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

BA: 03 PROGRAM ELEMENT: 0603747N
PROGRAM ELEMENT TITLE: Undersea 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
R2916 Undersea Warfare Advanced Technology	40,782	37,743	26,515	27,262	32,562	46,058	47,034
R9164 Motorized Air Gun Program	955	0	0	0	0	0	0
R9165 University Oceanographic Lab System	3,343	0	0	0	0	0	0
R9336 HAWAII UNDERSEA VEHICLE TEST & TRAINING ENVIRONMEN	0	2,076	0	0	0	0	0
R9337 PRIMAMETRIC MODIFICATION OF THE SQS-53C SURFACE SH	0	3,461	0	0	0	0	0
R9338 SAUVIM	0	1,286	0	0	0	0	0
R9339 SEA TEST FOR TOWED ACOUSTIC ARRAYS	0	1,978	0	0	0	0	0
Totals	45,080	46,544	26,515	27,262	32,562	46,058	47,034

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: All Navy advanced technology development in undersea target detection, classification, localization, tracking and neutralization is funded through this Program Element (PE). The related technologies being developed are aimed at enabling Sea Shield, one of the three core operational concepts detailed in the Naval Transformational Roadmap. Associated efforts focus on new Anti-Submarine Warfare (ASW) operational concepts that promise to improve wide-area surveillance, detection, localization, tracking and attack capabilities against quiet adversary submarines operating in noisy and cluttered shallow water environments. The focus is on leveraging technologies that will protect the country's current capital investment in surveillance, submarine, surface ship and air ASW assets.

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

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

BA: 03 PROGRAM ELEMENT: 0603747N
PROGRAM ELEMENT TITLE: Undersea Warfare Advanced Technology

PROGRAM CHANGE SUMMARY:

	FY 2003	FY 2004	FY 2005
FY 2004-2005 President's Budget Submission	43,641	38,168	45,475
Cong. Rescissions/Adjustments/Undist.Reductions	0	-524	0
Congressional Actions	0	8,900	0
Execution Adjustments	2,710	0	0
Inflation Savings	0	0	-147
Rate Adjustments	0	0	-18
SBIR Assessment	-1,271	0	0
Technical Adjustments (includes transfer of Project Morgan)	0	0	-18,795
FY 2005 President's Budget Submission	45,080	46,544	26,515

PROGRAM CHANGE SUMMARY EXPLANATION:
Technical: Not applicable.

Schedule: In FY 2003 Project Morgan was to be funded with existing PE 0603747N funds at a level of $62.2M over four years as follows:
FY 2004—$18.6M FY 2005—$16.8M FY 2006—$14.1M; FY 2007—$12.7M

Littoral Anti-Submarine Warfare (LASW) Future Naval Capability (FNC) provided half of the overall Project funding. The impact on the LASW FNC schedule is summarized below:

- Littoral ASW Multistatic Project: Reduction of approximately $15M over the period FY 2004-2007; efforts re-directed to focus on data collection and several tasks have been delayed or terminated. The reductions extend project two years to FY 2009.
- PALANTIR: Project implementation delayed two years and project life extended accordingly (FY 2006-11) ($6.0M shifted to later years)
- Multi-Mode Magnetic Detection System: Implementation of project has been delayed one year; demonstrations delayed by 2 years (FY 2004-09); ($4.3M shifted to later years)
- Littoral Warfare Advanced Demonstration: Reduction of $5.8M over four years. Delays transitions, and partially shifts burden of funding demonstrations to individual LASW FNC projects.

In FY 2004 Project Morgan funding for FY 2005-07 was transferred from PE 0603747N (BA 3) to 0603734N (BA4).

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

BA: 03 PROGRAM ELEMENT: 0603747N PROGRAM ELEMENT TITLE: Undersea Warfare Advanced Technology
PROJECT NUMBER: R2916 PROJECT TITLE: Undersea 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
R2916 Undersea Warfare Advanced Technology	40,782	37,743	26,515	27,262	32,562	46,058	47,034

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: All Navy advanced technology development in undersea target detection, classification, localization, tracking and neutralization is funded through this project. Technologies being developed within this project are aimed at enabling Sea Shield, one of the three core operational concepts detailed in the Naval Transformational Roadmap. Associated efforts focus on new Anti-Submarine Warfare (ASW) operational concepts that promise to improve wide-area surveillance, detection, localization, tracking and attack capabilities against quiet adversary submarines operating in noisy and cluttered shallow water environments. Related efforts are aimed at leveraging technologies that will protect the country's current capital investment in surveillance, submarine, surface ship and air ASW assets.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2003	FY 2004	FY 2005
Wide Area Anti-Submarine Warfare (ASW) Surveillance	13,727	19,237	7,426

Wide Area ASW Surveillance is focused on dramatically improving the capability to sanitize large areas relative to the capabilities of legacy ASW sensors. Efforts include the development of affordable off-board systems with associated processing and robust, high-bandwidth communications links. The cornerstone of Wide Area Surveillance is the ability to rapidly distribute sensors from air, surface and sub-surface platforms as well as to develop long-endurance sensors and unmanned ASW vehicles. This activity represents a shift from traditional fixed surveillance systems to autonomous, networked, multi-static operation, supported by passive/active signal processing with the objective of increased detection capabilities. This activity includes support to Project Morgan (the details of which are classified). Project Morgan funding transfers to PE 0603734N, Project Z1804 in FY 2005.

FY 2003 Accomplishments:

- Completed development and interim testing of Claymore Marine (CM) on-board, in-flight, real-time processor

and associated detection algorithms.
- Completed analysis of the CM FY02 Tactical Test data and incorporated the results into demonstration planning.
- Completed CM processor technology demonstration including limited free-play against a non-cooperative target, with detections called in-flight.
- Transitioned Compact Deployable Multistatic Receiver (CDMR) signal processing algorithms to the Naval Air Systems Command (NAVAIR) Improved Extended Echo Ranging (IEER) Program in Program Element (PE) 0604261N.
- Continued requirements and technology study for a small, lightweight, low frequency multistatic source.
- Continued development of multistatic sonar signal classification algorithms for coherent/incoherent sources.
- Continued Deployable Autonomous Distributed System (DADS) algorithm development and validation.
- Continued at-sea testing of a DADS five-node design.
- Continued development and testing of DADS technologies in preparation for the FY05 barrier demonstration.
- Continued the Claymore Marine Engineering Development Model (CM EDM) assessment and documented results; provided recommendation for a potential acquisition decision.
- Initiated concept of operations development and performance requirements for multistatic sonar employing remotely operated sound sources and receivers.
- Initiated construction of Advanced Development Models (ADM) of CDMR and Compact Deployable Multistatic Sources (CDMS) for use in future at-sea demonstrations.

FY 2004 Plans:

- Complete requirements and technology study for a small, lightweight, low frequency multistatic source.
- Complete development of multistatic sonar signal classification algorithms for incoherent sources and transition to the NAVAIR IEER Program in PE 0604261N.
- Complete DADs baseline algorithm development and validation.
- Complete at-sea testing of a DADS five-node design.
- Complete the CM EDM assessment and provide an acquisition recommendation. Transition technologies to NAVAIR, PE 0603254N, ASW Systems Development.
- Complete construction of ADM of CDMR and CDMS for use in future at-sea demonstrations.
- Continue development of multistatic sonar signal classification algorithms for coherent sources.
- Continue development and testing of DADS technologies in preparation for FY05 barrier demonstration.
- Continue concept of operations development and performance requirements for multistatic sonar employing remotely operated sound sources and receivers.
- Initiate at-sea demonstrations and data collections with the CDMS ADM.
- Initiate test planning for FY05 barrier demonstration.

FY 2005 Plans:

- Complete development and testing of DADS technologies in preparation for a barrier demonstration.
- Complete planning for and conduct of DADS barrier demonstration.
- Continue at-sea demonstrations and data collections with the CDMS ADM.
- Continue development of multistatic sonar signal classification algorithms for coherent sources.
- Continue concept of operations development and performance requirements for multistatic sonar employing remotely operated sound sources and receivers.
- Initiate the writing of DADS system documentation.

	FY 2003	FY 2004	FY 2005
Battlegroup Anti-Submarine Warfare (ASW) Defense	10,626	8,274	8,218

Battlegroup ASW Defense technology focuses on the development of platform-based sources and receivers aimed at denying submarines the ability to target grey ships. This technology area is primarily concerned with detections inside 10 nautical miles. Battlegroup ASW Defense integrates next-generation technologies, automatic target recognition, sensors that adjust to complex acoustic environments, and environmentally adaptive processing techniques. Battlegroup ASW Defense will enable smaller, lighter, and cheaper arrays, large multi-line arrays, and submarine flank arrays all with environmental adaptation capabilities. This activity includes support to Project Morgan (the details of which are classified). Project Morgan funding transfers to Program Element (PE) 0603734N, Project Z1804 in FY 2005.

FY 2003 Accomplishments:

- Completed the writing of the Sonar Automation Technology (SAT) development plan.
- Completed development of High Frequency (HF) candidate transducers and fabricated partial arrays to demonstrate transducer performance. This effort was terminated due to budget reductions; analysis and report documentation was written.
- Completed development of Environmentally Adaptive (EA) AN/SQS-53C (part of AN/SQQ-89) signal processing and system control software.
- Completed EA AN/SQS-53C sonar system at-sea demonstrations utilizing fleet test platforms.
- Transitioned EA AN/SQS-53C sonar system technologies to PE 0205620N (Surface ASW Combat System Integration).
- Continued to develop, demonstrate and transition SAT threat submarine detection and classification algorithms to Naval Sea Systems Command (NAVSEA) under PE 0603561N (Advanced Submarine System Development), Project S0223 (Submarine Combat Systems Improvements).
- Continued hardware component integration, testing and installation of an acoustic array test bed in support

of future passive sonar system designs.
- Continued adaptive beamforming technology development.

FY 2004 Plans:

- Continue to develop, demonstrate and transition SAT threat submarine detection and classification algorithms to NAVSEA.
- Continue hardware component integration, testing and installation of an acoustic array test bed in support of future passive sonar system designs.
- Continue adaptive beamforming technology development.
- Initiate a performance evaluation of a Counter Torpedo Detection, Classification, and Localization (CTDCL) prototype torpedo protection system capable of countering two torpedoes launched in rapid succession.
- Initiate the integration of CTDCL products into the AN/WSQ-11 “Block II and III” system upgrades.

FY 2005 Plans:

- Complete hardware component integration, testing and installation of an acoustic array test bed in support of future passive sonar system designs.
- Continue to develop, demonstrate and transition SAT threat submarine detection and classification algorithms to NAVSEA.
- Continue adaptive beamforming technology development.
- Continue a performance evaluation of a CTDCL prototype torpedo protection system capable of countering two torpedoes launched in rapid succession.
- Continue integration of CTDCL products into the AN/WSQ-11 “Block II and III” system upgrades.
- Initiate a focused research study to evaluate sonar array performance using the acoustic array testbed.
- Initiate Multi-Mode Magnetic Detection System (MMMDS) development of magnetometer sensor technologies and deliver first AN/ASQ-233 magnetometer sensor.
- Initiate the integration of MMMDS sensor hardware/software into towed vehicles and fixed-wing Unmanned Air Vehicles (UAVs).

	FY 2003	FY 2004	FY 2005
Cooperative Anti-Submarine Warfare (ASW)	7,449	4,458	3,759

Cooperative ASW technology developments enable ASW platforms to work together effectively to detect, classify and localize very quiet undersea targets. Many of the tools required to achieve this objective have been developed under the heading of Integrated ASW (IASW) in Program Elements (PEs) 0602235N and 0603235N. The

IASW effort has since been terminated due to budget reductions. In this PE (0603747N), the focus is to demonstrate the operational utility of employing these IASW tools together with ASW sensor technologies developed as part of the Battlegroup ASW Defense, Wide Area ASW Surveillance, and Neutralization program areas. Demonstrations are conducted primarily in conjunction with Fleet platforms and exercises. This activity includes support to Project Morgan the details of which are classified. Project Morgan funding transfers to PE 0603734N, Project Z1804 in FY 2005.

FY 2003 Accomplishments:

- Continued Littoral Warfare Advanced Demonstration (LWAD) test planning, scientific support, fleet and research vessel coordination, test reconstruction, logistical and environmental compliance support for three Littoral ASW (LASW) Future Naval Capability (FNC) initiatives, with one CONUS (Continental United States) demonstration and two overseas experiments.

FY 2004 Plans:

- Continue LWAD activities for two LASW FNC CONUS at-sea experiments and one overseas demonstration in collaboration with The Technical Cooperation Program (TTCP) and involving multiple ASW technologies.

FY 2005 Plans:

- Continue LWAD activities for one LASW FNC CONUS at-sea experiment and two overseas demonstrations involving multiple ASW technologies.

	FY 2003	FY 2004	FY 2005
Neutralization	8,980	5,774	7,112

Neutralization focuses on undersea weapons technologies to counter threat submarines by increasing the Probability of Kill (PK). Weapon technology areas include: (1) Non-Traditional Homing which addresses the demonstration of the operational utility of a stealthy torpedo detection, classification and homing sensor (this effort has been terminated in FY 2004 due to budget reductions); (2) Weapon/Platform Connectivity (FY03) and Torpedo Bridging Technologies (TBT) (FY04 and beyond) which address development of technologies to enable a heavyweight torpedo and a shooting platform to be effectively employed as a fully-linked weapon system; and (3) the SwampWorks Advanced Torpedo (SWAT) effort which demonstrates technologies to meet emerging challenges of low Doppler, small targets (diesel submarines), in harsh littoral environments. The ultimate goal of Neutralization is to develop reduced size advanced undersea weapons with revolutionary capabilities and fill

Sea Shield mission capability gaps.

FY 2003 Accomplishments:

- Completed development of a non-traditional homing sensor system with a robust adjunct homing capability.
- Completed a technical assessment concerning the viability of integrating the sensor of choice into the MK48 Common Broadband Active Sonar System (MK48 CBASS).
- Transitioned broadband signal processing and intelligent torpedo control algorithms to the MK-48 CBASS Program (Program Element (PE) 0205632N, Project F0366).
- Continued development of technologies to enable a torpedo and a shooting platform to be effectively employed as a fully linked weapon system.
- Continued demonstration of the advanced half-length torpedo vehicle including self noise, stability and control, and a proof-of-concept littoral upgrade to the Mk 48 advanced capability (ADCAP) sonar.
- Continued demonstration of a broadband recording system.

FY 2004 Plans:

- Continue development and demonstration of technologies to enable a torpedo and a shooting platform to be effectively employed as a fully linked weapon system.
- Continue demonstration of the advanced half-length torpedo vehicle including self noise, stability and control, and a proof-of-concept littoral upgrade to the Mk 48 Advanced Capability (ADCAP) sonar.
- Continue demonstration of a broadband recording system.
- Initiate transition of broadband signal processing algorithms to Naval Sea Systems Command Advanced Systems Technology Office (ASTO) Advanced Processing Build (APB) – Acoustic in PE 0603561N.
- Initiate planning and logistics for in-water demonstration of an improved PK for close-in, submarine-on-submarine engagements.

FY 2005 Plans:

- Transition broadband signal processing algorithms to NAVSEA in PE 0603561N.
- Complete in-water demonstration of an improved PK for close-in submarine-on-submarine engagements.
- Continue development and evaluation of PK enhancements that enables a heavyweight torpedo and a submarine to be effectively employed as a fully linked weapon system.
- Continue demonstration of the advanced half-length torpedo vehicle including self noise, stability and control, and a proof-of-concept littoral upgrade to the Mk 48 ADCAP sonar.
- Continue demonstration of a broadband recording system.

C. OTHER PROGRAM FUNDING SUMMARY:

RELATED RDT&E:

- PE 0204311N (Integrated Surveillance System)
- PE 0205620N (Surface ASW Combat System Integration)
- PE 0601153N (Defense Research Sciences)
- PE 0602235N (Common Picture Applied Research)
- PE 0602747N (Undersea Warfare Applied Research)
- PE 0602782N (Mine and Expeditionary Warfare Applied Research)
- PE 0602435N (Ocean Warfighting Environment Applied Research)
- PE 0603235N (Common Picture Advanced Technology)
- PE 0603254N (ASW Systems Development)
- PE 0603506N (Surface Ship Torpedo Defense)
- PE 0603513N (Shipboard System Component Development)
- PE 0603553N (Surface ASW)
- PE 0603734N (Chalk Coral)
- PE 0604221N (P-3 Modernization Program)
- PE 0604261N (Acoustic Search Sensors (ENG))
- PE 0604784N (Distributed Surveillance Systems)
- PE 0604503N (SSN-688 and Trident Modernization)

NON-NAVY RELATED RDT&E:

- PE 0602173C (Support Technologies Applied Research)
- PE 0602702E (Tactical Technology)
- PE 0603739E (Advanced Electronics Technologies)
- PE 0603763E (Marine Technology)

D. ACQUISITION STRATEGY:

Not Applicable.

CONGRESSIONAL PLUS-UPS:

R9164	FY 2003	FY 2004
MOTORIZED AIRGUN PROGRAM	955	0

The Motorized Airgun project conducted an at-sea experiment of the design, analyzed the results and formulated a plan for transition.

R9165	FY 2003	FY 2004
UNIVERSITY OCEANOGRAPHIC LABORATORY SYSTEM	3,343	0

This effort provided support for research time at sea to upgrade vessel research capabilities, as well as enhancements to ensure vessel operation reliability.

R9336	FY 2003	FY 2004
HAWAII UNDERSEA VEHICLE TEST AND TRAINING ENVIRONMENT	0	2,076

Review and identify opportunities to develop an advanced test and training facility to enhance operational training and translate operational needs into design and improvement requirements.

R9337	FY 2003	FY 2004
PRIMAMETRIC MODIFICATION OF THE SQS-53C SURFACE SHIP SONAR	0	3,461

Develop and demonstrate a modification to the AN/SQS-53C sonar which will allow conventional as well as lower frequency operation.

R9338	FY 2003	FY 2004
Semi-Autonomous Underwater Vehicle for Intervention Missions (SAUVIM)	0	1,286

The objective of this project is to develop and demonstrate the control methodologies and algorithms necessary to perform complex tasks using a robotic arm attached to an underwater vehicle. The problem is enhanced by strong underwater currents, force feedback, object recognition, and object dimensioning.

FY 2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2004

Exhibit R-2a

BA: 03 PROGRAM ELEMENT: 0603747N PROGRAM ELEMENT TITLE: Undersea Warfare Advanced Technology

PROJECT NUMBER: Various PROJECT TITLE: Congressional Plus-Ups

R9339	FY 2003	FY 2004
SEA TEST FOR TOWED ACOUSTIC ARRAYS	0	1,978

Initiate development, design and modeling of a novel sonar waveform and signal processing technique for use with the Multi-Function Towed Array for improved detection of submarines.