BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603747N
PROGRAM ELEMENT TITLE: UNDERSEA WARFARE ADVANCED TECHNOLOGY

COST: (Dollars in Thousands)

Project Number & Title	FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total PE	52,895	33,087	27,603	35,520	41,300	37,782	50,039	47,345
R2916 UNDERSEA WARFARE ADVANCED TECHNOLOGY	44,336	26,251	27,603	35,520	41,300	37,782	50,039	47,345
R9336 HAWAII UNDERSEA VEHICLE TEST AND TRAINING ENVIRONMENT	2,021	2,576	0	0	0	0	0	0
R9337 PRIMAMETRIC MODIFICATION OF THE SQS-53C SURFACE SHIP SONAR	3,363	0	0	0	0	0	0	0
R9338 SAUVIM	1,252	1,288	0	0	0	0	0	0
R9339 SEA TEST FOR TOWED ACOUSTIC ARRAYS	1,923	1,981	0	0	0	0	0	0
R9497 LITTORAL AWS MISSION FOR RIGID HULL-INFLATABLE BOAT (RHIB)	0	991	0	0	0	0	0	0

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.

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PROGRAM CHANGE SUMMARY:

	FY 2004	FY 2005	FY 2006	FY 2007
FY 2005 President's Budget Submission	46,544	26,515	27,262	32,562
Cong Rescissions/Adjustments/Undist. Reductions	0	-322	0	0
Congressional Action	0	6,900	0	0
Execution Adjustments	7,368	0	0	0
FNC Realignment	0	0	-200	-142
Non-Pay Inflation Adjustments	-43	0	0	0
Program Adjustments	0	-6	-26	-30
Program Realignment	0	0	565	2,962
Rate Adjustments	0	0	2	168
SBIR Assessment	-974	0	0	0
FY 2006/2007 President's Budget Submission	52,895	33,087	27,603	35,520

PROGRAM CHANGE SUMMARY EXPLANATION:
Technical: Not applicable.

In FY 2004 Project Morgan funding for FY 2005-07 was transferred from PE 0603747N (BA 3) to 0603734N (BA 4). This funding transfer creates a downward funding profile in PE 0603747N.

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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 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
R2916 UNDERSEA WARFARE ADVANCED TECHNOLOGY	44,336	26,251	27,603	35,520	41,300	37,782	50,039	47,345

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 2004	FY 2005	FY 2006	FY 2007
WIDE AREA ANTI-SUBMARINE WARFARE (ASW) SURVEILLANCE	23,927	7,352	12,769	15,710

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 ASW 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 transferred to PE 0603734N, Project Z1804 in FY 2005 through FY 2007.

As described under the Cooperative ASW Activity, beginning in FY 2005 testing and demonstrations associated

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with Littoral Warfare Advanced Development will be reported as part of the overall technologies being tested/demonstrated in this PE. As a result, funding no longer is reported under Cooperative ASW, rather it is included in the other activities. This change causes an additional shift among the R-2 Activities.

FY 2004 Accomplishments:

- Completed requirements and technology study for a small, lightweight, low frequency multistatic source.
- Completed development of multistatic sonar signal classification algorithms for incoherent sources and transition to the Naval Air Systems Command Improved Extended Echo Ranging Program in P.E. 0604261N.
- Completed Deployable Autonomous Distributed System (DADS) baseline algorithm development and validation.
- Completed at-sea testing of a DADS five-node design.
- Completed the Claymore Marine (CM) Engineering Development Model (EDM) assessment.
- Completed construction of Advanced Development Model (ADM) of Compact Deployable Multistatic Receiver (CDMR) for use in future at-sea demonstrations.
- Completed an excursion analysis (Decibel Audit) of various possible, technically feasible CM configurations falling outside the scope of the CM EDM assessment.
- Completed documentation of all CM tasks and provided a final report.
- Continued development of multistatic sonar signal classification algorithms for coherent sources.
- Continued development and testing of DADS technologies in preparation for FY 2005 DADS barrier demonstration.
- Continued concept of operations development and performance requirements for multistatic sonar employing remotely operated sound sources and receivers.
- Continued construction of ADM of the Compact Deployable Multistatic Source (CDMS) for use in future at-sea demonstrations.
- Initiated at-sea demonstrations and data collections with the CDMR ADM.
- Initiated test planning for FY 2005 DADS barrier demonstration.

FY 2005 Plans:

- Continue all FY 2004 efforts less those noted as completed above.
- Complete development and testing of DADS technologies in preparation for a barrier demonstration.
- Complete planning for and conduct of DADS barrier demonstration.
- Initiate the writing of DADS system documentation.

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FY 2006 Plans:

- Continue all FY 2005 efforts less those noted as completed above.
- Complete development of multistatic sonar signal classification algorithms for coherent sources.
- Complete concept of operations development and performance requirements for multistatic sonar employing remotely operated sound sources and receivers.
- Complete writing of the DADS system documentation.
- Complete construction of ADM of the CDMS.

FY 2007 Plans:

- Continue all FY 2006 efforts less those noted as completed above.
- Complete integrated at-sea testing of the multistatic system components (CDMR, CDMS, signal processing software, and "field-level" processing).
- Complete DADS deployment study to investigate various tactical deployment options. This effort transitioned from PE 0602747N.
- Initiate DADS deployment feasibility effort.
- Initiate testing of the PALANTIR (A non-acoustic surveillance system) sensor system.
- Initiate tactical test planning for the PALANTIR sensor.

	FY 2004	FY 2005	FY 2006	FY 2007
BATTLEGROUP ANTI-SUBMARINE WARFARE (ASW) DEFENSE	11,636	8,136	14,834	16,268

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 transferred to PE 0603734N, Project Z1804 in FY 2005 through FY 2007.

As described under the Cooperative ASW Activity, beginning in FY 2005 testing and demonstrations associated with Littoral Warfare Advanced Development will be reported as part of the overall technologies being

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tested/demonstrated in this PE. As a result, funding no longer is reported under Cooperative ASW, rather it is included in the other activities. This change causes an additional shift among the R-2 Activities.

FY 2004 Accomplishments:

- Completed the establishment of a Counter Torpedo Detection, Classification, and Localization (CTDCL) processing baseline.
- Continued development, demonstration and transition of Sonar Automation Technology (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. Applied research related to future passive sonar system designs were carried out in PE 0602747N.
- Continued adaptive beamforming technology development. Applied research relative to future passive sonar system designs were carried out in PE 0602747N.
- Initiated a performance evaluation of a CTDCL prototype torpedo protection system capable of countering two torpedoes launched in rapid succession.

FY 2005 Plans:

- Continue all FY 2004 efforts less those noted as completed above.
- Continue development, demonstration and transition of Sonar Automation Technology (SAT) threat submarine detection and classification algorithms to Naval Sea Systems Command. A similar algorithm effort reported prior to FY 2005 in PE 0602747N was merged with this effort.
- Initiate integration of CTDCL processing with advanced sensors for outyear transition to the AN/WSQ-11 program via the Block II and III upgrades.
- Initiate Multi-Mode Magnetic Detection System (MMMDS) development of magnetometer sensor technologies and deliver the first AN/ASQ-233 magnetometer sensor.
- Initiate the integration of MMMDS sensor hardware/software into towed vehicles and fixed-wing Unmanned Air Vehicles (UAV).

FY 2006 Plans:

- Continue all FY 2005 efforts less those noted as completed above.

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- Complete collection and analysis of MMMDS performance data. This work transitioned from PE 0602747N.
- Complete evaluation of proposed MMMDS processing approaches and down-select to one approach. This work transitioned from PE 0602747N.
- Complete planning for MMMDS tests that utilize fixed wing aircraft, helicopter, and UAV platforms.
- Complete performance evaluation of a CTDCL prototype torpedo protection system capable of countering two torpedoes launched in rapid succession.
- Complete integration of CTDCL processing with advanced sensors.

FY 2007 Plans:

- Continue all FY 2006 efforts less those noted as completed above.
- Complete development, demonstration and transition of SAT threat submarine detection and classification algorithms to the NAVSEA.
- Complete characterization of undersea threat signals and clutter to be used to design new signal processing algorithms for submarine and surveillance sonar systems.
- Complete MMMDS development of magnetometer sensor technologies.
- Complete test flights to collect relevant MMMDS data.
- Complete a performance evaluation of a CTDCL prototype torpedo protection system capable of countering four torpedoes launched in rapid succession.
- Complete signal processing, control algorithm and testbed development; initiate transition of processing and sensor technologies to AN/WSQ-11 Program, PE 0603506N. This CTDCL effort transitioned from PE 0602747N.

	FY 2004	FY 2005	FY 2006	FY 2007
COOPERATIVE ANTI-SUBMARINE WARFARE (ASW)	5,620	3,722	0	0

Cooperative Anti-Submarine Warfare (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. The focus of this project 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 through FY 2007.

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As described under the Cooperative ASW Activity, beginning in FY 2005 testing and demonstrations associated with Littoral Warfare Advanced Development will be reported as part of the overall technologies being tested/demonstrated in this PE. As a result, funding no longer is reported under Cooperative ASW, rather it is included in the other activities. This change causes an additional shift among the R-2 Activities.

FY 2004 Accomplishments:

- Continued Littoral Warfare Advanced Development (LWAD) activities for two Littoral Anti-Submarine Warfare (LASW) FNC at-sea experiments off the coast of the continental United States and one overseas.

FY 2005 Plans:

- Testing and demonstrations associated with LWAD activities will be reported in the future as an integral part of the overall technologies being tested/demonstrated in PEs 0602747N and 0603747N.

	FY 2004	FY 2005	FY 2006	FY 2007
NEUTRALIZATION	3,153	7,041	0	3,542

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) Torpedo Bridging Technologies (TBT) which addresses 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 effort which demonstrates technologies to meet emerging challenges of low Doppler, small targets (diesel submarines), in harsh littoral environments. The ultimate goals of Neutralization are to develop reduced size advanced undersea weapons with revolutionary capabilities and to fill Sea Shield mission capability gaps.

As described under the Cooperative ASW Activity, beginning in FY 2005 testing and demonstrations associated with Littoral Warfare Advanced Development will be reported as part of the overall technologies being tested/demonstrated in this PE. As a result, funding no longer is reported under Cooperative ASW, rather it is included in the other activities. This change causes an additional shift among the R-2 Activities.

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FY 2006 reflects the transfer of funds requirements associated with Swampworks to PE 0603758N. FY 2007 reflects continuation of TBT development efforts funded in FY 2005.

FY 2004 Accomplishments:

- Continued development and demonstration of technologies to enable a torpedo and a shooting platform to be effectively employed as a fully linked weapon system incorporating TBT.
- Continued demonstration of the SwampWorks advanced half-length torpedo vehicle including self noise, stability and control, and a proof-of-concept littoral upgrade to the MK 48 Advanced Capability sonar.
- Continued demonstration of a broadband recording system (SwampWorks).
- Completed the development and integration of the SwampWorks Advanced Torpedo sonar, a broadband sonar for the heavyweight torpedo (MK 48 ADCAP sonar).
- Initiated transition of broadband signal processing algorithms to Naval Sea Systems Command Advanced Systems Technology Office (ASTO) Advanced Processing Build (APB) – Acoustic in Program Element (P.E.) 0603561N.
- Initiated planning and logistics for in-water demonstration of an improved PK for close-in, submarine-on-submarine engagements. (SwampWorks)
- Initiated the development of a sonar for the new lightweight torpedo, MK 54, under the auspices of SwampWorks.

FY 2005 Plans:

- Continue all efforts of FY 2004 less those noted as completed above.
- Complete transition of TBT coherent broadband signal processing algorithms to Naval Sea Systems Command (NAVSEA) in PE 0603561N.
- Complete transition of TBT weapon control tactics to conduct advanced counter-countermeasure algorithms and Area of Uncertainty multi-way-point search to the MK 48 Common Broadband Sonar System via NAVSEA in P.E. 0603561N.
- Complete in-water demonstration of an improved capability for TBT close-in submarine-on-submarine engagements.
- Complete evaluation of PK enhancements provided by a broadband heavyweight torpedo effectively employed from an attack submarine as a fully linked weapon system.
- Complete the development of a sonar for the new lightweight torpedo, MK 54, under the auspices of SwampWorks.
- Complete the final submarine exercise for the SwampWorks broadband sonar associated with the heavyweight

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advanced capability torpedo (MK 48).

FY 2006 Plans:

- All SwampWorks related activities will transfer to P.E. 0603758N in FY 2006 and out.

FY 2007 Plans:

- Initiate broadband and adjunct sensor data collection for development of lightweight TBT to result in a new dual-mode sensor guidance and control system.

C. OTHER PROGRAM FUNDING SUMMARY:

NAVY RELATED RDT&E:
- P.E. 0204311N (Integrated Surveillance Systems)
- P.E. 0205620N (Surface ASW Combat System Integration)
- P.E. 0601153N (Defense Research Sciences)
- P.E. 0602235N (Common Picture Applied Research)
- P.E. 0602435N (Ocean Warfighting Environment Applied Research)
- P.E. 0602747N (Undersea Warfare Applied Research)
- P.E. 0602782N (Mine and Expeditionary Warfare Applied Research)
- P.E. 0603235N (Common Picture Advanced Technology)
- P.E. 0603254N (ASW Systems Development)
- P.E. 0603506N (Surface Ship Torpedo Defense)
- P.E. 0603513N (Shipboard System Component Development)
- P.E. 0603553N (Surface ASW/1704 ASW Advanced Development)
- P.E. 0603734N (Chalk Coral)
- P.E. 0604221N (P-3 Modernization Program)
- P.E. 0604261N (Acoustic Search Sensors)
- P.E. 0604503N (Submarine Systems Equipment Development)
- P.E. 0604784N (Distributed Surveillance System)

NON-NAVY RELATED RDT&E:
- P.E. 0603175C (Ballistic Missile Defense Technology)

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P.E. 0602702E (Tactical Technology)
P.E. 0603739E (Advanced Electronics Technology)
P.E. 0603763E (Marine Technology)

D. ACQUISITION STRATEGY:
Not applicable.

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PROJECT NUMBER: Various PROJECT TITLE: Congressional Plus-Ups

CONGRESSIONAL PLUS-UPS:

R9336	FY 2004	FY 2005
HAWAII UNDERSEA VEHICLE TEST AND TRAINING ENVIRONMENT	2,021	2,576

FY 2004: Reviewed and identified opportunities to develop an advanced test and training facility to enhance operational training and translate operational needs into design and improvement requirements.
FY 2005: Develop and test advanced technologies to meet operational requirements related to the Advanced Swimmer Delivery Vehicle.

R9337	FY 2004	FY 2005
PRIMAMETRIC MODIFICATION OF THE SQS-53C SURFACE SHIP SONAR	3,363	0

FY 2004: Developed and demonstrated a modification to the AN/SQS-53C sonar which allows conventional as well as lower frequency operation.

R9338	FY 2004	FY 2005
SAUVIM	1,252	1,288

FY 2004 and FY 2005: Continued development and demonstration of an unmanned, underwater vehicle capable of navigation, station keeping and performing complex tasks using a robotic arm, all with minimal interaction from an operator stationed on the ocean surface. Strong underwater currents and limited visibility exacerbate the problem of vehicle navigation and control. Performing tasks with the arm requires the development of complex robotic control algorithms and the capability to recognize and determine the dimensions of underwater objects.

R9339	FY 2004	FY 2005
SEA TEST FOR TOWED ACOUSTIC ARRAYS	1,923	1,981

FY 2004: Initiated development, design and modeling of a novel sonar waveform and signal processing technique

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for use with the Multi-Function Towed Array for improved detection of submarines.
FY 2005: Expand the current at-sea test to extend the existing array shape prediction capability to include the TB-16 towed array under drastic maneuvering and high speed conditions.

R9497	FY 2004	FY 2005
LITTORAL AWS MISSION FOR RIGID HULL-INFLATABLE BOAT (RHIB)	0	991

FY 2005: Initiate adaptation and testing of a Variable Depth Sonar System Anti-Submarine Warfare mission package for the Rigid Hull-Inflated Boat.