

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY
RDTE, Defense Wide BA 01

PE NUMBER AND TITLE
0601111D8Z - Government/Industry Co-sponsorship of University Research

COST (\$ in Millions)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
P111 Government/Industry Co-sponsorship of University Research	8.679	6.161					

A. Mission Description and Budget Item Justification: (U) The FY 2008 Government/Industry Co-sponsorship of University Research (GICUR) program reflects four Congressional adds, they are:

1. Nanotechnology Initiative at Shaw University (\$.990 million). Sponsor Rep Etheridge (NC)
2. New York Structural Biology Center (\$1.590 million). Sponsors Rep Rangel, Senators Clinton and Schumer (NY)
3. Integrated Cryo-cooled High Power Density Systems (\$1.590 million). Sponsor Rep Boyd (FL)
4. High Power Densities Research (\$1.991 million). Senator Martinez (FL)

<u>B. Program Change Summary</u>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008)	9.147		
Current BES/President's Budget (FY 2009)	8.679	6.161	
Total Adjustments	-0.468	6.161	
Congressional Program Reductions		-0.039	
Congressional Rescissions			
Congressional Increases		6.200	
Reprogrammings	-0.226		
SBIR/STTR Transfer	-0.255		
Other	0.013		

Two FY07 Congressional Initiatives were added to this PE:
 Bio/Nano Electronic Defense Devices and Sensors - \$1.200 million
 Focus Center Defense Research Program - \$8.000 million

C. Other Program Funding Summary Not applicable for this item.

D. Acquisition Strategy Not applicable for this item.

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY

RDTE, Defense Wide BA 01

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0601111D8Z - Government/Industry Co-sponsorship of University Research

E. Performance Metrics: Not Applicable.

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY RDTE, Defense Wide BA# 1		PE NUMBER AND TITLE 0601111D8Z - Government/Industry Co-sponsorship of University Research					PROJECT P111	
COST (\$ in Millions)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
P111 Government/Industry Co-sponsorship of University Research	8.679	6.161						

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B. Accomplishments/Planned Program:

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Interconnect Focus Center, Georgia Institute of Technology, Atlanta, GA	1.085		

FY 2007 Accomplishments:

The integration of optical materials with silicon was demonstrated.
Optical links were developed and measurements of power consumption and bit-error rate were collected.
Experiments with nanotubes were conducted, leading to the development and refinement of accurate models of transient performance, including parasitic reactances.

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Materials/Structures/Devices Center, Massachusetts Institute of Technology, Cambridge, MA	1.072		

FY 2007 Accomplishments

Experiments with carbon nanotubes and the integration of nanotubes with silicon circuits were conducted.
Measurements of mobility were performed and methods to form good contacts using metallics were developed.
Experiments were conducted to quantify how film strains and new materials will provide carrier mobility enhancements for very short channel transistors.

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)		February 2008		
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<u>Accomplishments/Planned Program Title:</u>		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Functional Engineering Nano-Architectonics Center, University of California at Los Angeles, Los Angeles, CA		1.222		
FY 2007 Accomplishments				
Advances in understanding the chemistry of certain polymeric materials enabled development of a process for creating a novel polymeric memory cell that would have significant low power and low fabrication cost and could be scaled to nano-scale dimensions.				
<u>Accomplishments/Planned Program Title:</u>		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Gigascale Design Center, University of California at Berkeley, Berkeley, CA		2.000		
FY 2007 Accomplishments				
A design methodology for obtaining low power but high performance processors was developed using a robust checking circuit that corrects errors in a very low voltage core processor. A design roadmap was implemented to guide future technologies by enabling the accurate modeling and simulation of "what-if" experiments and scenarios on the complex semiconductor technology process. Concepts of platform-centric design were translated from the digital domain to the analog/mixed signal regime and work started to formalize the approach.				
<u>Accomplishments/Planned Program Title:</u>		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Circuits, Systems, and Software Focus Center, Carnegie Mellon University, Pittsburgh, PA		2.100		
FY 2007 Accomplishments				
Robust design methodologies for enabling computation with unreliable or faulty components were investigated and interfaces defined. Applications of fin field effect transistors (FinFETs) were investigated, including dynamic and dc properties.				
<u>Accomplishments/Planned Program Title:</u>		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Bio/Nano Electric Defense Devices and Sensors Program		1.200		
FY 2007 Plan				
The performer for this congressional add was Florida International University. The objective of this research is (1) to develop a protein based and a 3-dimensional mechanism for writing and reading from ultra-dense magnetic medium, with orders of magnitude improvement in stored non-volatile information density over current state-of-the-art magnetic memory storage technologies; (2) to develop high power cold cathodes for microwave generators; (3) to model, design and synthesize carbon-nanotube-based biosensors; (4) to integrate nanoparticles and nanophotonic resonators with the aim of creating multiple wavelength on-chip laser arrays and high sensitivity to bio/chemicals sensors; and (5) to use nanocrystalline diamonds to make nanoceramic lasers.				
<u>Accomplishments/Planned Program Title:</u>		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Nanotechnology Initiative at Shaw University. Sponsor Rep Etheridge (NC)			0.990	

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

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FY 2008 Plan: Execute the congressional add as directed by Congress.

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
New York Structural Biology Center. Sponsors Rep Rangel, Senators Clinton and Schumer (NY)		1.590	

FY 2008 Plan: Execute the congressional add as directed by Congress.

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Integrated Cryo-cooled High Power Density Systems. Sponsor Rep Boyd (FL)		1.590	

FY 2008 Plan: Execute the congressional add as directed by Congress.

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
High Power Densities Research. Senator Martinez (FL)		1.991	

FY 2008 Plan: Execute the congressional add as directed by Congress.

<u>C. Other Program Funding Summary</u>	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
0601101E Defense Research Sciences	139.521	174.996	195.657	226.125	231.195	236.361	241.652

Comment:

D. Acquisition Strategy Not applicable for this item.

E. Major Performers Not applicable for this item.

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY
RDTE, Defense Wide BA 01

PE NUMBER AND TITLE
0601114D8Z - Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)

COST (\$ in Millions)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
P114 Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)	8.992	16.931	2.833				

A. Mission Description and Budget Item Justification: (U) The Defense Experimental Program to Stimulate Competitive Research (DEPSCoR) is a legislated program that funds research activities in science and engineering fields at institutions of higher education in selected states. DEPSCoR was intended to expand research opportunities in states that traditionally received the least funding in federal support for university research.

(U) Participation in this program is limited to states that meet eligibility criteria as set forth in the authorizing language. The program improves the capabilities of institutions of higher education to develop, plan, and execute science and engineering research that is competitive under a peer-review system. Educational institutions in eligible DEPSCoR states are invited, to compete for research/infrastructure awards in areas identified by the department in Broad Agency Announcements published by the Services. The first 2008 BAA closed on October 26, 2007. Anticipated announcement of winners on or about March 28, 2008.

(U) Due to new language in the FY 2008 Authorization Conference Report the Senate amendment contained a provision (sec. 254) that would give the Department of Defense more flexibility in its execution of the DEPSCoR Program, therefore a second BAA will be published early 2008 to allow competition in accordance with the new language.

(U) Also Sec. 241 of the FY 2008 Authorization Conference Report directs the Secretary of Defense to utilize a defense federally funded research and development center to carry out an assessment of the DEPSCoR program. The assessment is due no later than nine months after the date of the enactment of this Act (September 2008).

<u>B. Program Change Summary</u>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008)	9.478	5.878	2.833
Current BES/President's Budget (FY 2009)	8.992	16.931	2.833
Total Adjustments	-0.486	11.053	
Congressional Program Reductions		-0.147	
Congressional Rescissions			
Congressional Increases		11.200	
Reprogrammings			
SBIR/STTR Transfer	-0.255		
Other	-0.231		

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY

RDTE, Defense Wide BA 01

PE NUMBER AND TITLE

0601114D8Z - Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)

C. Other Program Funding Summary Not applicable for this item.

D. Acquisition Strategy Not applicable for this item.

E. Performance Metrics: Not Applicable.

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY RDTE, Defense Wide BA 01		PE NUMBER AND TITLE 0601114D8Z - Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)					PROJECT P114	
COST (\$ in Millions)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
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B. Accomplishments/Planned Program:

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)	8.992		

FY 2007 Accomplishments:
 Awarded 17 grants to 13 academic institutions in 9 states to perform research in science and engineering fields.
 Proposals were competitively selected by the Air Force Office of Scientific Research, the Army Research Office, and the Office of Naval Research
 Average award: \$441,000 each (total over the three year grant period).

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY RDTE, Defense Wide BA 01	PE NUMBER AND TITLE 0601114D8Z - Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)	PROJECT P114
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<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)		16.931	

FY 2008 Planned Program:
 First FY08 BAA closed 26 October 2007. Following evaluation and selection, FY 2008 DEPSCoR grants will be announced end of March, 2008.

Second FY08 BAA to be announced in early 2008.

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)			2.833

FY 2009 Planned Program:
 Plan to announce a FY 2009 BAA for DEPSCoR states to compete.

C. Other Program Funding Summary Not applicable for this item.

D. Acquisition Strategy Not applicable for this item.

E. Major Performers

Category	Name	Location	Type of Work and Description	Award Date
<u>Labs/Centers</u>				
	Army Research Office	Research Triangle Park, NC	Continue research/infrastructure support improving the capabilities of institutions of higher education to develop, plan, and execute science and engineering research that is competitive under the peer-review.	Mar 08
	Air Force Office of Scientific Research	Arlington, VA	Continue research/infrastructure support improving the capabilities of institutions of higher education to develop, plan, and execute science and engineering research that is competitive under the peer-review.	Mar 08

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY

RDTE, Defense Wide BA 01

PE NUMBER AND TITLE

**0601114D8Z - Defense Experimental Program to Stimulate
Competitive Research (DEPSCOR)**

PROJECT

P114

Office of Naval Research

Arlington, VA

Continue research/infrastructure support improving the capabilities of institutions of higher education to develop, plan, and execute science and engineering research that is competitive under the peer-review.

Mar 08

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY
RDTE, Defense Wide BA 01

PE NUMBER AND TITLE
0601120D8Z - National Defense Education Program (NDEP)

COST (\$ in Millions)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
P120 National Defense Education Program (NDEP)	18.425	43.988	68.972	91.484	114.122	127.771	130.136

A. Mission Description and Budget Item Justification: (U) Section 1101 of the National Defense Authorization Act (NDAA) for Fiscal Year 2005 and Section 1104 of the National Defense Authorization Act of 2006 established and modified the National Defense Education Program (NDEP).

(U) DoD employs almost half of the Federal Governments scientists and engineers. NDEP attacks a continuing DoD challenge: educating, training, recruiting, and retaining workers in the science, technology, engineering, and mathematics (STEM) disciplines that are critical to our national security. In the US, there is a long-term, downward trend in defense-relevant science and engineering degrees at all levels awarded to clearable persons, whether native-born or naturalized. This trend is exacerbated by a general erosion of US competency in math and science at the middle and high school levels. Basic science and mathematics competence, gained in grades K-12, form the foundation of an educated, capable, technical future workforce for DoD. NDEP is a bridge from DoD STEM education efforts in mid and late term education to future defense community employment. One of NDEPs major programs is the Science, Mathematics and Research for Transformation (SMART) Defense Education Program.

(U) SMART awards physical science and engineering scholarships to current and future scientists, mathematicians, and engineers. Scholarships are awarded at undergraduate and graduate levels and recipients are required to obtain security clearances and to enter government civilian service for a period of time commensurate with the duration of educational support they receive. SMART scholars gain additional education, develop skills, talents, and expertise that are directly applicable to specific DoD needs through interaction at DoD laboratories.

(U) The NDAA of 2006 amendment to SMART further enables the development of DoDs future workforce. The amendment establishes a permanent program (the initial FY 2005 program was a pilot) with four features: 1) increased development, recruitment, and retention of individuals with acumen in physical science disciplines critical to the Department of Defense; 2) expanded the kinds of academic degrees covered by the program, including the associate's degree; 3) authorized DoD to employ SMART scholars in over-strength positions while pursuing their studies and for up to two years after completion; and 4) increased the recipients types of allowable expenses.

<u>B. Program Change Summary</u>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008)	19.420	44.372	58.972
Current BES/President's Budget (FY 2009)	18.425	43.988	68.972
Total Adjustments	-0.995	-0.384	10.000
Congressional Program Reductions		-0.384	
Congressional Rescissions			
Congressional Increases			
Reprogrammings	-0.477		
SBIR/STTR Transfer	-0.543		

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY
RDTE, Defense Wide BA 01

PE NUMBER AND TITLE
0601120D8Z - National Defense Education Program (NDEP)

Other	0.025		10.000
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C. Other Program Funding Summary Not applicable for this item.

D. Acquisition Strategy Not applicable for this item.

E. Performance Metrics:

FY	Strategic Goals Supported	Existing Baseline	Planned Performance Improvement / Requirement Goal	Actual Performance Improvement	Planned Performance Metric / Methods of Measurement	Actual Performance Metric / Methods of Measurement
07	AT&L 3.3.3; 3.3.4; 3.3.5					
08	AT&L 3.3.3; 3.3.4; 3.3.5					

Comment: Performance Metrics within the National Defense Education Program:

- 1) Award 1000 SMART scholarships by 2013
- 2) Demonstrate DoD involvement in 20 states K-12 education programs by 2010
- 3) Award 50 National Security Science and Engineering Faculty Fellowships by 2013

AT&L 3.3.3 - Attract students at elementary, middle, and high school levels to pursue careers in science and engineering: A DoD outreach program has been established within NDEP. The Pre-Engineering Partnership and Material World Modules initiatives address this outreach requirement.

AT&L 3.3.4 - Support National Defense Education Program: Funding has been increased over FY06 levels to expand the scope of NDEP to include National Security Science and Engineering Faculty Fellowships and an increase in the scope and magnitude of the Science, Mathematics and Research for Transformation scholarship initiatives.

AT&L 3.3.5 - Ensure grant and fellowship programs are providing maximum benefit to DoD and the taxpayer: Reviews of the NDEP scholarship and fellowship programs continue. Modifications to grants, scholarships and fellowships are being made as appropriate.

Data will be gathered and analyzed annually to assess program execution including level of application to the program, and level of satisfaction and ability of graduates to meet the expectations of sponsoring services and agencies. Placement and performance of scholars and fellows will be tracked. Services and agencies will be queried to identify any need for programmatic adjustments to maximize program benefits.

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY RDTE, Defense Wide BA 01		PE NUMBER AND TITLE 0601120D8Z - National Defense Education Program (NDEP)					PROJECT P120	
COST (\$ in Millions)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
P120 National Defense Education Program (NDEP)	18.425	43.988	68.972	91.484	114.122	127.771	130.136	

A. Mission Description and Budget Item Justification: (U) DoD laboratories expect to lose 13,000 scientists and engineers over the next ten years. At the same time, the overall US demand for scientists is projected to increase by 17 percent, and for engineers by 22 percent. NDEP attacks this continuing DoD challenge: educating, training, recruiting, and retaining workers in the science, technology, engineering, and mathematics (STEM) disciplines that are critical to the national security. NDEP is a bridge from DoD STEM education efforts in mid and late term K-12 education to future defense community employment. The program provides support for the study of physical sciences and engineering in pre-college, undergraduate, graduate, and postgraduate projects.

(U) Pre-college: There are two initiatives in this area: the Material World Modules project and the Pre-Engineering Partnership Program. These two initiatives improve teacher skills and techniques, stimulate student interest, and promote competence in physical sciences and math. They are evidence based, multidisciplinary, hands-on activities for middle through high school students. Additionally, they connect working DoD laboratory scientists and engineers with local teachers to provide assistance in teaching scientific concepts through real-world applications.

(U) Undergraduate, Graduate, Post-Graduate: There are two projects in this area: Science, Mathematics, and Research for Transformation (SMART) scholarships and the National Security Science and Engineering Faculty Fellowships (NSSEFF). These two projects educate, recruit, and retain clearable scientists and engineers by awarding scholarships and fellowships, some of which require civil service payback employment. Assistance is for clearable and employable candidates. They receive comprehensive academic education and training as well as mentorship, internship, and employment. These programs generate competent STEM professionals in critical DoD physical science disciplines and engage the nations top university researchers in critical, long-term DoD research.

B. Accomplishments/Planned Program:

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Material World Modules	4.600	6.500	13.000

FY 2007 Accomplishments:
 Expanded DoD laboratory involvement by three additional states and partnered with private sector STEM stakeholders in a coordinated effort on STEM education in middle and high schools.
 Organized and conducted next teacher training sessions. A total of 254 teachers from 13 states had completed training in MWM at the conclusion of FY07 activities.

FY 2008 Planned program
 Expand DoD laboratory involvement and partner with private sector STEM stakeholders in a coordinated effort on STEM education at the middle and high school level.

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY RDTE, Defense Wide BA 01	PE NUMBER AND TITLE 0601120D8Z - National Defense Education Program (NDEP)	PROJECT P120
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Organize and conduct final teacher training sessions.

FY 2009 Planned program

Expand and balance DoD laboratory involvement and partner with private sector STEM stakeholders in a coordinated effort on STEM education at the middle and high school level in school systems across the USA.

Development of new learning modules.

Continue and expand the organization and execution of DoD S&E and school system teacher training sessions.

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Pre-Engineering Partnerships (new start)		3.500	10.000

FY 2008 Planned program

Provide hands-on, inquiry-based learning of real-world math, engineering, and science principles that tie physical science and mathematics learning to real-world applications for middle school students.

Fund development of additional computer-based curriculum modules that encourage, stimulate, and engage middle school students

Evaluate and select proposals for broad module implementation.

Award contracts

FY 2009 Planned program

Provide hands-on, inquiry-based learning of real-world math, engineering, and science principles that tie physical science and mathematics learning to real-world applications for middle school students.

Fund development of additional computer-based curriculum modules

Initiate assessment of module effectiveness for purpose intended

Exercise first contract option for implementation or re-compete

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Science, Mathematics and Research for Transformation (SMART)	13.825	26.588	34.572

FY 2007 Accomplishments

106 SMART awards made. Applications were invited from the public for science and engineering educational support at the associate, undergraduate, and graduate degree levels. The application window for FY08 awards closed on 14 Dec 2007.

Modified program based upon input from the previous year lessons learned.

Continued assessment of SMART program.

Developed metrics to assess utility of SMART program.

FY 2008 Planned program

Invite applications from the public for science and engineering educational support at the associate, undergraduate, and graduate degree levels.

Modify program as indicated based upon input from the previous year lessons learned.

Report assessment of SMART program.

Review metrics with field activity directors to assess utility of SMART program

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

APPROPRIATION/ BUDGET ACTIVITY RDTE, Defense Wide BA 01	PE NUMBER AND TITLE 0601120D8Z - National Defense Education Program (NDEP)	PROJECT P120
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FY 2009 Planned program
 Invite applications from the public for science and engineering educational support at the associate, undergraduate, and graduate degree levels.
 Modify program as indicated based upon input from the previous year lessons learned.
 Report assessment of SMART program.
 Review metrics with field activity directors to assess utility of SMART program

<u>Accomplishments/Planned Program Title:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
National Security Science and Engineering Faculty Fellowships (NSSEFF) (new start)		7.400	11.400

FY 2008 Planned program
 Creates a competitive award program with substantial financial support for outstanding scientists and engineers that is large enough to be attractive and long enough to produce quantifiable research results. Fellowships awards are \$600K annually for five consecutive years. Funds 50 top-flight researchers over the FYDP and adds 10 more each year thereafter, all working on critical DoD research issues. Engages, without additional funding, at least double that number of graduate students and post-docs, each receiving substantial DoD funding at a critical juncture in their careers. Engages for the long-term, the absolute best available university research talent to pursue DoD research.
 Issue competitive fellowship announcement for research in areas of DoD long-term interest. Public announcement for the competitive fellowships will be advertised in national professional journals in January 2008.
 Evaluate proposals and select first fellowship recipients. Biased toward early-career faculty members.

FY 2009 Planned program
 Conduct Fellows S&T conclave with COCOM leaders and assess results
 Re-direct and revise research areas as needed for FY 2008 and FY 2009
 Issue competitive fellowship announcement for research in areas of COCOM long-term interest
 Evaluate proposals and select next fellowship recipients.

C. Other Program Funding Summary Not applicable for this item.

D. Acquisition Strategy Not applicable for this item.

E. Major Performers

Category	Name	Location	Type of Work and Description	Award Date
<u>Labs/Centers</u>				
	Naval Postgraduate School	Monterey, CA	These funds are provided for the execution of the Science, Mathematics and Research for Transformation (SMART) Defense Education Program and for execution of NSSEFF grants.	Jul 07

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

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<u>FFRDCs</u>				
	Institute for Defense Analysis	Arlington, VA	These funds are provided for the technical, programmatic, and administrative support of the National Security Science and Engineering Faculty Fellowship (NSSEFF) Program.	Dec 07