

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1		PE NUMBER AND TITLE 0601111D8Z - Government/Industry Co-sponsorship of University Research						
Cost (\$ in Millions)	FY 2006 Actual	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total Program Element (PE) Cost	9.552	9.147	0.000	0.000	0.000	0.000	0.000	0.000
P111 Government/Industry Co-sponsorship of University Research	9.552	9.147	0.000	0.000	0.000	0.000	0.000	0.000

A. Mission Description and Budget Item Justification: (U) GICUR provides early access to leading-edge military technologies and reduces vulnerabilities for the electronics manufacturing industries involved. Industry and government co-sponsor (required one-for-one dollar match) next generation semiconductor electronics research at five university-based Focus Research Centers.

(U) FY 2007 Estimate reflects Congressional add for the Focus Center Research Program (8000) and a Bio/Nano Electronic Defense Devices and Sensors program (1200).

Focus Research Centers:

1. Interconnect Focus Center, Georgia Institute of Technology, Atlanta, GA
 2. Materials/Structures/Devices Center, Massachusetts Institute of Technology, Cambridge, MA
 3. Functional Engineering Nano-Architectonics Center, University of California at Los Angeles, Los Angeles, CA
 4. Gigascale Design Center, University of California at Berkeley, Berkeley, CA
 5. Circuits, Systems, and Software Focus Center, Carnegie Mellon University, Pittsburgh, PA
- Through the Defense Advanced Research Projects Agency, the Focus Center Research program is administered by the Microelectronics Advanced Research Corporation (MARCO).

Bio/Nano Electronic Defense Devices and Sensors:
FY2007 Congressional initiative

<u>B. Program Change Summary</u>	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)	10.038	0.000	0.000	0.000
Current BES/President's Budget (FY 2008/2009)	9.552	9.147	0.000	0.000
Total Adjustments	-0.486	9.147	0.000	0.000
Congressional Program Reductions		-0.053		
Congressional Rescissions				
Congressional Increases		9.200		

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1		PE NUMBER AND TITLE 0601111D8Z - Government/Industry Co-sponsorship of University Research		
Reprogrammings	-0.200			
SBIR/STTR Transfer	-0.286			
Other				

Two FY07 Congressional Initiatives were added to this PE:

- Bio/Nano Electronic Defense Devices and Sensors - 1,200
- Focus Center Defense Research Program (Transferred from RDT&E, DW Line2) - 8,000

C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Not Applicable.

E. Performance Metrics: Not Applicable.

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1		PE NUMBER AND TITLE 0601111D8Z - Government/Industry Co-sponsorship of University Research						PROJECT P111	
Cost (\$ in Millions)	FY 2006 Actual	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	
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(U) FY 2007 Estimate reflects Congressional add for the Focus Center Research Program (8000) and a Bio/Nano Electronic Defense Devices and Sensors program (1200).

Focus Research Centers:

1. Interconnect Focus Center, Georgia Institute of Technology, Atlanta, GA
 2. Materials/Structures/Devices Center, Massachusetts Institute of Technology, Cambridge, MA
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- Through the Defense Advanced Research Projects Agency, the Focus Center Research program is administered by the Microelectronics Advanced Research Corporation (MARCO).

Bio/Nano Electronic Defense Devices and Sensors:
FY2007 Congressional initiative

B. Accomplishments/Planned Program:

Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Interconnect Focus Center, Georgia Institute of Technology, Atlanta, GA	2.100	7.947	0.000	0.000

FY 2006 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.

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1	PE NUMBER AND TITLE 0601111D8Z - Government/Industry Co-sponsorship of University Research	PROJECT P111		
FY 2007 Plan				
<ul style="list-style-type: none"> To continue from FY 2006 with the integration of optical materials with silicon will be explored and demonstrated. Optical links will continue to be developed and measurements of power consumption and bit-error rate will continue to be collected. Experiments with nanotubes will continue to be conducted, leading to the development and refinement of accurate models of transient performance, including parasitic reactances. 				
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Materials/Structures/Devices Center, Massachusetts Institute of Technology, Cambridge, MA	1.570	0.000	0.000	0.000
FY 2006 Accomplishments				
<ul style="list-style-type: none"> 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. 				
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Functional Engineering Nano-Architectonics Center, University of California at Los Angeles, Los Angeles, CA	1.220	0.000	0.000	0.000
FY 2006 Accomplishments				
<ul style="list-style-type: none"> 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. 				
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Gigascale Design Center, University of California at Berkeley, Berkeley, CA	2.017	0.000	0.000	0.000
FY 2006 Accomplishments				
<ul style="list-style-type: none"> 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. 				
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
rcuits, Systems, and Software Focus Center, Carnegie Mellon University, Pittsburgh, PA	2.645	0.000	0.000	0.000
FY 2006 Accomplishments				
<ul style="list-style-type: none"> 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. 				

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

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APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1	PE NUMBER AND TITLE 0601111D8Z - Government/Industry Co-sponsorship of University Research	PROJECT P111
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Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Bio/Nano Electric Defense Devices and Sensors Program	0.000	1.200	0.000	0.000

FY 2007 Plan

- DARPA has not provided identification of performer has not been provided. No proposal has been received.

C. Other Program Funding Summary	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	To Compl	Total Cost
0601101E Defense Research Sciences	127.893	145.239	152.622	156.242	0.000	0.000	0.000	0.000	0.000	581.996

Comment:

D. Acquisition Strategy: Not Applicable.

E. Major Performers Not Applicable.

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1		PE NUMBER AND TITLE 0601114D8Z - Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)						
Cost (\$ in Millions)	FY 2006 Actual	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total Program Element (PE) Cost	11.817	9.478	5.878	2.833	0.000	0.000	0.000	0.000
P114 Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)	11.817	9.478	5.878	2.833	0.000	0.000	0.000	0.000

A. Mission Description and Budget Item Justification: (U) The Defense Experimental Program to Stimulate Competitive Research (DEPSCoR) is a legislated program that builds national infrastructure for research and education by funding research activities in science and engineering fields. 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 states are invited, through their NSF State EPSCoR Committee, to compete for research/infrastructure awards in areas identified by the department in Broad Agency Announcements regularly published by the Services.

(U) Funding for this program will be reduced by about half in FY 2008 and the remaining half in FY 2009. It will terminate thereafter. The funds reduced in FY 2008 and FY 2009 will be transferred to the National Defense Education Program (PE 0601120D8Z) to support science, technology, engineering, and mathematics education at all levels.

(U) A recent broad survey of the Services was unable to identify any DEPSCoR awards that led to applications used by, or supportive of, the warfighter. The Global War Against Terrorism (GWAT) is exacting a high cost from DoD, including support for science and technology. DoD must make R&D investments supporting GWAT, short-term tactical innovations, and long-term solutions to continuing operational problems. There is an increased emphasis to fund research and development that is fully competitive and merit-based within DoD's mission area. Relying on merit-based competitions, data suggests that institutions in DEPSCoR states do well in NDEP competitions. For example, ~25% of the FY 2005 Science, Mathematics and Research for Transformation (SMART) Defense Education Program awards went to students attending institutions located in DEPSCoR eligible states. Academic institutions from states eligible for DEPSCoR do perform valuable research for DoD Research, Development, Test and Evaluation programs.

<u>B. Program Change Summary</u>	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)	12.365	9.532	9.839	9.874
Current BES/President's Budget (FY 2008/2009)	11.817	9.478	5.878	2.833
Total Adjustments	-0.548	-0.054	-3.961	-7.041
Congressional Program Reductions		-0.054		

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1	PE NUMBER AND TITLE 0601114D8Z - Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)
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Congressional Rescissions				
Congressional Increases				
Reprogrammings	-0.200			
SBIR/STTR Transfer	-0.348			
Other			-3.961	-7.041

C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Not Applicable.

E. Performance Metrics: Not Applicable.

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1		PE NUMBER AND TITLE 0601114D8Z - Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)						PROJECT P114	
Cost (\$ in Millions)		FY 2006 Actual	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
P114	Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)	11.817	9.478	5.878	2.833	0.000	0.000	0.000	0.000

A. Mission Description and Project Justification: (U) DEPSCoR builds national infrastructure for research and education by funding research activities in science and engineering fields. Participation in this program is limited to states that meet eligibility criteria. Annually, USD(AT&L) determines state eligibility based on legislative guidelines. State EPSCoR Committees in eligible states, invite their educational institutions to compete for research/infrastructure awards in Broad Agency Announcements regularly published by the Services. Awards are made to states which distribute funds to performing organizations.

(U) There is only one project in this PE: DEPSCoR

(U) Historical note: Through FY 2000 DEPSCoR was funded within the University Research Initiative Program (PE 0601103D8Z).

B. Accomplishments/Planned Program:

Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)	11.817	9.478	5.878	2.833

FY 2006 Accomplishments:

- Awarded 25 separate grants for research/infrastructure support to 22 academic institutions in 17 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: \$460,000 (each; total over the three year grant period).

FY 2007 Planned Program:

- FY07 BAA closed 31 October 2006. Following evaluation and selection, FY 2007 DEPSCoR grants will be announced in March, 2007.

FY 2008 Planned Program:

- Plan and initiate a reduced program for FY 2008 which will award approximately 10 DEPSCoR awards.

FY 2009 Planned Program:

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY
RDT&E/ Defense Wide BA# 1

PE NUMBER AND TITLE

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

PROJECT

P114

- Plan and initiate a reduced program for FY 2009 which will award approximately 5 DEPSCoR awards.

C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Not Applicable.

E. Major Performers

Category	Name	Location	Type of Work and Description	Award Date
<u>Labs</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 tht is competitive under the peer-review.	03 MAR 2006
	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 tht is competitive under the peer-review.	03 MAR 2006
	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 tht is competitive under the peer-review.	03 MAR 2006

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1		PE NUMBER AND TITLE 0601120D8Z - National Defense Education Program (NDEP)						
Cost (\$ in Millions)	FY 2006 Actual	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total Program Element (PE) Cost	11.420	19.420	44.372	58.972	86.938	106.021	113.106	114.884
P120 National Defense Education Act (NDEA)	11.420	19.420	44.372	58.972	86.938	106.021	113.106	114.884

A. Mission Description and Budget Item Justification: (U) Section 1101 of the National Defense Authorization Act (NDAA) for Fiscal Year 2005 and the National Defense Authorization Act of 2006 establish and modify this program

(U) DoD employs almost half of the Federal Government's 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 the 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 NDEP's 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 DoD's 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 recipient's types of allowable expenses.

B. Program Change Summary	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)	10.119	19.532	26.075	31.663
Current BES/President's Budget (FY 2008/2009)	11.420	19.420	44.372	58.972
Total Adjustments	1.301	-0.112	18.297	27.309
Congressional Program Reductions		-0.112		
Congressional Rescissions				
Congressional Increases				

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1		PE NUMBER AND TITLE 0601120D8Z - National Defense Education Progam (NDEP)		
Reprogrammings	1.589			
SBIR/STTR Transfer	-0.288			
Other			18.297	27.309

C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Not Applicable.

E. Performance Metrics: Not Applicable.

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1		PE NUMBER AND TITLE 0601120D8Z - National Defense Education Act (NDEA)					PROJECT P120	
Cost (\$ in Millions)	FY 2006 Actual	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
P120 National Defense Education Act (NDEA)	11.420	19.420	44.372	58.972	86.938	106.021	113.106	114.884

A. Mission Description and Project 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: These two projects 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.

There are two projects in this area: Material World Modules and Pre-Engineering Modules.

(U) Undergraduate, Graduate, Post-Graduate: 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 nation's top university researchers in critical, long-term DoD research.

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).

B. Accomplishments/Planned Program:

Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Material World Modules	2.969	4.600	2.000	0.000

FY 2006 Accomplishments:

- National & Maryland Centers established, impact experiment completed, teacher training completed. A cadre of teachers was trained (at a summer institute) in the use of Inquiry-Based Instruction and the use of the Materials World Modules (MWM) as a teaching tool. A random matched experiment to determine the effectiveness of the MWM as a learning tool was also conducted. An independent

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1	PE NUMBER AND TITLE 0601120D8Z - National Defense Education Act (NDEA)	PROJECT P120
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evaluator assessed teacher training and student experiment components.

- Results of the experiment are expected in early 2007.

FY 2007 Planned program

- Expand DoD laboratory involvement to threes states and partner with private sector STEM stakeholders in a coordinated efforts on STEM education in middle and high school.
- Organize and conduct next teacher training institutes.

FY 2008 Planned program

- Expand DoD laboratory involvement to nine states and partner with private sector STEM stakeholders in a coordinated efforts on STEM education in middle and high school.
- Organize and conduct final teacher training institutes.

Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Pre-Engineering Modules (new start)	0.000	0.000	13.000	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

Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Science, Mathematics and Research for Transformation (SMART)	8.451	14.820	23.972	37.572

FY 2006 Accomplishments

- 32 SMART awards made.

FY 2007 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.
- Continue assessment of SMART program.

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY RDT&E/ Defense Wide BA# 1	PE NUMBER AND TITLE 0601120D8Z - National Defense Education Act (NDEA)	PROJECT P120
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- Develop 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
- 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

Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
National Security Science and Engineering Faculty Fellowships (NSSEFF) (new start)	0.000	0.000	5.400	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 (up to the SECRET level) 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
 - Evaluate proposals and select first nine fellowship recipients. Biased toward early-career faculty members.
- FY 2009 Planned program
- Conduct Fellows S&T conclave with COCOM leaders - 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 ten fellowship recipients.

C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Not Applicable.

OSD RDT&E PROJECT JUSTIFICATION (R2a Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY
RDT&E/ Defense Wide BA# 1

PE NUMBER AND TITLE
0601120D8Z - National Defense Education Act (NDEA)

PROJECT
P120

E. Major Performers

Category	Name	Location	Type of Work and Description	Award Date
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Labs

	Naval Post Graduate School	Monteray, CA	These funds are provided for the execution of the Science Mathematics and Research for Transformation (SMART), Pilot Scholarship Program.	26 APR 2005
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