

# UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 1

PROGRAM ELEMENT: 0601152N

PROGRAM ELEMENT TITLE: In-House Laboratory Independent Research

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
Ocean Sciences	531	586	786	821	1,002	1,038	1,242	1,274	CONT.	CONT.
Advanced Materials	1,725	1,760	2,202	2,300	2,504	2,595	2,838	2,911	CONT.	CONT.
Information Sciences	1,061	1,173	1,886	2,301	2,672	3,115	3,550	3,640	CONT.	CONT.
Sustaining Programs	9,951	11,144	10,756	10,999	10,519	10,553	10,113	10,373	CONT.	CONT.
TOTAL	13,268	14,663	15,630	16,421	16,697	17,301	17,743	18,198		

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program supports the missions of the Naval Warfare Centers, Naval Personnel Research and Development Center (NPRDC), and Bureau of Medicine and Surgery (BUMED) with high-risk/high-payoff research, responding as shown below to the Department of the Navy (DON) Joint Mission Areas/Support Areas (JMA/SA) and enabling the technologies that could significantly improve Joint Chiefs of Staff's Future Joint Warfighting Capabilities. The research addresses fundamental questions regarding existing and anticipated naval systems, and is supported within the Office of Naval Research (ONR) by thrusts in Ocean Sciences, Advanced Materials, Information Sciences, and its Sustaining Programs. This program reflects the integration of efforts both within Warfare Centers, NPRDC, BUMED, and among other research performers. Research efforts are proposed and selected by the Warfare Centers, NPRDC, and BUMED, and reviewed after the fact for the quality of science produced and for relevance to the naval mission.

(U) This program responds to the Littoral Warfare JMA through ocean sciences research into the variability of the marine environment, such as acoustic shallow water (SW) models that incorporate wave-breaking sources, allowing superior signal

R-1 Line Item 1

Budget Item Justification  
(Exhibit R-2, page 1 of 6)

# UNCLASSIFIED

# UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 1

PROGRAM ELEMENT: 0601152N

PROGRAM ELEMENT TITLE: In-House Laboratory Independent Research

processing in SW environments. Research advancing fundamental understanding of DON-essential materials and processes responds to operational capability requirements in the Strategic Mobility JMA, such as the recent development of an aluminum based, metal-matrix, high-temperature superconducting material that can be extruded into wires for significantly improved naval electrical power systems. The program responds to the Intelligence, Surveillance, Reconnaissance JMA through thrusts in information sciences that address naval-relevant computing applications including software engineering, high performance computing, artificial intelligence, and the use of computers in manufacturing. For example, the development of an advanced signal processing technique for the analysis of real Anti-Submarine Warfare (ASW) broadband acoustic data provides detection performance, which exceeds the conventional energy detector in high noise ASW applications. Research in other areas supports requirements of the Readiness JMA, such as discovering redox chemicals for use in "smart" coatings, which alter color when degraded and serve as early warning systems for corrosion of naval systems.

(U) Due to the sheer volume of efforts included in this program element, the programs described in the Accomplishments and Plans sections are representative selections of the work included in this program element.

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

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under BASIC RESEARCH because it encompasses scientific study and experimentation directed towards increasing knowledge and understanding in broad fields directly related to long-term DoN needs.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) (\$531) Ocean Sciences responded to the Littoral Warfare JMA in the undersea battlespace dominance area by studying techniques for the near optimum detection of unknown signals and fluid-elastic interface modeling, both of which enhanced sonar performance in shallow water.

R-1 Line Item 1

Budget Item Justification  
(Exhibit R-2, page 2 of 6)

# UNCLASSIFIED

# UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 1

PROGRAM ELEMENT: 0601152N

PROGRAM ELEMENT TITLE: In-House Laboratory Independent Research

- (U) (\$1,725) Advanced Materials responded to the Littoral Warfare JMA in the undersea battlespace dominance area by molecular modeling of new sonar transducer materials and the use of tessellation theory to design efficient multi-element transducers.
- (U) (\$1,061) Information Sciences responded to the Littoral Warfare JMA by formulating new concepts and algorithms to fuse data collected from multiple sensor platforms deployed in the shallow water environment for the purpose of environmental mapping and classification/identification of bottom targets.
- (U) (\$9,951) Sustaining Programs responded to the Strategic Mobility JMA, the Command, Control, Communications JMA, and Strike JMA by investigating: (1) drag reducing hull forms; (2) improved maneuvering performance of ships and subs in littoral waters; (3) new types of opto-electrical components for use in communications systems; (4) enhanced capabilities in computational fluid dynamics for the improved efficiency, maintainability, and reliability of naval propulsors and turbomachinery, and contributing to the detection of wake signatures. Sustaining Programs also responded to the readiness JMA with research into training methods and materials and into disease prevention and casualty care.

## 2. (U) FY 1999 PLAN:

- (U) (\$586) Ocean Sciences will respond to the Littoral Warfare JMA by investigating physical mechanisms for deposition of high energy acoustic or seismic pulses on elastic objects deployed on or in the bottom of a shallow water ocean environment.
- (U) (\$1,760) Advanced Materials will respond to the Strike and Littoral Warfare JMAs by studying energetic materials using nanosize fuels and high heat of reaction intermetallic ingredients to enhance warhead performance; by synthesizing high performance, insensitive explosive ingredients (based on principles of molecular charge delocalization and graphitic-like crystal structures) for penetrator applications; by studying the dynamic shock wave properties of warhead materials to support the modeling and design of warheads; and by developing equations of state and reaction rate models for use in hydrodynamic code modeling of warheads.
- (U) (\$1,173) Information Sciences statistical analyses will reduce the complexities of signals and of the algorithms for signal processing to advance the capability for electronic warfare and electronic countermeasures in Strike and Intelligence, Surveillance, and Reconnaissance JMA, with enhanced detection probability and diminished tracking time in cluttered environments and in the presence of false targets.

R-1 Line Item 1

Budget Item Justification  
(Exhibit R-2, page 3 of 6)

# UNCLASSIFIED

# UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 1

PROGRAM ELEMENT: 0601152N

PROGRAM ELEMENT TITLE: In-House Laboratory Independent Research

- (U) (\$11,144) Sustaining Programs will respond to the Strike and Command, Control, Communications, Computers and Information Warfare JMAs by investigating the three-dimensional effects of loss mechanisms in non-ideal, thin-film, integrated waveguide structures for opto-electronic applications, and will respond to the readiness JMA with research focused on the medical areas of Aviation Medicine, Diving and Submarine Medicine, Toxicology, Human Performance, Infectious Disease, and Combat Casualty Care.

3. (U) FY 2000 PLAN:

- (U) (\$786) Ocean Sciences will respond to the Littoral JMA, to the Air and Sea Superiority JMA, and to the Strike JMA by investigating acoustical propagation with application in mine countermeasures, underwater acoustic communications, and underwater target detection.
- (U) (\$2,202) Advanced Materials will respond to: (1) The Readiness JMA by investigating material corrosion reduction and coatings; (2) the Strike JMA and the Sea and Air Superiority JMA by investigating energetic materials; (3) the Strike JMA, the Littoral JMA, and the Strategic Sealift JMA through research into new types of structural and electronic materials.
- (U) (\$1,886) Information Sciences will respond to the Joint Surveillance JMA, the Strike JMA, the Littoral JMA, the Sea and Air Superiority JMA, and the EW JMA through research into network controls and security, displays, and advanced methods in digital signal processing.
- (U) (\$10,756) Sustaining Programs will respond to the EW JMA through research into: (1) the electromagnetic response of materials, and (2) sensors. It will respond to the Strategic Mobility JMA through research into ways to improve the protection of the assets by improved defensive warheads. It will respond to the readiness JMA with medical research in the areas of Aviation Medicine, Diving and Submarine Medicine, Toxicology, Human Performance, Infectious Disease, and Combat Casualty Care.

B. (U) PROGRAM CHANGE SUMMARY:

R-1 Line Item 1

Budget Item Justification  
(Exhibit R-2, page 4 of 6)

# UNCLASSIFIED

# UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 1

PROGRAM ELEMENT: 0601152N

PROGRAM ELEMENT TITLE: In-House Laboratory Independent Research

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
(U) FY 1999 President's Budget:	14,248	14,734	15,680
(U) Appropriated Value:		14,734	0
(U) Adjustments from FY 2000 PRESBUDG:	-980	-71	-50
(U) FY 2000 PRESBUDG Submission:	13,268	14,663	15,630

(U) CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998 adjustments reflect Actual Update adjustments (-\$980). FY 1999 adjustments reflect Congressional Undistributed Reductions (-\$71). FY 2000 adjustments reflect Navy Working Capital Fund (NWCF) rate adjustment (+\$125); Non Pay Inflation adjustment (-\$227); Civilian Pay Rates adjustment (+\$110); and Minor adjustment (-\$58).

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E:

- (U) PE 0601101A (In-House Laboratory Independent Research)
- (U) PE 0601101F (In-House Laboratory Independent Research)
- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602111N (Air and Surface Launched Weapons Technology)
- (U) PE 0602234N (Materials, Electronic & Computer Technology)
- (U) PE 0602314N (Undersea Surveillance and Weapons Technology)

R-1 Line Item 1

Budget Item Justification  
(Exhibit R-2, page 5 of 6)

# UNCLASSIFIED

# UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 1

PROGRAM ELEMENT: 0601152N

PROGRAM ELEMENT TITLE: In-House Laboratory Independent Research

D. (U) SCHEDULE PROFILE: Not applicable.

R-1 Line Item 1

Budget Item Justification  
(Exhibit R-2, page 6 of 6)

# UNCLASSIFIED