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FY 2001 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN

DATE: FEBRUARY 2000

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0829	Energy Conservation (ADV)								
	2,458	2,783	2,757	2,871	2,887	2,942	3,027	CONT.	CONT.
R0838	Mobility Fuels (ADV)								
	2,060	2,173	2,185	2,219	2,246	2,289	2,355	CONT.	CONT.
R2766	Dehumidification Demo								
	-	1,989	-	-	-	-	-	1,989	1,989
TOTAL	4,518	6,945	4,942	5,090	5,133	5,231	5,382	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program supports projects to evaluate, adapt, and demonstrate energy related technologies for ship and aircraft operations to: (a) increase fuel-related weapons systems capabilities such as range and time on station; (b) reduce energy costs; (c) reduce dependence on petroleum fuels and apply energy technologies that improve environmental compliance; (d) relax unnecessarily restrictive fuel specification requirements to reduce cost and increase availability worldwide; (e) provide guidance to fleet operators for the safe use of commercial grade or off-specification fuels when military specification fuels are unavailable or in short supply; and (f) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems. As presently funded and planned the Navy Ship and Aircraft Energy Conservation Research and Development Program, of which Project R0829 is a part, is estimated to

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result in energy cost avoidance of \$70M/yr by FY2005. Project R2766 is an FY2000 Congressional plus-up to demonstrate dessicant dehumidification in Naval Facilities.

(U) This program, and the companion PE 0604710N, Navy Energy Program support the achievement of legislated, White House, Department of Defense and Navy Energy Management Goals. It also responds to direction from the Office of the Secretary of Defense, the Secretary of the Navy and the Chief of Naval Operations to make up-front investment in technologies that reduce future cost of operation and ownership of the fleet and supporting infrastructure.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications.

J) PROGRAM CHANGE SUMMARY FOR TOTAL PE:

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY2001</u>
(U) FY 2000 President's Budget:	4,571	4,984	4,962
(U) Appropriated Value:		6,984	
(U) Adjustments from PRESBUDG:			
(U) SBIR/STTR Adjustment	-31		
(U) Various Rate Adjustment	-20		-20
(U) Execution Rate Adjustment	-2		
(U) Congressional Rescissions		-39	
(U) Congressional Plus-Up (R2766)		2000	
(U) FY 2001 PRESBUDG Submission	4,518	6,945	4,942

(U) CHANGE SUMMARY EXPLANATION:

(U) Schedule: Not applicable.

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PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) Technical: Not applicable.

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PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0829 Energy Conservation	2,458	2,783	2,757	2,871	2,887	2,942	3,027	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project improves the energy efficiency of Navy ships and aircraft, and thereby contributes to reduced operating costs and improved fleet sustainability and performance. Major efforts include work to increase the efficiency of aircraft engines; and develop improved hull drag reducing technologies and more efficient energy conversion systems for ships.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1999 ACCOMPLISHMENTS:

- (U) (\$916) Aircraft: Continued cooperative effort with General Electric (GE) for detailed design of an advanced High Pressure Turbine (HPT) to meet F414 (the F/A-18E/F engine) growth requirements. Directed F-414/F/A-18E/F simulator set up to support testing of an advanced engine "Performance Seeking Control" (PSC) system to ensure flight worthiness. Monitored conceptual design of an advanced fan for F414 engine (a joint F414 program office and GE program) to ensure efficiency consideration.
- (U) (\$1,542) Ships: Model tested bow bulb and stern/propeller hydrodynamic enhancements for TAO-187 class to determine drag reduction. Completed detailed design and drawings for Guided Missile Destroyer (DDG-51) retrofit stern flap applicable to first 28 ships. Completed LHA/LHD stern flap model tests. Continued laboratory to bilge-keel panel tests of emerging Anti-Fouling coatings: self-polishing reduced copper/cobiocide paints in particular.

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PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

Continued development of variable geometry diffusor technology to improve efficiency of air conditioning plants using non Chloro-flouro-carbon (CFC) refrigerants; for both forward and backfit.

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BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROJECT: R0829
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT TITLE: Energy Conservation

2. (U) FY 2000 PLAN:

- (U) (\$1,050) Aircraft: Flight test PSC advanced engine control logic on F/A-18E/F. Develop advanced components to meet F414 growth requirements: HPT, advanced fan, compressor, low- pressure turbine, and advanced full authority digital engine control with PSC. These are joint efforts with the Navy F414 program office and GE. Energy program participation incentivizes these efforts and ensures that efficiency, as well as performance gains are pursued.
- (U) (\$1,733) Ships: Begin assessment of hydrodynamic refinements for Landing Ship Dock (LSD) 41/49 classes. Evaluate self-polishing reduced copper/cobiocide paints for energy savings and environmental impact. Support design of optimized air-conditioning plants for both retrofit and forward fit. Begin development of on-line water-wash system for gas turbines. Optimize tool designs for hull inspection remotely operated vehicle for fouling assessment and spot cleaning.

3. (U) FY 2001 PLAN:

- (U) (\$1,050) Aircraft: Continue participation in development of advanced F414 engine components: (advanced fan, compressor and low pressure turbine). These efforts are jointly funded with the Navy F414 Program Office, and GE, and in some cases transition new technology from the Integrated High Performance Turbine Engine Technology Program. Components will be tested via the next GE-23a demonstrator engine build. Energy R&D participation incentivizes efficiency improvements. Begin evaluation of new, fuel efficient, component technology options for application to future F404 variants (F/A-18C/D engine).
- (U) (\$1,707) Ships: Evaluate effectiveness and maintenance requirements of self -polishing reduced copper/cobiocide paints. Screen candidate paints by rates of copper release and binder hydrolysis --best paints will undergo large scale testing in PE 0604710N to demonstrate suitability for Navy use. Support design of optimized air-conditioning plants for both retrofit and forward fit. Continue development of on-line water-wash system for gas turbines. Continue screening and model testing of simple hydrodynamic mods for future ships to improve energy efficiency.

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

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BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROJECT: R0829

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Energy Conservation

(U) RELATED RDT&E:

- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602121N (Surface Ship Technology)
- (U) PE 0602122N (Aircraft Technology)
- (U) PE 0602234N (Materials, Electronics and Computer Technology)
- (U) PE 0603217N (Air Systems and Weapons Advanced Technology)
- (U) PE 0603712N (Environmental Quality and Logistics Advanced Technology)
- (U) PE 0603721N (Environmental Protection)
- (U) PE 0604710N (Navy Energy Program (ENG))

D. (U) SCHEDULE PROFILE: Not applicable.

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BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROJECT: R0829

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Energy Conservation

A. (U) PROJECT COST BREAKDOWN: (\$ in thousands)

Project Cost Categories	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY2001</u>
a. System Development and Integration	2,458	2,783	2,757

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION: Not applicable.

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PE/Project Cost Breakdown
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FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

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BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in thousands)

PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0838 Mobility Fuels (ADV)	2,060	2,173	2,185	2,219	2,246	2,289	2,355	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project provides data through engine and fuel system tests which relate the effects of changes in Navy fuel procurement specification properties to the performance and reliability of Naval ship and aircraft engines and fuel systems. This information is required to: (a) determine the extent to which unnecessarily restrictive specification features can be relaxed to reduce cost and increase availability worldwide; (b) provide guidance to fleet operators for the safe use of off-specification or commercial grade fuels when military specification fuels are unavailable or in short supply; and (c) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems while accommodating evolutionary changes in the fuel supply industry. Recent problems with fuel quality have adversely affected ship and aircraft system performance and reliability and resulted in degradation of fuel in storage. The resulting readiness impacts, additional maintenance costs, and the cost of lost equipment, although difficult to quantify, are many times the cost of this project. Over the next decade, the potential for fuel quality related problems will increase because of changing industry practices required to comply with new environmental regulations. This project represents the only investment designed to maintain the Navy's ability to operate as a "smart" customer for fuels that cost over \$2B per year to procure, transport, store and consume and are essential to fleet operations.

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PROGRAM ELEMENT: 0603724N

PROJECT NUMBER: R0838

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Mobility Fuels (ADV)

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1999 ACCOMPLISHMENTS:

- (U) (\$910) Ships: Completed experimental work to determine lubricity characteristics of low sulfur Navy military specification (MILSPEC) ship diesel fuels. Initiated work to determine effects of low lubricity ship diesel fuels on the durability of Navy gas turbine engine and high-speed diesel engine fuel handling systems. Conducted bench scale tests to determine the effects of red-dyed marine distillate fuels on Navy gas turbine engine hot section materials. Completed study to forecast marine distillate fuel and Navy engine characteristics through 2010.
- (U) (\$1,150) Aircraft: Completed test & evaluation (T&E) of prototype fuel/water separator elements for +100 aircraft fuel thermal stability enhancing additive containing fuels. Completed evaluation of effect of +100 additives on P-3 and C-130 engines. Initiated evaluation of effects of +100 additives on F/A-18 engine systems. Completed test and evaluation of non-toxic, environmentally benign fuel system icing inhibitors.

2. (U) FY 2000 PROGRAM:

- (U) (\$970) Ships: Continue gas turbine and diesel engine component tests with low lubricity MILSPEC ship diesel fuels to determine effects on durability and initiate full-scale fuel handling system tests. Initiate evaluation of lubricity enhancing additives for use with low lubricity MILSPEC ship diesel fuels. Initiate work to quantify effects of low thermal stability Navy distillate fuels on maintenance requirements for navy gas turbine and diesel engines. Initiate work to determine the feasibility of specifying a single fuel for use by all Naval systems (ships, aircraft, and ground equipment).
- (U) (\$1,203) Aircraft: Initiate shipboard evaluation of prototype fuel/water separator elements for +100 additive containing fuels. Complete evaluation of effects of +100 additives on F/A-18C/D and T-45 engine systems. Complete detailed cost benefit analysis for Naval use of +100 additives. Complete F/A-18E/F engine component tests to determine effects of copper contaminated Navy jet fuels on engine maintenance requirements. Complete development of a prototype copper contamination removal system for fuels.

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PROGRAM ELEMENT: 0603724N

PROJECT NUMBER: R0838

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Mobility Fuels (ADV)

3. (U) FY 2001 PLAN:

- (U) (\$990) Ships: Complete testing of full scale Navy gas turbine and diesel engine fuel handling systems with low lubricity fuels. Use results to specify minimum lubricity levels and test method to be used for fuel acceptance. Complete evaluation of lubricity enhancing additives for use with Navy distillate fuels. Complete component tests to determine effects of low thermal stability Navy distillate fuels on maintenance requirements for Navy gas turbine and diesel engines, and initiate tests on full scale fuel handling systems. Complete assessment of the feasibility of specifying the use of a single fuel for all Naval Systems.
- (U) (\$1,195) Aircraft: Complete evaluation of the effects of +100 additives on F/A-18E/F and AV-8B engine systems. Complete shipboard evaluation of prototype fuel/water separator elements for +100 additive containing fuels. Initiate Joint Strike Fighter engine component tests to determine effects of copper contaminated jet fuel on engine maintenance requirements. Conduct field tests of prototype copper contamination removal system for fuels.

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

(U) RELATED RDT&E:

(U) PE 0601152N (In-House Laboratory Independent Research)

(U) PE 0602234N (Materials, Electronics and Computer Technology)

D. (U) SCHEDULE PROFILE: Not applicable.

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PROGRAM ELEMENT: 0603724N

PROJECT NUMBER: R0838

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Mobility Fuels (ADV)

A. (U) PROJECT COST BREAKDOWN: (\$ in thousands)

Project Cost Categories	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY2001</u>
a. Reliability, Maintainability, and Availability	2,060	2,173	2,185

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION: Not applicable.

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