FY 2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2004
Exhibit R-2

BA: 03 PROGRAM ELEMENT: 0603782N
PROGRAM ELEMENT TITLE: Mine and Expeditionary Warfare Advanced Technology

COST: (Dollars in Thousands)

Project Number & Title	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
R2720 OCEAN MODELING FOR MINE & SUB WARFARE	954	989	0	0	0	0	0
R2917 MINE AND EXPEDITIONARY WARFARE ADVANCED TECHNOLOGY	40,090	31,346	32,899	38,880	37,595	38,303	39,093
R9166 MODELING THE WARRIOR AS A COGNITIVE SYSTEM	1,222	1,682	0	0	0	0	0
R9343 AUGMENTED REALITY RESEARCH	0	1,236	0	0	0	0	0
R9344 EXTREME TERRAIN MEDICAL EVACUATION VEHICLE PILOT	0	1,682	0	0	0	0	0
R9345 HYPERSPECTRAL MAPPING IMAGER FOR THE COASTAL OCEAN	0	1,978	0	0	0	0	0
Totals	42,266	38,913	32,899	38,880	37,595	38,303	39,093

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This PE develops and demonstrates prototype Mine Warfare (MIW) system components that support capabilities enabling Naval Expeditionary 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. Gulf War operations demonstrated the requirement to quickly counter the mine threat. Advanced technologies are required to rapidly detect and neutralize all mine types, from deep water through the beach. This PE supports the advanced development and integration of sensors, processing, warheads and delivery vehicles to demonstrate improved MIW capabilities. It supports the Organic Mine Countermeasures (OMCM) Future Naval Capability. Within the Naval Transformation Roadmap, this investment will achieve one of three key transformational capabilities required by Sea Shield as well 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.

PROGRAM CHANGE SUMMARY:

	FY 2003	FY 2004	FY 2005
FY 2004-2005 President's Budget Submission	44,985	31,719	30,081
Cong. Rescissions/Adjustments/Undist.Reductions	0	-455	0
Congressional Actions	0	7,650	0
Execution Adjustments	-1,081	0	0
Inflation Savings	0	0	-96
Rate Adjustments	0	-1	-86
SBIR Assessment	-1,638	0	0
Technical Adjustments	0	0	3,000
FY 2005 President's Budget Submission	42,266	38,913	32,899

PROGRAM CHANGE SUMMARY EXPLANATION:

Technical: Not applicable.
Schedule: Not applicable

FY 2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2004
Exhibit R-2a

BA: 03 PROGRAM ELEMENT: 0603782N PROGRAM ELEMENT TITLE: Mine and Expeditionary Warfare Advanced Technology
PROJECT NUMBER: R2917 PROJECT TITLE: Mine and Expeditionary Warfare Advanced Technology

COST: (Dollars in Thousands)

Project Number & Title	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
R2917 Mine and Expeditionary Warfare Advanced Technology	40,090	31,346	32,899	38,880	37,595	38,303	39,093

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:
This project develops and demonstrates prototype Mine Warfare (MIW) system components that support a range of capabilities enabling Naval Expeditionary 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 real-world operations demonstrated the requirement to counter the projected mine threat. Advanced technologies are required to rapidly detect and neutralize all mine types, from deep water through the beach. This project supports the advanced development and integration of sensors, processing, warheads, and delivery vehicles. It supports the Organic Mine Countermeasures (OMCM) Future Naval Capability.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2003	FY 2004	FY 2005
Mine/Obstacle Detection	22,956	14,581	21,733

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: remote sensing techniques/procedures to survey threat mining activities and locations (ends FY04); electro-optic (E-O) sensors/systems to enable unmanned airborne vehicle (UAV) rapid minefield reconnaissance and precise mineline location from very shallow water through the beach exit zone; 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; decision support and visualization software for amphibious planning/operations; and sensor data fusion to enable a theater mine warfare common operating picture and own ship protection.
The funding dip for Mine and Obstacle Detection that occurs in FY04 is due to several factors: A shift of funds out of the Mine and Obstacle Detection activity into the Assault Breaching Systems (ABS) activity, and a

decreased emphasis on sensor systems due to the maturity of the Navy's Organic Mine Countermeasures (MCM) Systems acquisition program (IOC for first systems is FY05). The rise in FY05 funding in this activity results from increasing investment in the new area of MCM mission modules for both afloat and ashore applications.

FY 2003 Accomplishments:

-Completed development and demonstrated visualization tool for amphibious assault craft to aid in staying in cleared lanes.
-Demonstrated UUV multi-platform, coordinated VSW reconnaissance during FY03 Fleet Exercises.
-Demonstrated magneto-inductive firing device for remote triggering of UUV neutralization charges.
-Demonstrated UAV night illumination techniques with S&T-developed Airborne Laser Diode Array Illuminator (ALDAI) for detection of land minefields.
-Continued Remote Sensing Tier II algorithm refinement efforts on critical environmental parameters, including offshore bathymetry, surface currents, and other essential elements of information for amphibious operations.
-Continued development of automated mine/minefield detection algorithms for active 3D E-O sensors.
-Continued demonstration of integrated UUV search, marking, bathymetry mapping, threat objects and gaps and reporting back in test-bed minefields in VSW environments.
-Continued demonstration of capability to enable diver teams using UUVs to efficiently and accurately reacquire previously targeted areas and individual targets.
-Continued decision support system integration of technologies/concepts for mine countermeasures in support of ship to objective maneuver.
-Continued multi-platform, multi-sensor data fusion effort focused on fusion of AV-15 kingfisher data for improved ship mine detection and avoidance.
-Initiated dual frequency small Synthetic Aperture Sonar (SAS) design and fabrication for VSW UUV.
-Initiated development of Remote Sensing Tier III algorithms for critical environmental parameters.
-Initiated development of Rapid Overt Airborne Reconnaissance (ROAR) – a UAV-sized system for day/night automatic mine/minefield/obstacle detection in the very shallow water (VSW), surf zone (SZ), and beach zone (BZ), using a scanned convection-cooled custom laser with a true 3D receiver for VSW and SZ and active multi-spectral capability for land-based detection.

FY 2004 Plans:

-Complete and transition Remote Sensing Tier II algorithm refinement/enhancement efforts. Close out and document Tier III algorithm efforts.
-Complete development and testing of the UAV ROAR system for tactical airborne VSW/SZ/BZ day/night

mine/minefield/obstacle detection.
-Demonstrate UUV target reacquisition with simulated neutralization.
-Demonstrate VSW multi-platform, coordinated UUV reconnaissance and reacquisition/identification during Fleet Exercises in FY04.
-Continue demonstration of integrated UUV search, marking, bathymetry mapping, threat objects and gaps and reporting back in test-bed minefields in VSW environments.
-Continue demonstration of capability to enable diver teams using UUVs to efficiently and accurately reacquire previously targeted areas and individual targets.
-Continue integration of dual frequency small SAS into VSW UUV for reconnaissance.
-Continue to improve functionality of expeditionary warfare decision support software to include domain interpretation rules, active templates, and intelligent agents.
-Continue development of multi-platform fusion of AV-15 Kingfisher data and those from high-resolution mine hunting systems (e.g. AN/AQS-20) for improved ship mine detection and avoidance.
-Initiate a call for proposals for advanced development for tactical airborne buried mine/minefield detection over the beach.

FY 2005 Plans:

-Demonstrate full day/night capability to detect mines, mine lines, and minefields in the VSW, SZ and BZ during a fleet exercise with the ROAR system.
-Demonstrate UUV target reacquisition with simulated neutralization in Fleet Exercise.
-Continue testing/evaluation of UAV buried mine/minefield detection technology solutions for BZ reconnaissance.
-Perform field evaluation of small SAS on UUV.
-Continue demonstration of integrated UUV search, marking, bathymetry mapping, threat objects and gaps and report back in test-bed minefields in VSW environments.
-Continue demonstration of capability to enable diver teams with UUVs to efficiently and accurately reacquire previously targeted areas and individual targets.
-Continue expeditionary warfare decision support system integration of technologies/concepts for mine countermeasures in support of ship to objective maneuver.
-Continue development of multi-platform fusion of AV-15 Kingfisher data and those from high-resolution mine hunting systems (e.g. AN/AQS-20 and Long-Term Mine Reconnaissance System (LMRS) for improved mine detection and avoidance.

	FY 2003	FY 2004	FY 2005
Mine/Obstacle Neutralization	17,134	10,765	11,166

This activity will develop technologies for: stand-off breaching of mines and obstacles in the surf and beach zones; and minesweeping of sea mines. It 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. Far-term effort will demonstrate a tactical countermine dart and dispenser concept. The minesweeping effort will develop a mission package for deployment on Unmanned Surface Vehicles (USVs).

FY 2003 Accomplishments:

-Completed tow body motion measurement and analysis as part of USV minesweeping mission package development.
-Completed unitary bomb static effects testing to characterize lethality at tactical impact burial/height of burial.
-Completed static BZ lane clearance demonstration in preparation for bomb flight demo.
-Completed water effects testing to characterize bomb lethality at tactical impact/height of detonation - in flight regime.
-Completed continuous rod warhead (CRW) lethality testing.
-Continued development of chemical and reactive darts for neutralization of SZ/BZ mines.
-Continued development of dispensing technologies for distributing chemical and reactive darts.
-Initiated integration of chemical dart warhead payload and delivery platforms for system level demonstration.
-Initiated advanced development of assault lane navigation system.
-Initiated development of minesweeping mission package technologies and began integration onto an USV.

FY 2004 Plans:

-Conduct static water effects testing to characterize bomb lethality at tactical impact/height of detonation.
-Demonstrate SZ/BZ lane clearance to characterize unitary bomb lethality - in flight regime with B-52s dropping flight ready MK-84 bombs.
-Demonstrate high explosive dart lethality.
-Continue development and demonstration of lethality of separate beach zone and surf zone variant of chemical dart.
-Continue development and demonstration of dispensing technologies using sled and horizontal gun testing for

air-delivered and naval gun-delivered darts.
-Continue advanced development of assault lane navigation system.
-Continue development and integration of minesweeping mission package on an USV.

FY 2005 Plans:

-Complete development of dispensing technologies and integration of chemical and reactive dart warhead payload and delivery platforms for system level demonstrations.
-Demonstrate lethality of chemical dart final design for BZ/SZ clearance.
-Demonstrate early capability of autonomous minesweeping operations from a High Speed Vessel (HSV) during a fleet training exercise or fleet battle experiment.
-Continue advanced development of assault lane navigation system.
-Continue development of modular, high-fidelity minesweeping signal generator (magnetic/acoustic) mission package on an USV.

	FY 2003	FY 2004	FY 2005
Assault Breaching System	0	6,000	0

Assault Breaching System concepts will lead to a future mine and obstacle breaching capability. The employment of air and surface strike weapon systems will minimize exposure to service personnel; enable amphibious landing forces to maintain an unencumbered operational tempo from the sea to the objectives ashore; and reduce total ownership costs and logistics requirements. It supports the future naval warfare directions of power projection, operational maneuver from the sea, ship-to-objective maneuver, and sea-based logistics.

FY 2004 Plans:

-Conduct tradeoff analysis including systems that can provide a precision mine and obstacle breaching capability delivered by Naval Tactical Aircraft, United States Air Force Bombers, and Naval Guns.
-Develop prototype mission planning tools to support air-delivered breaching concepts.
-Continue development and demonstration of reconnaissance technologies for detecting minefields in the surf zone (initiated in the mine and obstacle detection activity).

C. OTHER PROGRAM FUNDING SUMMARY:

PE 0601153N (Defense Research Sciences)
PE 0602131M (Marine Corps Landing Force Technology)

PE 0602435N (Ocean Warfighting Environment Applied Research)
PE 0602747N (Undersea Warfare Applied Research)
PE 0602782N (Mine and Expeditionary Warfare 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 Mine Countermeasures)
PE 0604784N (Distributed Surveillance System)

NON-NAVY RELATED RDT&E:
PE 0602712A (Countermine Systems)
PE 0603606A (Landmine Warfare and Barrier Advanced Technology)

D. ACQUISITION STRATEGY: Not applicable.

CONGRESSIONAL PLUS-UPS:

R2720	FY 2003	FY 2004
OCEAN MODELING FOR MINE & EXPEDITIONARY WARFARE	954	989

FY03: Developed a fully-functioning web site populated with hourly moored buoy data, weather information, satellite data, model-output and forecasts, and portals to similar information at other ocean observing sites nationally. FY04: Continue expanding the forecast products and the fusion efforts.

R9166	FY 2003	FY 2004
MODELING THE WARRIOR AS A COGNITIVE SYSTEM	1,222	1,682

The objective of this effort is to design and implement new methodologies for modeling warrior competencies and capabilities across operations, support and training. As new missions develop, there is a need to better understand the warrior’s human factors and develop situation-specific models.

R9343	FY 2003	FY 2004
AUGMENTED REALITY PROGRAM	0	1,236

The objective is to support the development of an Augmented Reality program (ARVCOP – Augmented Reality Visualization of the Common Operational Picture) that will enhance maritime navigation (including amphibious operations), operational security, and harbor defense.

R9344	FY 2003	FY 2004
EXTREME TERRAIN-MEDICAL EVACUATION VEHICLE PILOT	0	1,682

The objective is to design, develop and prototype a medical evacuation ground transport platform that is suitable for use on uneven terrain and is internally air transportable in the MV-22 (Osprey) tilt rotor aircraft.

BA: 03 PROGRAM ELEMENT: 0603782N PROGRAM ELEMENT TITLE: Mine and Expeditionary Warfare Advanced Technology
PROJECT NUMBER: Various PROJECT TITLE: Congressional Plus-Ups

R9345	FY 2003	FY 2004
HYPERSPECTRAL IMAGER FOR THE COASTAL OCEAN (HICO)	0	1,978

The objective is to develop a hyperspectral Earth and Space imager for deployment on the international space station (ISS).