plans:

-Continue all FY 2006 efforts less those noted as completed above.
-Demonstrate buried minehunting with a combined LSG and dual frequency SAS 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 (LFBB) to enable rapid detection, classification and identification of buried sea mines.

	FY 2005	FY 2006	FY 2007
MINE/OBSTACLE NEUTRALIZATION	12,945	9,749	8,206

Mine and Obstacle Neutralization activity is focused on dramatically 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 surf and beach zones (SZ/BZ); minesweeping and jamming of sea mines; and expendable, autonomous underwater vehicle (AUV) neutralization of sea mines. Stand-off breaching efforts will 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), USAF Bombers, and Naval guns. In the near-term, tactical performance of existing unitary bombs will be demonstrated. Other efforts will demonstrate a tactical countermine dart and dispenser concept. The minesweeping effort will develop 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 FY06 to FY07 reflects the reorganization of Future Naval Capabilities (FNC) Program investments into Enabling Capabilities (ECs). As a result of this reorganization, the funding for each EC has

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been aligned to a Budget Activity 2 and Budget Activity 3 PE as appropriate. This Activity reflects the alignment of investments for the following ECs: Mine Countermeasures Capacity Spiral 2; and Mine Countermeasures for Maneuver Spiral 1 and 2.

FY 2005 Accomplishments:

-Completed development of an Assault Breaching Mission Planner, demonstrate utility with Mine Warfare Environmental Decision Aids Library (MEDAL), and began transition to PMS-495.
-Completed performance characterization of Mk-84 bombs against buried mines.
-Completed development of USV minesweeping payload (spiral 1); completed integration on a USV; conducted technology demonstration of mine influence sweep payload performance; conducted initial fleet demonstration of early USV mine sweeping capability from a High Speed Vehicle (HSV).
-Conducted demonstration of dart dispensing technologies and integration of payload and delivery platforms for system level demonstrations and conduct 2nd flight test of the Mine and Obstacle Defeat System (MODS) with a full payload of inert darts.
-Initiated dart fabrication and began planning FY06 MODS “live” payload demonstration.
-Initiated development of USV minesweeping module concept for the Littoral Combat Ship (LCS).
-Initiated development of mechanical designs for neutralization of moored and bottom mines in VSW.

FY 2006 Plans:

-Complete dart fabrication and complete MODS flight demonstration of the dispensing of live darts against live tactical mines.
-Complete mechanical designs for neutralization of bottom and moored mines in Very Shallow Water (VSW) then implement and test.
-Conduct technology demo of mine influence sweep payload performance; conduct initial fleet demo of early USV sweeping capability from an HSV.
-Initiate and complete integration of Mk-84 bomb lethality data for proud and buried mines and obstacles into MEDAL.
-Initiate the transition of countermine dart warhead technology to PMS-495.
-Initiate countermine dart lethality optimization in coordination with PMS-495.
-Initiate countermine dart dispensing optimization in coordination with PMS-495
-Initiate development of low drag, low frequency sound source for mine influence sweeping.
-Initiate development of advanced mine influence sweeping payload for USVs, focusing on increasing swept path

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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 transition of countermine dart technology to PMS-495.
-Complete countermine dart dispensing optimization and complete transition of dart dispensing technology to PMS-495.
-Initiate development of an expendable, autonomous underwater vehicle neutralizer, initially focused on neutralization of moored influence sea mines in shallow water.
-Initiate development of advanced influence minesweeping module for unmanned surface vehicle mine sweeping.
-Initiate development of stand-off, assault breaching warhead fuse to extend effectiveness of unitary warheads to greater water depths.
-Initiate technology development of precision navigation capability for targeting, safe navigation through assault lanes including lane marking.

	FY 2005	FY 2006	FY 2007
LITTORAL COMBAT	4,490	6,500	0

Within the Naval Transformation Roadmap, this investment supports achievement of transformational capabilities of Ship To Objective Maneuver (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 FY06 to FY07 reflects the reorganization of Future Naval Capabilities (FNC) Program investments into Enabling Capabilities (ECs). As a result of this reorganization, the funding for each EC has been aligned to a Budget Activity 2 and Budget Activity 3 PE 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, GIG-

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Compliant Networking, and Marine and Unmanned Vehicle Tactical Intelligence, Surveillance and Reconnaissance (ISR).

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

FY 2005 Accomplishments:

-Continued development of fires coordination and fire control system software/hardware for indirect fire weapons systems.
-Continued development of advanced lightweight materials for weapon systems/platforms. (Previous efforts funded by PE 0603640M)
-Continued development of lightweight mission essential computational fire control interfaces for weapons systems. (Previous efforts funded by PE 0603640M)
-Continued development of improved fire control technologies for weapon aiming and pointing systems. (Previous efforts funded by PE 0603640M, 0602236N and PE 0603236N.)
-Continued development of radio frequency (RF) emitter identification and geolocation technology. (Previous efforts funded by PE 0602131M)
-Continued integration and demonstration of secure mobile networks/secure wireless local area network (LAN) communication technologies. (Previous efforts funded by PE 0602782N and PE 0602131M)
-Continued development of planar/phased array electronic attack antenna technology.
-Completed development of an advanced sensor miniature digital data link. (Development also funded by PE 0602782N)

FY 2006 Plans:

-Continue development of fires coordination and control system software/hardware for indirect fire weapons systems. (FY07 work continues in PE 0603114N)
-Continue development of advanced lightweight materials for weapon systems/platforms. (FY07 work continues in PE 0603114N.)
-Continue development of lightweight mission essential computational interfaces for weapons systems. (FY07 effort funded by PE 0603114N)
-Continue development of improved fire control technologies for weapon aiming and pointing systems. (FY07 effort funded by PE 0603114N)
-Continue development of radio frequency (RF) emitter identification and geolocation technology. (FY07 work

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continues in PE 0603640N)
-Continue integration, development and demonstration of secure mobile networks/secure wireless Local Area Network (LAN) communication technologies. (FY07 effort funded by PE 0603640M)
-Continue advanced naval fires technology development Spiral 1. (Previous efforts funded by PE 0602131M and PE 0603640M; FY07 effort funded by PE 0603114N)
-Continue development of advanced ammunition packaging. (Previous and concurrent funding by PE 0602131M and PE 0603640M; FY07 effort funded by PE 0603114N)
-Continue hostile fire detection and response technology development (including Gunslinger). (Previous efforts funded by PE 0602131M) (FY07 work continues in PE 0603114N.)
-Continue development of enhanced sensor fusion Measurement and Signatures Intelligence (MASINT) capabilities. (Previous effort funded by PE 0603640M; FY07 effort funded by PE 0603114N)
-Complete development/testing/demonstration of Signals Intelligence (SIGINT) visualization system technologies in support of Ship to Objective Maneuver (STOM). (Previous efforts funded by PE 0603640M)
-Complete development of planar/phased array electronic attack antenna technology.
-Complete development of advanced sensing algorithms to derive maps using digital imagery and transition to Program of Record. (Previous effort funded by PE 0602131M)
-Initiate development of innovative tactical Global Information Grid (GIG)-compliant networking technologies. (FY 07 effort funded by PE 0603235N)

FY 2007 Plans:

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

C. OTHER PROGRAM FUNDING SUMMARY:
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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PROJECT NUMBER: 9999 PROJECT TITLE: Congressional Plus-Ups

CONGRESSIONAL PLUS-UPS:

	FY 2005	FY 2006
COUNTERMINE LIDAR UAV-BASED SYSTEM (CLUBS)	964	0

This effort developed Light Detection and Ranging (LIDAR) technology to support the detection of mines and obstacles in the Surf Zone from an Unmanned Aerial Vehicle (UAV).

	FY 2005	FY 2006
MODELING THE WARRIOR AS A COGNITIVE SYSTEM - PHASE II	1,640	1,700

FY 2005: This effort developed situation-specific models for modeling warrior competencies and capabilities across operations, support and training; and also expanded the scope to include emerging missions to better understand the warrior's human factors.
FY 2006: This effort extends beyond the Mobile Field Kit developed during FY 2005 to deliver a web based system that will serve the purpose of improving the educational process for the Advanced Improvised Explosive Device (AIED) School and the warfighter and to provide them both with a portable web based system that collects a variety of AIED training reference material.

	FY 2005	FY 2006
UPWARD LOOKING SENSOR	0	1,000

This effort supports upward looking sensor research.

	FY 2005	FY 2006
VISUAL INTEGRATED BRIDGE SYSTEM	0	1,000

This effort supports visual integrated bridge system research.