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

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603758N
PROGRAM ELEMENT TITLE: Naval Warfighting Experiments and Demonstrations

(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
R2918 Naval Warfighting Experiments and Demonstrations Experimentation	**	42,827	43,460	44,275	43,307	47,255	49,500	CONT.	CONT.

** The Science and Technology Program Elements (PEs) were restructured in FY 2002. The work described in FY 2001 was funded in PE(s) 0603792N and 0603238N.

(U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The mission of this program is to mature select technologies to facilitate advanced operational experimentation. The co-evolution of concepts and technologies requires that potentially revolutionary developments be investigated in Naval service operational experimentation: Fleet Battle Experiments (FBE), Advanced Warfighting Experiments (AWE) and Limited Objective Experiments (LOEs). Concept driven operational experimentation is constrained because the technology employed is either from currently deployed/available systems, or those about to complete the acquisition process. This program, in collaboration with the concept development activities for the Navy and Marine Corps, identifies high leverage and potentially revolutionary technology/concept pairings and focuses developmental efforts on preparation of Operational Experimentation Articles (OEA). The OEAs (fieldable technology prototypes) tailored for operational experimentation will provide the ability to operate/experiment with technologies and concepts that would otherwise be too advanced or high risk to be employed in the operational environment. Initial efforts will mature technologies in unmanned vehicles, High Speed Vessels, “Expeditionary Grid” elements, small low cost sensors, rapid target geo-location, Combat Identification, advanced countermeasures and knowledge management systems, tailored for littoral environments and expeditionary operations. These technologies are key enablers for evolving Network Centric access concepts for Naval first on scene operations in conflict and operations-other-than-war. Through maturation of key enabling technologies, the program will provide surrogate capabilities, which would be otherwise unavailable, and allow leading edge operational experimentation. The iterative technology/concept collaboration will enable innovation and dramatically shorten the time to understand and capitalize on the ramifications of new technologies.

(U) This program also completes the following Advanced Technology Demonstrations (ATD): Reactive Material Advanced Warhead, Multi-Element Buoyant Cable Antenna, Multi-Platform Broadband Processing, and Forward Air Support Marine (FASM). ATD programs are selected for a match between technological potential and Navy requirements, which are derived from operational issues of concern to the fleet. Risk-reducing ATDs cover integrating and assessing technology in a realistic operational environment and are focused on laying the technical foundations for acquiring improvements to

future joint warfighting capabilities. Each demonstration is designed to assess the extent to which the technology is feasible, affordable, and compatible with operational concepts and projected force structure.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is budgeted within the ADVANCED TECHNOLOGY Development Budget Activity because it encompasses design, development, simulation, and experimental testing or prototype hardware. It is also necessary 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 ACCOMPLISHMENTS AND PLANS:

- 1.(U) FY 2001 ACCOMPLISHMENTS:
- (U) ($5,390) Reactive Material Advanced Warhead ATD. Multiple full-scale cylindrical explosive launches of reactive fragmentation material were conducted showing significant structural damage to target structures. Sub-scale explosive launch testing of reactive material fragments against specific targets was completed for lethality studies. Preliminary scale-up production plans, materials property sensitivity studies and processing specifications were developed and documented for the Reactive Materials Enhanced Warhead. Preliminary Design Review of the Full Scale Demonstration Test completed. (FY01 accomplishments were funded in PE 0603792N)

- (U) ($6,801) Multi-Element Buoyant Cable Antenna ATD. Completed antenna module, tow cable, and inboard electronics design. Completed fabrication of tow cable. Completed fabrication and testing of critical antenna module components. (FY01 accomplishments were funded in PE 0603792N)

- (U) ($5,518) Multi-Platform Broadband Processing ATD: Completed development of broadband hybrid waveform/simultaneous signal processing for employment in an autonomous undersea weapon. Completed development of a Submarine Demonstration Sonar System required for the FY02 in-water demonstration. (FY01 accomplishments were funded in PE 0603792N)

- (U) ($5,017) Forward Air Support Marine ATD. Full-scale flight vehicle was demonstrated in radio controlled flight. Ground Control Computer software and wind tunnel test model were completed. Video downlink from onboard sensor suite was demonstrated. (FY01 accomplishments were funded in PE 0603238N)

(U) FY 2001 Congressional Plus-ups:

- (U) ($7,238) USMC Advanced Technology Transition (ATT) Initiative. Under this initiative, science, and technology efforts were focused and accelerated, toward developing a man-portable, Nuclear Quadrupole Resonance (NQR)-based, Advanced Mine Detector (AMD) for detecting metallic and nonmetallic buried landmines. The AMD requirement was recently given A-Priority status by the Marine Corps Ground Combat Element Advocate. Detection techniques were enhanced to discriminate buried mines from clutter (metal objects, rocks, voids), under field conditions. The ability to detect Tetryl explosives was dramatically improved, along with techniques for detecting other, multi-compound explosives. Metal and void detection parameters, and radio-frequency remediation effects were also identified, indicating bright prospects for fabricating the lightweight AMD components necessary for an operational system. (Funded in PE 0603792N)

2. (U) FY 2002 PLANS:

- (U) Naval Warfighting Experimentation Articles. This project includes initiatives for technology maturation to support technology concept pairing and for development and preparation of Operational Experimentation Articles (OEA). The project develops and provides OEAs for operational experimentation and limited objective experimentation. The project will modify these articles in an iterative manner in response to insights gained during experimentation in order to facilitate co-evolution of concepts and technology. The following efforts will be initiated in FY 2002:

  -(U)($5,700) Naval Warfare Experimentation- High Speed Vessel Experimentation and Demonstrations. The Navy Warfare Development Command (NWDC); U.S. Army Combined Arms Support Command; Office of Naval Research (ONR); the Marine Corps Plans, Policies, and Operations Department; Navy Special Warfare Command and the U.S. Coast Guard Deep Water Project Program, have agreed to cooperate in a joint experimentation effort to explore and develop this kind of technology. The 12-24 month experimentation phase will be coordinated by NWDC, in close partnership with other elements of the U.S. Navy, the U.S. Marine Corps, U.S. Army and U.S. Coast Guard. These commands and others will develop the experimentation plan that incorporates all the research objectives from each of the services to include joint experimentation in Millennium Challenge 02, the major Joint experimentation venue led by Joint Forces Command. The services will also work together to consolidate the analytical talent to both build the experiments and analyze results. Members of the experimentation team expect to conclude this joint experimentation effort with an understanding of where these technologies can best be applied across our respective mission spectrums. At that point, each partner will be able to much more accurately define and articulate the capabilities they need to include in the future ships that will optimize the advantages of these technologies.

  -(U)($7,783) Naval Warfare Experimentation- Expeditionary Sensor Grid (ESG) Enabling Experimentation. The Expeditionary Sensor Grid (ESG) Enabling Experimentation program (EEE) is the underlying foundation To allow

concept based operational, limited objective, and virtual experimentation to be conducted supporting the aligned concepts of Network-Centric Operations, FORCEnet and the Expeditionary Sensor Grid. A common methodology and connectivity will be established to facilitate a capability for Distributed Laboratory Experimentation allowing scoping analysis using each laboratory's contributions in their areas of excellence. The objective of the EEE is to deliver software to operational experiments that allows for easy connection of heterogeneous elements that comprise an ESG, that allow for dynamic configuration and reconfiguration of an ESG, and that delivers the power of the next generation Internet (Semantic Web) to provide the necessary information for dynamic command and control. The hypothesis is that ESG will improve the ease and availability of data and information to the warfighter, make available data that is not available today, improve the ability to fuse data and information from disparate sources, and decrease the decision makers' workload by providing actionable information. The deliverable will provide the ability to conduct operational experiments to co-evolve network-centric warfare concepts, technologies, and TTP (tactics, techniques and procedures).

-(U)($8,400) Naval Warfare Experimentation Articles- Expeditionary Sensor Grid (ESG) Elements. The ESG Elements initiative matures technology and produces Operational Experimentation Articles (OEA) which enable investigation of the feasibility and contribution of distributed sensors and affectors in littoral operations. The United States has some of the most sophisticated sensor systems in the world that have the ability to provide standoff sensing of adversary targets of interest. While these systems provide valuable data, potential adversaries have developed capabilities to cover, conceal, and deny information from these systems. The ESG concept envisions thousands of additional sensors that can be distributed across the battlespace of interest and placed in close proximity to the targets of interest. Network-Centric Operations envisions bringing the data and information from all sensor sources into one common picture that can be tailored to meet the specific requirements of each warfighter. Currently the existing and planned sensor systems have been developed in a stove-piped manner and are not integrated or even interoperable making it extremely difficult to provide timely decision quality information to each decision-maker. The proposed, traditional solution of standardization among systems is one that cannot achieve the Network-Centric Operations vision in the dynamic information environment of the future. The ESG concept envisions another solution with a true "plug and play" of, not only, new sensors and systems, but also legacy sensors, databases, and processes.
(U) ESG will include new expeditionary sensors, processing, and the supporting networks that when combined with the emerging information infrastructure of our programmed forces (Joint, Coalition, and National) will provide the tactical and operational warfighters with the necessary situational awareness to maintain battlespace dominance while rapidly dismantling any potential adversary's anti-access capabilities. The new sensors provide for exploitation of phenomenology (possibly new or currently unexploited) associated with targets of interest and are distributed across the domains of space, air, sea, land, and information. ESG sensors can be widely distributed, carried by unmanned vehicles, or on traditional manned platforms. ESG provides the means to move data to decision quality information to be used by the appropriate tactical and

operational warfighter. ESG provides or supports sensing, data archiving, processing, fusion, course of action assessment, and information presentation. ESG provides "plug and play" interoperability between heterogeneous elements, the capability to dynamically reconfigure the grid as systems enter and leave, and information assurance. ESG is envisioned as more than just a collector of information; it also can be used for information operations to inject false targets and information into an enemy's surveillance and targeting systems. The ESG elements are content generators that provide relevant data, which aggregates to actionable information in the context of Network Centric Operations. These types of simple sensors and affectors have not been fully investigated in the context of platform centric acquisition programs. Innovative and advanced technologies will be examined to reduce cost and risk, while expanding mission capabilities by enabling new operational concepts. ESG Elements being developed include: Distributed ELINT, Unmanned Autonomous Vehicle (UAV)-Borne Distributed Counter Battery Sensors, SWARM Distributed Micro-Affectors, Unattended Sea-Based Cruise Missile Sensors, Distributed Unattended Ground Sensor Field, and Distributed Undersea Warfare Pyramid Electromagnetic Sensors.

- (U)($5,200) Reactive Material Advanced Warhead ATD. Complete the ATD. Complete cylindrical full-scale explosive launch test series for Reactive Fragmentation Material and inclusion of results in lethality estimation programs. Conduct full-scale live explosive static testing of the Reactive Materials Enhanced Warhead against a number of targets, both real and simulated. Completion of Reactive Warhead Critical Design review and submission of design package to transition agent, including systems design interface considerations. Completion of Lethality Analysis and Toolset for Anti-Air Warfare (AAW) target set. Transition to Engineering Manufacturing Development (EMD) Production program.

- (U)($4,500) Multi-Function Buoyant Cable Antenna ATD. Complete the ATD. This includes completion of system fabrication and component testing, conducting surface based system tests using cable depressor and conducting a submarine demonstration.

- (U) ($4,600) Multi-Platform Broad Band Processing Advanced Technology Demonstration (ATD). Complete the ATD. Demonstrate the performance of coherent broadband signal processing for submarine, surface ship and undersea weapon applications.

- (U) ($6,644) Forward Air Support Marine. Complete the ATD. This entails completion of full-scale wind tunnel testing of the cruise vehicle, autonomous flights of the cruise vehicle and gun launch of full-scale test vehicle.

3. (U) FY 2003 PLAN:

- (U) Naval Warfighting Experimentation Articles. This project continues and expands initiatives for technology maturation to support technology concept pairing and for development and preparation of Operational Experimentation

Articles (OEA). The project develops and provides OEAs for operational experimentation and limited objective experimentation. The project will modify these articles in an iterative manner in response to insights gained during experimentation in order to facilitate co-evolution of concepts and technology. The following efforts will be ongoing in FY 2003:

-(U)($8,000) High Speed Vessel Experimentation and Demonstrations. The Navy Warfare Development Command (NWDC); U.S. Army Combined Arms Support Command; Office of Naval Research (ONR); the Marine Corps Plans, Policies, and Operations Department; Navy Special Warfare Command and the U.S. Coast Guard Deep Water Project Program, will continue to cooperate in a joint experimentation effort to explore and develop this kind of technology. The second phase of the 24 month experimentation phase will be coordinated by NWDC, in close partnership with other elements of the U.S. Navy, the U.S. Marine Corps, U.S. Army and U.S. Coast Guard. These commands and others will execute and dynamically modify the experimentation plan that incorporates all the research objectives from each of the services to include joint experimentation. The services will continue to work together to consolidate the analytical talent to both build the experiments and analyze results. Members of the experimentation team expect to conclude this joint experimentation effort with an understanding of where these technologies can best be applied across our respective mission spectrums. At that point, each partner will be able to much more accurately define and articulate the capabilities they need to include in the future ships that will optimize the advantages of these technologies.

-(U)($7,000) Naval Warfare Experimentation- Expeditionary Sensor Grid Enabling Experimentation. The Expeditionary Sensor Grid (ESG) Enabling Experimentation program (EEE) is the underlying foundation to allow concept based operational, limited objective, and virtual experimentation to be conducted supporting the aligned concepts of Network-Centric Operations, FORCEnet and the Expeditionary Sensor Grid. Work will continue toward establishment of a common methodology and connectivity to facilitate a capability for Distributed Laboratory Experimentation allowing scoping analysis using each laboratory's contributions in their areas of excellence. Additional Laboratories will be added and sensors and simulations increased. Each shall participate in the development of an Expeditionary Sensor Grid (ESG) operational capability through enabling experimentation with elements of the grid

arrayed in an end-to-end fashion. Develop an end-to-end capability enabled by the DARPA developed Control of Agent Based Systems (CoABS) grid and agent based computing technologies. Sensor types to be included are ELINT, radar, sonobuoys, tactical ship towed arrays, the ONR sponsored Distributed Acoustic Detection System (DADS) arrays, and environmental sensors. Sensor processing and fusion will incorporate existing algorithms, but new caching and retrieval schema will be used to provide expanded data and information. Computer agents, fuselets, and the Air Force Rome Laboratory developed "Publish and Subscribe" will be used to assist in data and information retrieval. Capabilities will be matured in distributed laboratory experiments and be further tested during Fleet Battle Experiments. The deliverable will provide the ability to conduct operational experiments to co-evolve network-centric warfare concepts, technologies, and TTP (tactics, techniques and procedures).

-(U) ($26,960) Naval Warfare Experimentation Articles- Expeditionary Sensor Grid (ESG) Elements. The ESG Elements initiative continues to mature technologies and produce Operational Experimentation Articles (OEA) which enable investigation of the feasibility and contribution of distributed sensors and affectors in littoral operations. ESG will add new expeditionary sensors, processing, and the supporting networks that when combined with the emerging information infrastructure of our programmed forces (Joint, Coalition, and National) will provide the tactical and operational warfighters with the necessary situational awareness to maintain battlespace dominance while rapidly dismantling any potential adversary's anti-access capabilities. The new sensors provide for exploitation of phenomenology (possibly new or currently unexploited) associated with targets of interest and are distributed across the domains of space, air, sea, land, and information. Innovative and advanced technologies will be examined to reduce cost and risk, while expanding mission capabilities by enabling new operational concepts. ESG Elements being developed will include: Miniaturized Undersea Warfare Sensors, Dissimilar Distributed ELINT, UAV-Borne Distributed Electro-Optical/Infrared Sensors, SWARM Distributed Micro-Affectors, Unattended Sea-Based Cruise Missile Sensors, Distributed Unattended Ground Sensor Field, and Distributed Undersea Warfare Pyramid Electromagnetic Sensors.

- (U)($1,500) Science and Technology Analysis and Assessments. Independent S&T reviews will be conducted to assure that experimentation is executed and operational analyses conducted which address relevant issues and allow the iterative improvement of concepts and technologies (in the form of OEAs). Analyses and assessments will be directed toward ensuring that S&T resources are focused in a context of relevance centered on unique naval needs, transformational concepts and opportunities.

C. (U) PROGRAM CHANGE SUMMARY:

	FY 2001	FY 2002	FY 2003
FY 2002 President's Budget	**	43,277	
Adjustments from FY 2002 President's Budget			
FFRDC Reduction		-68	
8123 Management Reform Initiative Reduction		-382	
FY 2003 President's Submission	**	42,827	43,460

**The Science and Technology PESs were restructured in FY 2002. FY 2001 efforts were funded in PEs 0603792N and 0603238N.

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

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603758N
PROGRAM ELEMENT TITLE: Naval Warfighting Experiments and Demonstrations

(U) PROGRAM CHANGE SUMMARY EXPLANATION:

(U) Schedule: Not Applicable.

(U) Technical: Not Applicable.

D. (U) OTHER PROGRAM FUNDING SUMMARY: The Navy's 6.1 program contributes to this effort.

(U) NAVY RELATED RDT&E:
- (U) PE 0601152N (In-house Lab Independent Research)
- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602114N (Power Projection Applied Research)
- (U) PE 0602123N (Force Protection Applied Research)
- (U) PE 0602131M (Marine Corps Landing Forces Technology)
- (U) PE 0602235N (Common Picture Applied Research)
- (U) PE 0602236N (Warfighter Sustainment Applied Research)
- (U) PE 0602271N (RF Systems Applied Research)
- (U) PE 0602435N (Ocean Warfighting Environment Applied Research)
- (U) PE 0602747N (Undersea Warfare Applied Research)
- (U) PE 0602782N (Mine and Expeditionary Warfare Applied Research)
- (U) PE 0603114N (Power Projection Advanced Technology)
- (U) PE 0603123N (Force Protection Advanced Technology)
- (U) PE 0603235N (Common Picture Advanced Technology)
- (U) PE 0603236N (Warfighter Sustainment Advanced Technology)
- (U) PE 0603271N (RF Systems Advanced Technology)
- (U) PE 0603640M (Marine Corps Advanced Technology Demonstrations)
- (U) PE 0603729N (Warfighter Protection Advanced Technology)
- (U) PE 0603747N (Undersea Warfare Advanced Technology)
- (U) PE 0603727N (Navy Technical Information Presentation System)
- (U) PE 0603782N (Mine & Expeditionary Warfare Advanced Technology)

(U) NON NAVY RELATED RDT& E.
- (U) PE 0603750D (Advanced Concept Technology Demonstration)

E. (U) SCHEDULE PROFILE: Not applicable.