FY 2003 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3

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

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 2001 ACTUAL	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	FY 2006 ESTIMATE	FY 2007 ESTIMATE	T0 COMPLETE	TOTAL PROGRAM
R2917	Mine and Expeditionary Warfare Advanced Technology								
	43,559*	47,852	43,725	44,324	43,105	43,888	42,558	CONT.	CONT
R2720	Ocean Modeling Research for Mine & Submarine Warfare								
	2,797	1,487							
TOTAL	46,538	49,339	43,725	44,324	43,105	43,888	42,558	CONT.	CONT

* In FY01, effort under R2917 was executed under R2226.

A. (U) 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, throughout the littoral battlespace.

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

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is budgeted within the Advanced Technology Budget Activity, because it encompasses design, development, simulation or experimental testing or prototype hardware to validate technological feasibility and concept of operations and reduce technological risk prior to initiation of a new acquisition program or transition to an ongoing acquisition program.

B. (U) PROGRAM CHANGE SUMMARY:

	FY 2001	FY 2002	FY 2003
FY 2002 President's Submission:	48,172	48,279	0
Adjustments from FY 2002 PRESBUDG:			
SBIR Adjustment	-2,079		
Execution Adjustment	+ 445		
Congressional Plus-ups		+1,500	
Section 8123 Management Reform Initiative Reduction		-440	
FY 2003 President's Submission:	46,538	49,339	43,725

FY 2003 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3

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

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 2001 ACTUAL	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	FY 2006 ESTIMATE	FY 2007 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R2917 Mine and Expeditionary Warfare Advanced Technology	43,559*	47,852	43,725	44,324	43,105	43,888	42,558	CONT.	CONT.

* In FY01, this effort was funded under R2226.

A. (U) 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, throughout the littoral battlespace. "Desert Storm" demonstrated the U.S. Navy's needs to counter the projected third world 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 to demonstrate improved MIW capabilities. The Thrust Areas in this project are:(1) Surveillance and Reconnaissance; and (2) Breaching and Neutralization. These Thrust Areas support the Organic Mine Countermeasures (MCM) Future Naval Capability.

(U) The Surveillance and Reconnaissance Thrust Area focuses on developing and demonstrating technologies to detect, classify, and identify mines and obstacles throughout the Littoral Penetration Area. Efforts within this thrust include: remote sensing techniques to survey threat mining activities and mine/obstacle field locations; advanced acoustic/non-acoustic sensors and processing technologies for rapid minefield reconnaissance and determination of the location of individual mines and obstacles. A major current focus is the development of technologies that provide rapid, surveillance and reconnaissance, specifically in the very shallow water, surf zone, beach zones, craft landing zones, and beach exit zones (VSW,SZ,BZ,CLZ,BEZ), that enable Ship to Objective Maneuver.

(U) The Breaching and Neutralization Thrust Area focuses on developing and demonstrating technologies for stand-off breaching of mines and obstacles in the SZ/BZ/CLZ/BEZ and precision neutralization of individual mines. Efforts within this thrust include: influence sweeping technologies for influence minefield clearance, explosive and non-explosive technologies for mine/obstacle field breaching, and advanced technologies to rapidly neutralize shallow water (SW) sea mines. A major current focus is the development of technologies that provide rapid detection and standoff breaching of mines and obstacles, specifically in the VSW/SZ/BZ/CLZ/BEZ) that enable Ship to Objective Maneuver.

FY 2003 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603782N PROGRAM ELEMENT TITLE: Mine and Expeditionary Warfare Warfare Advanced Technology PROJECT NUMBER: R2917 PROJECT TITLE: Mine and Expeditionary Warfare Advanced Technology

(U) This research directly supports the Department of Defense Joint Warfighting Science and Technology Plan and the Defense Technology Area Plans.

(U) The Navy Science and Technology program includes projects that focus on or have attributes that enhance the affordability of warfighting systems.

B. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 2001 ACCOMPLISHMENTS:

(U) ($24,559) SURVEILLANCE/RECONNAISSANCE

- (U) ADVANCED SURVEILLANCE/RECONNAISSANCE: Continued algorithm development efforts on critical environmental parameters, including offshore bathymetry, optical clarity, and other essential elements of information for amphibious operations. Continued assessment of performance of algorithms against ground truth data. Demonstrated near shore surveillance during Kernal Blitz 2001 (a 3rd Fleet Training Exercise). Continued transition of results to the Naval Oceanographic Office.

- (U) MODELING AND SIMULATION: Continued simulation/visualization concept-based assessment of technologies for naval surface fire support and Future Naval Capabilities in organic MCM. Initiated technology guideline study for mine countermeasures in support of ship to objective maneuver. Continued participation in Fleet Battle Laboratory experiments and expeditionary warfare wargaming.

- (U) EXPEDITIONARY WARFARE COMMUNICATIONS NETWORKING: Completed evaluation/assessment of high capacity communications links between ships and objectives ashore during Fleet Battle Experiment Hotel. Completed documentation of all deployment assessments.

- (U) SURFACE SURVEILLANCE, TARGET ACQUISITION, FIRE CONTROL, AND ORDNANCE: Completed development of composite metal fleschettes and delivery system. Began integration of guidance, control and warhead technologies into 5-inch projectile.

- (U) MINE IDENTIFICATION: Completed analysis of helicopter towed Streak Tube Imaging Lidar (STIL) mine identification technology demonstration. Completed development of automated mine identification algorithms and

completed performance assessment utilizing data obtained during ship/helicopter towed technology demonstration. Transitioned STIL mine identification technology to AQS-20X acquisition program (PE 0604373N (Airborne Mine Countermeasures)).

- (U) LITTORAL SEA MINE: Integrated target detection/tracking long baseline sensors, detection/tracking algorithms, underwater communications, and test bed weapons system (hybrid lightweight torpedo). Demonstrated target detection, tracking and fire control and completed documentation of littoral sea mine technology demonstration.

- (U) VERY SHALLOW WATER/EXPLOSIVE ORDNANCE DISPOSAL (VSW/EOD) RECONNAISSANCE: Demonstrated capability to communicate VSW target information to a control authority by surface piercing Radio Frequency technology. Demonstrated asset redirection and command redirection by a remote control. Demonstrated integrated search, marking, bathymetry mapping, threat objects and gaps and report back in test-bed minefields in VSW environments. Demonstrated capability to enable diver teams to efficiently and accurately reacquire previously targeted areas and individual targets. Demonstrated VSW reconnaissance during Kernal Blitz 2001 (a 3rd Fleet Training Exercise).

- (U) ORGANIC MINEHUNTING AND NEUTRALIZATION OF MINES: Developed and demonstrated (during Kernal Blitz 2001) adaptive, shallow water reconnaissance and minehunting sampling strategies which are optimized based on information provided by environmental survey data and through in-situ environmental measurements. Completed development of conductively cooled, low temperature superconducting magnetic solenoid for organic mine sweeping.

- (U) VECTORED THRUST DUCTED PROPELLER (VTDP) COMPOUND HELICOPTER: Completed design of the flight control, power, and propulsion systems and H-60 airframe structural modifications. Conducted Preliminary Design Review (PDR). (Funded in PE 0603792N in FY01, $5,100K).

(U) ($19,000) BREACHING AND NEUTRALIZATION

- (U) SZ NEUTRALIZATION OF MINES AND OBSTACLES: Completed development of GPS only guidance component. Assessed through simulation, the accuracy of warhead deployment utilizing GPS only inverse guidance technology. Continued development of reactive darts for neutralization of beach and surf zone mines. Initiated development of chemical darts for neutralization of beach and surf zone mines. Initiated development of dispensing technologies for distributing reactive and chemical darts. Assessed neutralization capability for small targets, which are predominant in the SZ.

- (U) BZ NEUTRALIZATION OF OBSTACLES: Initiated development of air delivered, explosively formed impactor for neutralization of beach obstacles. Began integration of guidance and warhead technologies for demonstration.

- (U) ADVANCED AIRBORNE MINE DETECTION: Initiated development of advanced electro-optic technologies for detection of near surface mines from a maritime unmanned airborne vehicle (UAV). Initiated development of multi-spectral laser for detection and targeting of minefields from a maritime UAV. Initiated development of three-dimensional camera for detection and targeting of minefields.

2. (U) FY 2002 PLAN:
(U)($26,852) SURVEILLANCE/RECONNAISSANCE:

- (U) ADVANCED SURVEILLANCE/RECONNAISSANCE: Continue algorithm refinement efforts on critical environmental parameters, including offshore bathymetry, surface currents, and other essential elements of information for amphibious operations. Update surveillance exploitation guide. Complete transition of critical battlespace products to the Naval Oceanographic Office.

- (U) MODELING AND SIMULATION: Continue simulation/visualization concept-based assessment of technologies for Future Naval Capabilities in organic MCM. Complete technology guideline study for mine countermeasures in support of ship to objective maneuver. Initiate system integration of technologies/concepts for mine countermeasures in support of ship to objective maneuver. Continue participation in Fleet Battle Laboratory experiments and expeditionary warfare wargaming.

- (U) VSW/EOD RECONNAISSANCE: Continue development of UUV based optimized search strategies for VSW reconnaissance. Continue demonstration of asset redirection and command redirection by a remote control. Continue demonstration of integrated search, marking, bathymetry-mapping threat objects and gaps and reports back in test-bed minefields in VSW environments. Continue demonstration of capability to enable diver teams to efficiently and accurately reacquire previously targeted areas and individual targets. Demonstrate VSW reconnaissance from a high-speed vessel during Fleet Battle Experiment Juliet.

- (U) ADVANCED AIRBORNE MINE DETECTION: Continue development of advanced electro-optic technologies for detection of near surface mines from a maritime unmanned airborne vehicle (UAV). Initiate development of automated mine/minefield detection and classification algorithms for active/passive electro-optic sensors. Continue development of multi-spectral laser for detection and targeting of minefields from a maritime UAV. Continue development of three-dimensional camera for detection and targeting of minefields.

- (U) DATA FUSION: Initiate multi-platform, multi-sensor fusion of mine countermeasure sensor data. Initiate development and demonstration of a Common Tactical Picture to support expeditionary maneuver planning in a mined

environment. Initiate development and demonstration of planning tools for expeditionary maneuver in a mined environment.

- (U) FLEET DEMONSTRATIONS: Initiate planning for demonstration of mine countermeasures AUV technologies during Fleet Battle Experiment Juliet (FBE (J)). Conduct Gulf of Mexico Limited Objective Experiment in preparation for FBE (J). Demonstrate deployment and operation of mine countermeasures AUV technologies from a high-speed vessel during FBE (J). Initiate planning for Kernal Blitz 2003 demonstration of mine countermeasure technologies in support of ship to objective maneuver.

- (U) VECTORED THRUST DUCTED PROPELLER (VTDP) COMPOUND HELICOPTER: Complete modifications to H-60 helicopter for flight testing of the VTDP. Complete pilot-in-the-loop verification of the VTDP flight control system. Continue flight test planning.

(U) ($21,000) BREACHING AND NEUTRALIZATION

- (U) SZ NEUTRALIZATION OF MINES AND OBSTACLES: Continue development of reactive darts for neutralization of beach and surf zone mines. Continued development of chemical darts for neutralization of beach and surf zone mines. Continue development of dispensing technologies for distributing reactive and chemical darts. Complete demonstration of chemical dart lethality against representative beach zone mines. Initiate demonstration of dart lethality against representative surf zone mines. Initiated integration of high velocity, reactive dart warhead payload and delivery platform for system levels demonstration.

- (U) BZ NEUTRALIZATION OF OBSTACLES: Continue development of air delivered, continuous rod warhead for neutralization of beach obstacles.

- (U) ORGANIC MINEHUNTING AND NEUTRALIZATION OF MINES: Initiate development of an unmanned surface vehicle (USV) for mine sweeping. Initiate development of magnetic and acoustic sweep generators for integration onto USV.

3. (U) FY 2003 PLAN:

(U)($19,325) SURVEILLANCE/RECONNAISSANCE

- (U) ADVANCED SURVEILLANCE/RECONNAISSANCE: Continue algorithm refinement efforts on critical environmental parameters, including offshore bathymetry, surface currents, and other essential elements of information for amphibious operations. Optimize processing and data reduction tools for wide area detection of beach mined areas and obstacle belts. Demonstrate wide area detection of beach mined areas during Kernal Blitz 2003.

- (U) ADVANCED AIRBORNE MINE DETECTION: Continue development of advanced Electro-optic technologies for detection of near surface mines from a maritime unmanned airborne vehicle (UAV). Continue development of automated mine/minefield detection and classification algorithms for active/passive Electro-optic sensors. Complete development of multi-spectral laser for detection and targeting of minefields from a maritime UAV. Complete development of three-dimensional camera for detection and targeting of minefields. Initiate integration of multi—spectral laser and three-dimensional camera on a UAV testbed.

- (U) DATA FUSION: Continue multi-platform, multi-sensor fusion of mine countermeasure sensor data. Continue development and demonstration of a Common Tactical Picture to support expeditionary maneuver planning in a mined environment. Continue development and demonstration of planning tools for expeditionary maneuver in a mined environment.

- (U) MODELING AND SIMULATION: Continue simulation/visualization concept-based assessment of technologies for Future Naval Capabilities in organic MCM. Continue system integration of technologies/concepts for mine countermeasures in support of ship to objective maneuver. Continue participation in Fleet Battle Laboratory experiments and expeditionary warfare wargaming.

- (U) VSW/EOD RECONNAISSANCE: Continue development of UUV based optimized search strategies for VSW reconnaissance. Continue demonstration of integrated 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 to efficiently and accurately reacquire previously targeted areas and individual targets. Demonstrate multi platform, coordinated VSW reconnaissance during Kernal Blitz 2003.

- (U) FLEET DEMONSTRATIONS: Complete documentation of FBE (J) exercise results. Continue planning for Kernal Blitz 2003 demonstration of mine countermeasure technologies in support of ship to objective maneuver. Demonstrate mine countermeasure technologies in support of ship to objective maneuver during Kernal Blitz 2003.

- (U) VECTORED THRUST DUCTED PROPELLER (VTDP) COMPOUND HELICOPTER: Continue preparations for flight-testing.

(U) ($24,400) BREACHING AND NEUTRALIZATION

- (U) SZ NEUTRALIZATION OF MINES AND OBSTACLES: Continue development of chemical darts for neutralization of beach and surf zone mines. Continue development of dispensing technologies for distributing reactive and chemical darts. Complete demonstration of chemical dart lethality against representative surf zone mines. Begin integration of chemical dart warhead payload and delivery platforms for system level demonstration. Demonstrate

standoff breaching of mines in the surf and beach zones during Kernal Blitz 2003.

- (U) BZ NEUTRALIZATION OF OBSTACLES: Continue development of air delivered, continuous rod warhead for neutralization of beach obstacles.

- (U) ORGANIC MINEHUNTING AND NEUTRALIZATION OF MINES: Continue development of an unmanned surface vehicle (USV) for mine sweeping. Continue development of magnetic and acoustic sweep generators for integration onto USV. Demonstrate USV for mine sweeping during Kernal Blitz 2003 (a 3rd Fleet Training Exercise).

C. (U) PROGRAM CHANGE SUMMARY EXPLANATION: See change summary for total PE.

(U) Schedule: Not applicable
(U) Technical: Not applicable

D. (U) OTHER PROGRAM FUNDING SUMMARY:

(U) NAVY RELATED RDT&E: The Navy's 6.1 program contributes to this effort.
(U) PE 0601153N (Defense Research Sciences)
(U) PE 0602131M (Marine Corps Landing Force Technology)
(U) PE 0602747N (Undersea Warfare Applied Research)
(U) PE 0602782N (Mine and Expeditionary Warfare Applied Research)
(U) PE 0602435N (Ocean Warfighting Environment Applied Research)
(U) PE 0603502N (Surface and Shallow Water Mine Countermeasure)
(U) PE 0603513N (Shipboard System Component Development)
(U) PE 0603640M (Marine Corpse Advanced Technology Demo (ATD))
(U) PE 0604373N (Airborne Mine Countermeasures)
(U) PE 0604784N (Distributed Surveillance System)

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

E. (U) SCHEDULE PROFILE: not applicable

FY 2003 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603782N
PROGRAM ELEMENT TITLE: Mine and Expeditionary Warfare Advanced Technology

(U) CONGRESSIONAL PLUS-UPS

(U) This section describes the following Congressional Plus-Ups appropriated in FY 2001 or FY2002:

Ocean Modeling Research for Mine and Submarine Warfare

1.FY 2001 Congressional Plus-ups:

- (U) ($2,979), Ocean Modeling Research for Mine and Submarine Warfare: The focus of this effort was to continue installation and maintenance of an ocean observational and data management system for the Gulf of Maine and to demonstrate, during Fleet Battle Experiments, the generation and exploitation of a common environment for enhancing mine and expeditionary warfare.

FY 2002 Congressional Plus-ups:

- (U) ($1,487), Ocean Modeling Research for Mine and Submarine Warfare: The objective of this effort is to continue maintenance of an ocean observational and data management system for the Gulf of Maine and to demonstrate the exploitation of a common environment for enhancing expeditionary operations in a mined environment.