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Exhibit R-2, RDT&E Budget Item Justification						Date: February 2005		
Appropriation/Budget Activity RDT&E,DW/BA 3				R-1 Item Nomenclature: Medical Advanced Technology, PE 0603002D8Z				
Cost (\$ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Total PE Cost	5.915	4.691	0.000	0.000	0.000	0.000	0.000	0.000
Medical Adv. Technology/P506 Subtotal Cost	5.915	4.691	0.000	0.000	0.000	0.000	0.000	0.000
A. Mission Description and Budget Item Justification:								
<p>(U) This program supports applied research for advanced development of biomedical strategies to prevent, treat and assess health consequences from exposure to ionizing radiation. It capitalizes on findings under PE 0602787DZ, Medical Technology, and from industry and academia to advance novel medical countermeasures into and through pre-clinical studies toward newly licensed products. Program objectives focus on mitigating the health consequences from exposures to ionizing radiation that represent the highest probable threat to US forces under current tactical, humanitarian and counter-terrorism mission environments. Findings from basic and developmental research are integrated into highly focused advanced technology development studies to produce the following: (1) protective and therapeutic strategies; (2) novel biological markers and delivery platforms for rapid, field-based individual dose assessment; and (3) experimental data needed to build accurate models for predicting casualties from complex injuries involving radiation and other battlefield insults. The Armed Forces Radiobiology Research Institute (AFRRI), because of its multidisciplinary staff and exceptional laboratory and radiation facilities, is uniquely positioned to execute the program as prescribed by its mission. Because national laboratories operated by the Department of Energy no longer support advanced research relevant to military medical radiobiology, AFRRI is currently the only national resource carrying out this mission.</p>								
B. Program Change Summary:								
	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>				
Previous President's Budget:	5.941	2.063	2.539	2.590				
Current FY 2006 President's Budget Submission:	5.915	4.691	0.000	0.000				
Adjustments to Appropriated Value:	-0.026	+2.628	-2.539	-2.590				
Congressional Program Reductions:	-0.026	-0.072						
Congressional Rescissions:								
Congressional Increases:		+2.700						
Reprogrammings:					-2.539*		-2.590*	
SBIR/STTR Transfers:								
Program Adjustment:								

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*NOTE 1: Program transfers effective FY 2006 from RDT&E Budget Activity 3, Program Element 0603002D8Z to Defense Health Program (DHP). Plans for FY 2006 and beyond remain unchanged under DHP.

NOTE 2: FY 2005 congressional add of \$1.2 million for Integrated Medical Information Technology Systems to be transferred to appropriate agency for execution.

C. Other Program Funding Summary: Not applicable

D. Acquisition Strategy: Not applicable

E. Performance Metrics:

By FY 2005 obtain “investigational new drug” status for a therapeutic agent to mitigate radiation injury.

By FY 2006 provide software tools for biodosimetric assessment.

By FY 2010 transition 4 new drugs for FDA approval for treatment of radiation injury.

By FY 2010 provide forward-fieldable biodosimetric tools.

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Exhibit R-2a, RDT&E Project Justification						Date: February 2005		
Appropriation/Budget Activity RDT&E, DW/BA 3					Project Name and Number Medical Advanced Technology, PE 0603002D8Z			
Cost (\$ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Medical Advanced Technology/ P 506	5.915	4.691	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal Cost								
A. (U) Mission Description and Budget Item Justification:								
(U) This program supports applied research for advanced development of biomedical strategies to prevent, treat and assess health consequences from exposure to ionizing radiation. It capitalizes on findings under PE 0602787D8Z, Medical Technology, and from industry and academia to advance novel medical countermeasures into and through pre-clinical studies toward newly licensed products.								
B. (U) Accomplishments/Planned Program:								
Cost (in \$ Millions)	FY 2004		FY 2005		FY 2006		FY 2007	
5-AED Preclinical Studies	0.553		0.020		0.000		0.000	
<p>FY 2004 Accomplishments: In FY 2003, in compliance with FDA requirements, pharmacokinetic and toxicity studies for 5-androstenediol were initiated in a large animal model through contract with a GLP certified laboratory. In vitro toxicity assessments on the contract did not demonstrate any toxicity. However, because the test article was unavailable from the pharmaceutical company for the primate studies, the contract was put on hold. The studies will resume early in FY 2005.</p> <p>FY 2005 Plans: Obtain results from toxicology and pharmacokinetic studies in primates. Contract out GLP efficacy studies on primates. Submit IND application to FDA/CDER. Transition to advanced development for Phase I clinical trials.</p>								
Cost (in \$ Millions)	FY 2004		FY 2005		FY 2006		2007	
Ex-Rad Radioprotectant (Congressional add)	1.000		1.500		0.000		0.000	
<p>FY 2004 Accomplishments: Collaborating with Onconova Therapeutics to evaluate the cellular and molecular mechanism by which Ex-Rad ON01210 exerts its radioprotective effects. Initiated studies on the toxicity, and pharmacology of the radioprotectant. Some of these studies will be performed by contract laboratories.</p> <p>FY 2005 Plans: Continue preclinical safety and toxicology studies in animal models in compliance with regulatory and quality assurance standards of the FDA.</p>								
Cost (in \$ Millions)	FY 2004		FY 2005		FY 2006		FY 2007	
Radiation Dose Assessment: Improving the Throughput	0.735		0.254		0.000		0.000	

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<p>FY 2004 Accomplishments: Defined high throughput approaches for dose assessment of mass casualties, to include improvements in quality control and quality assurance with data logging and bar-coding for example. In addition, demonstrated proof of concept that high throughput systems for lymphocyte isolation and metaphase spread preparation will work and are amenable to automation. Supplemental funding from NIAID allowed the purchase of necessary equipment for laboratory automation.</p> <p>FY 2005 Plans: Integrate the automation process for dicentric assay, including tracking system and automated assay preparation.</p>				
Cost (in \$ Millions)	FY 2004	FY 2005	FY 2006	FY 2007
Biodosimetry Assay Validation of PCC Assay	0.705	0.296	0.000	0.000
<p>FY 2004 Accomplishments: Initiated collaborative studies to assess the effect of sampling delay on the persistency of chromosome damage using the mouse. Continued validation of PCC assay using samples from accident victims and radiotherapy patients.</p> <p>FY 2005 Plans: Complete time-course study to determine the effect of sampling delay on the PCC assay. Establish multicolor chromosome aberration analysis. Continue validation of assays using samples from accident victims and radiotherapy patients.</p>				
Cost (in \$ Millions)	FY 2004	FY 2005	FY 2006	FY 2007
Biodosimetry Assay Validation of Molecular Markers	0.973	0.360	0.000	0.000
<p>FY 2004 Accomplishments: Demonstrated that the gene expression markers developed in peripheral blood lymphocytes irradiated ex vivo were up regulated in vivo in an animal model and in human radiotherapy patients. Developed a 4 target QRT-PCR assay for gene expression to increase assay throughput, increase the number of observable targets, conserve sample, and reduce assay cost.</p> <p>FY 2005 Plans: Using radiotherapy patients whenever possible, continue to validate the assays for both protein and gene expression markers. Initiate validation studies for gene expression and protein biomarkers in rodent exposed to radiation in vivo. Initiate studies to assess the responses follow partial body exposures. Begin development of fieldable protocols for blood collection, stabilization of sample, sample isolation, and assay.</p>				
Cost (in \$ Millions)	FY 2004	FY 2005	FY 2006	FY 2007
Biodosimetry Assessment Tool (BAT) and Blood Markers for biodosimetry	0.638	0.258	0.000	0.000

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<p>FY 2004 Accomplishments: Created the preliminary version of the “First Responder Radiological Assessment Triage” (FRAT) which is the PDA version of the software tool for dose prediction, “Biodosimetry Assessment Tool” (BAT). Evaluated accuracy of hematology analyzer and initiated testing of reliability, accuracy and dynamic range. Initiated development of hematology protocol with necessary quality control. Created hematology database from REAC/TS accident registry including photon and criticality exposure scenarios and initiated analysis of lymphocyte depletion kinetics for consideration to use to expand BAT and FRAT. FY 2005 Plans: Incorporate dose-dependent time window on lymphocyte depletion data analysis into BAT. Incorporate neutron criticality lymphocyte depletion data set into BAT. Complete FRAT software application. Complete hematology protocol development and exercise deployable hematology system.</p>				
Cost (in \$ Millions)	FY 2004	FY 2005	FY 2006	FY 2007
Assessment of uranium exposure	0.111	0.083	0.000	0.000
<p>FY 2004 Accomplishments: Began assessment of commercially available resins to concentrate urinary uranium to increase the sensitivity of methodology for the rapid detection. Continued synthesis of imprinted polymers capable of sequestering uranium. FY 2005 Plans: Assess the utility of imprinted polymers to concentrate urinary uranium. Assess the utility of chelation chromatography methodologies for the concentration of uranium in urine.</p>				
Cost (in \$ Millions)	FY 2004	FY 2005	FY 2006	FY 2007
Integrated medical information technology systems (Congressional add)	0.000	1.200	0.000	0.000
NOTE : Funds to be transferred to appropriate agency for execution				
Cost (in \$ Millions)	FY 2004	FY 2005	FY 2006	FY 2007
Infection Therapies	1.200	0.720	0.000	0.000
<p>FY 2004 Accomplishments: Demonstrated a non-specific biological response modifier (beta-1,3-1,6 glucan) and the antimicrobial agent ceftriazone enhanced survival of opportunistic infection with K. pneumoniae in sublethally irradiated mice. The combination therapy was superior to either the beta glucan or the antibiotic alone. FY 2005 Plans: Determine the pharmacokinetics of gatifloxacin, ciprofloxacin, and moxifloxacin in mice after irradiation. Evaluate a variety of antibiotics for their efficacy to treat gram-positive and gram-negative infections that result after lethal irradiation.</p>				
<p>C. Other Program Funding Summary: Not applicable.</p> <p>D. Acquisition Strategy: Not applicable.</p> <p>E. Major Performers: Armed Forces Radiobiology Research Institute, Bethesda, MD.</p>				

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Exhibit R-2, RDT&E Budget Item Justification						February 2005		
Appropriation/Budget Activity RDT&E.DW/BA3		R-1 Item Nomenclature: SO/LIC Advanced Development - PE 0603121D8Z						
Cost (\$ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Total PE Cost	32.861	35.586	34.529	35.021	35.982	36.856	37.495	38.366
Explosive Ordnance Disposal/Low-Intensity Conflict/P206	11.087	9.411	9.343	9.487	9.440	9.909	10.109	10.333
Special Reconnaissance Capabilities /P207	19.804	23.179	21.214	21.501	22.529	22.734	23.087	23.640
Information Dissemination Concepts /P208	1.970	2.996	3.972	4.033	4.013	4.213	4.299	4.393

A. Mission Description and Budget Item Justification:

P206, Explosive Ordnance Disposal/Low-Intensity Conflict (EOD/LIC). The EOD/LIC program provides advanced technology and equipment solutions for military EOD operators and Special Operations Forces (SOF) to meet the challenges of Improvised Explosive Devices (IEDs), force protection and the war on terrorism. EOD/LIC efforts focus primarily on the access, detection, identification, and neutralization of all types of conventional explosive ordnance and improvised explosive devices. Requirements submitted by the Joint Service EOD and Service Special Operations communities are prioritized and approved by OASD (SO/LIC).

P207, Special Reconnaissance Capabilities (SRC). The SRC program exploits, leverages, and integrates DoD's service and agency efforts to improve surveillance and reconnaissance tools (unattended sensors, tagging devices, data infiltration/exfiltration, remote delivery, and mobility/delivery of sensors), while providing risk reduction for DoD and other agency technology and development programs. The SRC Program identifies, integrates, and operationalizes the technical tools for the collection of actionable information against a variety of targets and mission requirements, including Global War on Terrorism (GWOT) and maintains DoD's on-line catalog of tools in order to minimize crisis response time for special reconnaissance and surveillance.

P208, Information Dissemination Concepts (IDC). Information Dissemination Concepts (IDC) is a new program within the SO/LIC Advanced Development PE0603121D8Z. The IDC program addresses technology capabilities necessary to enable sustained information dissemination campaigns in denied areas. The IDC program, working as necessary with DoD and the interagency, develops, modifies, and demonstrates concepts, mechanisms, platforms and payloads to propagate themes and messages that convince target audiences to take action favorable to the United States and its allies.

B. Program Change Summary:

	<u>FY2004</u>	<u>FY2005</u>	<u>FY2006</u>	<u>FY 2007</u>
Previous President's Budget	31.300	32.723	33.752	34.100
Current President's Budget	32.861	35.586	34.529	35.021
Total Adjustments				
Congressional program reductions				
Congressional rescissions				
Congressional increases	2.800	3.700		
Reprogrammings	1.561	2.863	.777	.921
SBIR/STTR Transfer	(.592)			
Other Program Adjustments	(.647)	(.041)	(.017)	

C. Other Program Funding Summary: NA

D. Acquisitions Strategy: NA

E. Performance Metrics:

SO/LIC Advanced Development - PE 0603121D8Z; Explosive Ordnance Disposal/Low-Intensity Conflict/P206; Special Reconnaissance Capabilities /P207; Information Dissemination Concepts /P208	
Long Term Strategies: Obtain adequate funding to support critical shortfalls; prioritize proposals that are deemed acceptable and allocate funding accordingly; and establish outreach to leverage institutional knowledge and expertise.	
Performance Indicator and Rating:	
FY 2004 Target	<ul style="list-style-type: none"> • 70% of currently funded research projects completed on time and within budget • 5% increase in the number of research projects accepted • Complete 90% of scheduled R&D tasks
FY 2004 Rating	ON TARGET
FY 2005 Target	<ul style="list-style-type: none"> • 70% of currently funded research projects are completed on time and within budget • 5% increase in the number of research projects accepted • Transition scheduled projects to user communities
FY 2006 Target	<ul style="list-style-type: none"> • 70% of currently funded research projects are completed on time and within budget • 5% increase in the number of research projects accepted
FY 2007 Target	<ul style="list-style-type: none"> • 70% of currently funded research projects are completed on time and within budget

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	<ul style="list-style-type: none">• 5% increase in the number of research projects accepted
Basis of FY 2004 to Date Performance Rating	Currently the number of funded research projects are on track to be completed per the target
Verification	The SO/LIC Advanced Development Program projects each track the status of their efforts. Reviews are conducted to assess project status. Oversight of the entire effort is undertaken by ASD SO/LIC.
Validation	Completed research products increase the capabilities of the DoD to effectively detect, deter and defend against terrorist attacks; defeat improvised explosive devices and unexploded ordinance; and enable sustained information operations in denied areas - thus the Department's personnel and interests at home and abroad are safer.

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Exhibit R-2a, RDT&E Project Justification						February 2005		
Appropriation/Budget Activity RDT&E.DW/BA3		Project Name and Number SO/LIC Advanced Development 0603121D8Z						
Cost (\$ in millions)	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011
Explosive Ordnance Disposal/Low-Intensity Conflict/P206	11.087	9.411	9.343	9.487	9.444	9.909	10.109	10.333

A. Mission Description and Budget Item Justification: P206, Explosive Ordnance Disposal/Low-Intensity Conflict (EOD/LIC). The EOD/LIC program provides advanced technology and equipment solutions for military EOD operators and SOF to meet the challenges of improvised explosive devices (IEDs), force protection and the war on terrorism. EOD/LIC efforts focus primarily on the access, detection, identification, and neutralization of all types of conventional explosive ordnance and improvised explosive devices. Requirements submitted by the Joint Service EOD and Service Special Operations communities are prioritized and approved by OASD (SO/LIC).

B. Accomplishments/Planned Program

	FY 2004	FY 2005	FY 2006	FY2007
Accomplishment/Effort/Subtotal Cost	11.087	9.411	9.343	9.487

FY2004 Accomplishments: Developed a limpet mine neutralization tool for use by EOD divers to destroy explosive threats to warships. Developed and evaluated the EOD underwater search remotely operated vehicle (ROV) for identification of bottom and moored seamines. Developed the EOD dispersion suppressive system for containment of blast from improvised explosive devices (IED). Developed a real-time radiography system for rapid x-ray imaging of large improvised explosive devices. Developed and demonstrated the Tele-present Remote Aiming Platform (TRAP) on the Autonomous Remote Transport System (ARTS) robot for remote neutralization of scattered submunitions. Developed a miniature diver display system (MDDS) to display sonar imagery to military divers. Developed a remote automated munitions clearance system for remote aiming of a variety of military weapons. Developed an EOD improved incendiary tool for nonexplosive burnout of explosive fill material in conventional ordnance. Designed and evaluated a launching ramp for new Naval Special Clearance Team – One surface craft. Evaluated and demonstrated the military utility of the Segway Human Transporter for improved mobility of explosive ordnance disposal technicians. Multiple Segways were deployed in CENTCOM. Deployed the MK 6 Benign Case Entry System to an operational EOD team.

FY2005 Plans:

Complete development of an improved underwater demolition charge to facilitate the destruction of sea mines. Demonstrate new ballistic protection for the Special Operations Craft – Riverine (SOC-R). Complete development of a laser aiming and ranging system for robotic platforms. Finish development of a new recoilless explosive disruption system to neutralize IEDs. Demonstrate tactical decision aids for Special Operations Forces. Field a joint digital reporting system for EOD incidents. Evaluate commercial active thermal protection systems for cooling EOD technicians while wearing personal protective ensembles. Demonstrate an advanced lift balloon for EOD divers.

Advance the development of an auxiliary module for the standard Remote Activation Munitions System (RAMS) to initiate shock tube remotely. Commercialize the Combat Diver Display Mask (IDDM) for Marine Corps divers. Transition a low-cost, expendable ground robotic vehicle for IED disruption into an acquisition program. Demonstrate an unmanned riverine reconnaissance vehicle for use by Navy Special Warfare. Demonstrate a prototype wall breaching system for inclusion in the fielded SOF Demo Kit. Continue the development of low-cost, field supportable robotic ground vehicles. Design a radar IED detection system for use on tactical vehicles. Demonstrate a prototype database of navy ships for use in underwater hull searches.

Develop a low-cost tactical training round for the MK 40 long range disrupter. Initiate development of a radiography system with a capability for port mortuary operations while deployed. Integrate the current EOD digital radiography system with commercial photographic capabilities and a fiber optics control link. Design a limpet mine removal tool for use by EOD divers. Initiate development of a command and control link for unmanned ground vehicles using magnetic inductive technology. Prototype a explosive threat simulation system for student evaluation at EOD School.

FY2006 Plans:

Finalize development of integrated dive mask for military divers to improve safety. Complete development of a low-cost unmanned ground vehicle for IED neutralization. Demonstrate an enhanced prototype unmanned riverine reconnaissance vehicle for Navy Special Warfare. Provide fieldable prototype Navy ship hull database. Provide a tactical wall-breaching capability for Special Operation Forces. Demonstrate a combination camera/digital x-ray for use in aiming EOD explosive disruption tools, and a fiber-optic command and control option when radio use is denied.

Continue the development of a low-cost tactical training round for the MK 40 Explosive Disrupter. Demonstrate a radiography capability for deployed EOD port mortuary operations. Fabricate a radar for the detection of roadside IEDs. Demonstrate a diver operated tool for the removal of limpet mines from ship hulls. Demonstrate magnetic inductive technology in a command and control link for unmanned ground vehicles. Demonstrate an improved simulator at EOD School for training and evaluating students.

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Initiate the development of an expert system for selecting appropriate EOD tools in the field. Begin design of frangible 7.62mm and .50 caliber ammunition to improve safety during small munitions disruption. Develop a sidearm with a low magnetic signature. Develop a decelerator to safely catch slugs from EOD standoff disruption tools. Initiate the development of a catalogue of types of ballistic protection materials.

FY2007 Plans:

Finalize development of a low-cost tactical training round for the MK 40 Explosive Disrupter. Complete demonstration of a radiography capability for deployed EOD port mortuary operations. Demonstrate a decelerator to safely catch slugs from EOD standoff disruption tools. Transition a diver operated tool for the removal of limpet mines from ship hulls. Complete development of magnetic inductive technology in a command and control link for unmanned ground vehicles.

Continue the development of an expert system for selecting appropriate EOD Tools in the field. Develop prototype frangible 7.62mm and .50 caliber ammunition to improve safety during small munitions disruption. Demonstrate a sidearm with a low magnetic signature. Populate a catalogue of types of ballistic protection materials.

Initiate the development of back blast protection for operator launched missiles. Improve fuel tank safety on board small boats. Develop of a low cost disposable remote firing set receiver for use on expendable vehicles.

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Exhibit R-2a, RDT&E Project Justification						February 2005		
Appropriation/Budget Activity		Project Name and Number						
RDT&E.DW/BA3		SO/LIC Advanced Development 0603121D8Z						
Cost (\$ in millions)	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011
Special Reconnaissance Capabilities /P207	19.804	23.179	21.214	21.205	22.529	22.734	23.087	23.640

A. Mission Description and Budget Item Justification: P207, Special Reconnaissance Capabilities (SRC). The SRC program exploits, leverages, and integrates DoD's service and agency efforts to improve surveillance and reconnaissance tools (unattended sensors, tagging devices, data infiltration/exfiltration, remote delivery, and mobility/delivery of sensors), while providing risk reduction for DoD and other agency technology and development programs. The SRC Program identifies, integrates, and operationalizes the technical tools for the collection of actionable information against a variety of targets and mission requirements, including Global War on Terrorism (GWOT) and maintains DoD's on-line catalog of tools in order to minimize crisis response time for special reconnaissance and surveillance.

B. Accomplishments/Planned Program

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	19.804	23.179	21.214	21.205

FY 2004 Accomplishments: Program provided technology support to GWOT to include variants of unattended ground sensor prototypes for maritime and ground persistent surveillance missions with associated technology training. Assessed, evaluated, and initiated the integration of various tag capabilities for end-to-end operations in concert with user CONOPS. Demonstrated radio frequency (RF) tagging capability using national and theater sensor platforms. Enhanced and evaluated military utility of next generation optical tags. Developed and performed end-to-end assessment of next generation small beacon TTL device. Assessed and began integration of an improved day and night optics capabilities into remoted capabilities. Integrated and demonstrated improved reliable unattended electro-optics, acoustic, magnetic, seismic, and other unattended ground sensors into the remoted capabilities. Initiated the integration of GPS and remote wake up into remoted capabilities. Developed and demonstrated the capability to automatically detect, acquire and exfiltrate a target moving past a remoted camera. Improved power management, endurance and reliability of remoted capabilities. Enhanced functionality and expanded access of on-line information to supporting commands, DoD activities and OGAs. Assessed more than 10 reconnaissance capabilities and conducted four technology evaluations to assess operational capabilities. Leveraged advanced sensing, tracking, communications and power technologies with DoD and OGA to accelerate the transition of advanced SR technology to operational community.

FY 2005 Plans: Integrate new micro sensors into prototype remoted capabilities. Conduct end-to-end testing of extremely small, power efficient, beacon device. Continue the following tasks: to provide technology support to the Global War on Terrorism to include, technology training and variants of unattended ground sensor prototypes for maritime and ground persistence surveillance; to

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identify, evaluate and operationalize sensor and tagging, tracking, and locating technologies to enhance the technical performance of reconnaissance and surveillance missions; to insert operational capable prototypes into operator training exercises to vet tactics, techniques and procedures for employment; to refine family of tags for both end-to-end operations, mission specific, emplacement for installation and removal capabilities in concert with user CONOPS; to enhance and evaluate Radar TTL capability; to enhance and evaluate the capabilities of optical tags; to research, evaluate and integrate remote and TTL emplacement; to improve data infiltration and exfiltration capabilities through the integration of advanced technology and new communications links; to improve SR optic capabilities through the integration of advanced optic technology and processing; to improve SR power capabilities through the integration of advanced power technologies and device redesign; to exploit remote control capabilities by reducing form factors, improving power management, and integrating air droppable and maritime capabilities; to perform field evaluations of selected SR technologies and document results in on-line SRC knowledgebase; to support cooperative projects and evaluate technology maturity for new capabilities with the DoD and OGA that accelerates the transition of advanced SR and TTL technology to operational the community.

FY 2006 Plans: Provide technology support to DoD with emerging SR precise location prototype technologies. Develop micro sensor controller for hand emplacement, and air and maritime employment. Continue the following projects: to provide technology support to the Global War on Terrorism to include, technology training and variants of TTL and unattended ground sensor prototypes for maritime and ground persistence surveillance; to engage the research and development community for technical solutions and candidate technologies to improve DoD SR mission capabilities; to evaluate and operationalize sensor and tagging, tracking, and locating capabilities through insertion of maturing mini and micro technologies to enhance the technical performance of SR missions; to insert operationally capable prototypes into operator training exercises to vet technologies and to develop tactics, techniques and procedures for employment; to research, evaluate and integrate enhanced tagging and sensing capabilities to enable remote and standoff emplacement; research, evaluate and integrate emerging netted sensor technologies into remoted capabilities; to integrate improved SR data infiltration and exfiltration capabilities through the development and integration of advanced technology and new communications links; to perform field evaluations of selected SR technologies and document results in on-line SRC knowledgebase; and to support cooperative projects with DoD and OGA to accelerate the transition of advanced SR technologies to operational community.

FY 2007 Plans: Insert operationally capable prototypes into operator training exercises to vet technologies and new develop tactics, techniques and procedures for employment. Continue to: provide technology support to the Global War on Terrorism to include, technology training and variants of TTL and unattended ground sensor prototypes for persistence surveillance; engage the research and development community for technical solutions and candidate technologies to improve DoD SR mission capabilities; evaluate and operationalize sensor and tagging, tracking, and locating capabilities through insertion of mini and micro maturing technologies; research, evaluate and integrate enhanced tagging and sensing capabilities to extend mission life and standoff emplacement; integrate extended life mission sensors, micro optics, fingerprinting, emerging precise location technologies, and improved netted SR data infiltration and exfiltration capabilities; research, evaluate and integrate emerging netted sensor technologies into remoted capabilities; perform field evaluations of selected SR technologies and document results in on-line SRC knowledgebase; and support cooperative

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projects with the DoD and OGA Intelligence Agencies to accelerate the transition of advanced R&S technology to operational community.

Exhibit R-2a, RDT&E Project Justification						February 2005		
Appropriation/Budget Activity RDT&E.DW/BA3		Project Name and Number SO/LIC Advanced Development 0603121D8Z						
Cost (\$ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Information Dissemination Concepts/P208	1.970	2.996	3.972	4.033	4.013	4.213	4.299	4.393

A. Mission Description and Budget Item Justification: The Information Dissemination Concepts (IDC) program addresses technology shortfalls necessary to enable sustained information dissemination campaigns in denied areas. The IDC program, working as necessary with DoD and the interagency, develops, modifies, and demonstrates concepts, mechanisms, platforms and payloads to propagate themes and messages that convince target audiences to take action favorable to the United States and its allies. IDC also includes other aspects of information operations to include advanced analysis and planning techniques.

B. Accomplishments/Planned Program

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	1.970	2.996	3.972	4.033

FY 2004 Accomplishments: This is the first year of this program. The Multimedia Alert Processing Systems (MAPS) is in prototype development and being evaluated by USSOCOM and USCENTCOM. All other efforts are either new starts or accelerating other efforts. Continue efforts on the psychological operations (PSYOP) analysis support environment (PSYASE) in order to conduct impact analysis of PSYOP campaigns. Began effort to install a Ku-band satellite antenna and a video/audio receive capability on the EC-130J Commando Solo aircraft. This capability will enable the EC-130J to receive PSYOP products while on station increasing the responsiveness of providing distribution of products into denied areas. Started project to test and evaluate commercial compression software in an effort to reduce the amount of transponder bandwidth and downlink power required for PSYOP support as well as reducing the operational costs.

FY 2005 Plans: Continue RD&TE efforts on PSYASE, as well as facilitating the testing of prototype PSYASE technology to the USSOCOM Global Reach ACTD. Multimedia Alert Processing System (MAPS) development will continue in order to deploy additional prototypes into the USSOCOM and USCENTCOM area of responsibility. A new focus area for FY 2005 is Scatterable Media Technologies, which identifies the capability to project information into denied areas of operations in support of psychological operations. This project will examine technologies, which will specifically address information dissemination techniques into physically denied areas that possess mature information infrastructures.

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FY 2006 Plans: Support counter-terrorism and combating terrorism operations by continuing the development of information operations tools and technologies, and expanding translation capabilities and monitoring of local radio and Internet dissemination of foreign news services. Develop information dissemination requirements in support of instability and counter- narcotic operations. Start new projects defined through collaboration efforts to address technology shortfalls.

FY 2007 Plans: Continue to expand IDC in support of all SO/LIC missions. Work closely with the Information Operations community in order to leverage information technology development across DoD agencies with the focus of supporting military operations.

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Exhibit R-2, RDT&E Budget Item Justification						February 2005		
Appropriation/Budget Activity		R-1 Item Nomenclature:						
RDT&E.DW/BA3		Combating Terrorism Technology Support (CTTS) - PE 0603122D8Z						
Cost (\$ in millions)	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011
Total PE Cost	94.720	97.661	55.301	66.624	79.391	82.754	85.327	89.140
Combating Terrorism Technology Support/P484	94.720	97.661	55.301	66.624	79.391	82.754	85.327	89.140

A. Mission Description and Budget Item Justification: This program develops technology and prototype equipment that address needs and requirements with direct operational application in the national effort to combat terrorism. Projects support antiterrorism, counter terrorism, intelligence, and terrorism consequence management activities to: conduct tactical operations; protect military forces, civilian personnel, installations, infrastructure elements and the general populace from terrorist attack; detect, neutralize, and mitigate the effects of conventional and unconventional devices; conduct surveillance and tracking of terrorists; conduct threat and incident assessments; and process and disseminate information. The program integrates Defense advanced development efforts with government-wide and international efforts to combat terrorism. The Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict oversees and is responsible for execution of the CTTS program, which addresses defense, interagency, and international combating terrorism technology requirements.

B. Program Change Summary:

	<u>FY2004</u>	<u>FY2005</u>	<u>FY2006</u>	<u>FY2007</u>
Previous President's Budget	60.526	46.778	44.575	44.980
Current President's Budget	94.720	97.661	55.301	66.624
Total Adjustments				
Congressional program reductions				
Congressional rescissions				
Congressional increases	38.200	52.116	10.726	21.644
Reprogrammings				
SBIR/STTR Transfer	(2.128)			
Other program adjustments	(1.878)	(2.323)		

C. Other Program Funding Summary: NA

D. Performance Metrics:

Combating Terrorism Technology Support - PE 0603122D8Z	
D. Performance Metrics	
Long Term Strategies: Obtain adequate funding to support critical shortfalls; prioritize proposals that are deemed acceptable and allocate funding accordingly; establish outreach programs with the interagency to leverage institutional knowledge and expertise; utilize cooperative R&D agreements with the United Kingdom, Canada and Israel to leverage technology; and initiate full cooperative R&D programs with two new foreign partners.	
Performance Indicator and Rating:	
FY 2004 Target	<ul style="list-style-type: none"> • 70% of currently funded research projects completed on time and within budget • 5% increase in the number of research projects accepted • Negotiate MOAs with new foreign partners • Initiate threat/technology solutions workshop program
FY 2004 Rating	ON TARGET
FY 2005 Target	<ul style="list-style-type: none"> • 70% of currently funded research projects are completed on time and within budget • 5% increase in the number of research projects accepted • Initiate pilot cooperative R&D program with new foreign partners • Continue threat/technology solutions workshop program
FY 2006 Target	<ul style="list-style-type: none"> • 70% of currently funded research projects are completed on time and within budget • 5% increase in the number of research projects accepted • Expand pilot R&D programs with two new foreign partners to full cooperative programs • Continue threat/technology solutions workshop program
FY 2007 Target	<ul style="list-style-type: none"> • 70% of currently funded research projects are completed on time and within budget • 5% increase in the number of research projects accepted • Continue full R&D programs with existing and new foreign partners
Basis of FY 2004 to Date Performance Rating	Currently the number of funded research projects are on track to be completed per the target
Verification	The CTTS Program utilizes a database to track the status of the projects. Quarterly program reviews are conducted to assess project status. In addition an annual report is produced which assesses the status of current projects and the ability to accept new projects.
Validation	Completed research products increase the capabilities of the DoD to effectively detect, deter and defend against terrorist attacks; thus the Department's personnel and interests at home and abroad are safer from terrorism.

Exhibit R-2a, RDT&E Budget Item Justification						February 2005		
Appropriation/Budget Activity		Project Name and Number						
RDT&E.DW/BA3		Combating Terrorism Technology Support - PE 0603122D8Z						
Cost (\$ in millions)	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011
Combating Terrorism Technology Support	94.720	97.661	55.301	66.624	79.391	82.754	85.327	89.140

A. Mission Description and Budget Item Justification: This program develops technology and prototype equipment that address needs and requirements with direct operational application in the national effort to combat terrorism. Projects are distributed among ten mission categories: Chemical, Biological, Radiological, and Nuclear Countermeasures; Explosives Detection; Improvised Device Defeat; Infrastructure Protection; Investigative Support and Forensics; Physical Security; Training Technology Development; Surveillance, Collection, and Operations Support; Tactical Operations Support; and VIP Protection. This program is a non-system, advanced technology development effort that demonstrates the utility or cost reduction potential of technology when applied to combating terrorism requirements. It includes technology development and proof-of-principle demonstrations in field applications and coordination to transition from development to operational use.

B. Accomplishments/Planned Program

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR COUNTERMEASURES

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	15.452	8.148	3.500	3.997

FY 2004 Accomplishments: Developed and tested advanced personal protective equipment and clothing. Designed and tested advanced systems to collect and detect biological and chemical agents and toxic industrial chemicals. Identified biological markers to quantify an individual's exposure to ionizing radiation. Evaluated new tools to detect food-borne attacks. Tested and operationally evaluated the portable water treatment system for critical facilities. Tested a cold-plasma system for decontamination against EPA standards. Assessed ozone as a decontamination agent for the building disinfection byproducts database. Developed a software application to facilitate improving chemical and biological (CB) protection capabilities for buildings. Tested the chemical sensor for the networked decontamination monitoring system. Evaluated the biological agent preservation system.

Conducted testing and field demonstration of a fiber-optic-based Distributed Chemical Sensor system. Validated the Electrostatic Decontamination System against chemical and biological agents. Tested the high-volume aerogel-based sampler collection system for aerosolized BW agents. Initiated lessons-learned database from bioterrorism exercises for use by the first responder community.

FY 2005 Plans: Develop and field-test the tactical self-contained breathing apparatus (SCBA) for specialized response units and advanced protective clothing for incident response personnel. Test new designs for CB escape hoods and conduct live-agent testing of

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the personal hydration CBR filtration system. Validate field methods for quantifying biological markers for personal exposure to ionizing radiation. Test a heat stress calculator for use by safety officers to manage worker heat-related health conditions. Deliver the final building disinfection byproducts database. Field-test the advanced high-volume air sampling systems for BW and CW agents. Develop and test the CW and BW water collection and detection system. Validate improved handheld BW immunoassays. Test initial prototypes of a small portable radio repeater system to maintain voice communication for military and first responders operating in underground environments. Evaluate protocols for a food security test kit for personnel protection at high-threat overseas government facilities.

Test the first building-scale installation of the fiber-optic-based Distributed Chemical Sensor system. Perform efficacy and toxicity testing of the Electrostatic Decontamination System to meet EPA requirements. Deploy initial lessons learned database from agricultural bioterrorism exercises and natural outbreak responses for use by the agricultural responder community.

FY 2006 Plans: Complete field testing of an advanced high-volume water sampling system for BW and CW agents. Field-test a small portable radio repeater system to maintain voice communication for first responders operating in underground environments. Operationally evaluate a food security test kit for personnel protection at high-threat overseas government facilities. Review initial designs for advanced personal protective equipment with improved heat stress management capabilities. Perform initial laboratory testing of a small personal toxic chemical and contact poison detector and dosimeter. Evaluate designs for toxic chemical release mitigation methods in an urban environment.

FY 2007 Plans: Conduct initial field and user tests on advanced personal protective equipment with improved heat stress management capabilities. Complete field tests for laboratory testing of a small personal toxic chemical and contact poison detector and dosimeter. Conduct modeling and initial user tests for toxic chemical release mitigation methods in an urban environment.

EXPLOSIVES DETECTION

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	8.023	6.937	4.500	5.330

FY 2004 Accomplishments: Conducted laboratory testing of trace explosives detection portals used in conjunction with metal detectors to evaluate concept of combining multiple explosives and weapons detection technologies into one system. Completed false alarm reduction for an explosive detection system that combines nuclear quadrupole resonance (NQR) with computed tomography. Characterized degree of canine ability to generalize from domestic to foreign explosives. Built NQR laboratory test bed for screening of mid size vehicles. Measured NQR signature for unconcealed explosives in laboratory test bed.

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FY 2005 Plans: Develop system for screening bottles for explosives and hazardous materials. Develop methods to improve canine handler selection and training. Evaluate methods to optimize canine performance. Determine feasibility of NQR for detection of large vehicle bombs. Conduct feasibility studies to assess emerging technologies for standoff explosives detection.

FY 2006 Plans: Demonstrate system for screening bottles for explosives and hazardous materials. Conduct comparative study of methods to optimize canine performance. Complete breadboard systems for standoff detection of explosives.

FY 2007 Plans: Test and evaluate breadboard systems for standoff detection. Implement canine optimization methods in operational pilot program.

IMPROVISED DEVICE DEFEAT

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	7.300	6.481	4.500	5.330

FY 2004 Accomplishments: Completed lab testing of recoilless variable velocity disruption system. Completed commercial transfer of the Standoff Connectivity Control Unit. Conducted an operational assessment of Explosive ordinance disposal (EOD) remote controlled vehicles (RCV) to identify and quantify user requirements. Field tested the fragmentation-free, field-expedient explosive access tool. Field tested and commercially transitioned a ruggedized radio frequency remote firing device. Completed development and field testing of a PDA based First Responders Tool for real-time information access. Completed safety characterization and testing of an EOD backpack toolkit and the first phase characterization of precision and general disruption EOD tools. Finished testing a downsized high-energy access and disablement device.

FY 2005 Plans: Initiate development of the First Responder Automated Data Tool (FRAT) Real Time Information Sharing System for web-based information support to bomb squads and First Responders. Develop and field test lightweight recoilless disrupters for small RCV platforms. Complete characterization of a recoilless breech for the PAN disrupter. Develop a tactical timed firing device for EOD operations. Develop and field test a multiple improvised explosive device (IED) disruption system that will integrate with existing robotic platforms. Develop an X-Ray emissions mitigation system. Develop and field test a vehicle bomb improvised explosive device (VBIED) integrated diagnostic & neutralization system. Continue evaluation and characterization of precision and general disruption tools.

FY 2006 Plans: Complete development of a tactical timed firing device, multiple IED disruption system and a VBIED integrated diagnostic & neutralization system. Develop a VBIED single sided diagnostic system that is fully integrated onto a robotic platform. Complete evaluation and characterization of precision and general disruption tools.

FY 2007 Plans: Complete development of a single-sided diagnostic system for VBIEDs that is fully integrated onto a robotic platform, and enhanced VBIED disablement tools.

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INFRASTRUCTURE PROTECTION

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	1.731	2.279	1.700	1.999

FY 2004 Accomplishments: Developed a prototype encryption algorithm and hardware platform for supervisory control and data acquisition (SCADA) system protection. Delivered two components of the Network Isolation Tool for integration testing. Developed software tool to protect against the insider threat to information systems. Developed and deployed the Pipeline Net software tool.

FY 2005 Plans: Deploy and test a software tool to model computer virus propagation and implement better mitigation strategies. Expand the deployment of the Pipeline Net software tool.

FY 2006 Plans: Develop and field a prototype early warning system for critical drinking water infrastructure. Develop and deploy configuration-based network security technologies.

FY 2007 Plans: Research more secure communication platforms for air traffic controllers. Develop improved tools for cyber security. Research methods to improve the monitoring and control systems for electric power substations.

INVESTIGATIVE SUPPORT AND FORENSICS

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	5.074	4.734	4.200	5.330

FY 2004 Accomplishments: Fielded advanced video tape enhancement and advanced audio tape enhancement software. Distributed forensic computer clandestine data capture devices. Developed questioned identification document software system with data link analysis. Designed computer counter-encryption modules. Evaluated and delivered advanced technology for audio voice identification. Proved concept of forensic link analysis of computers and their media through reach back signals. Continued advancement of forensic document examination methodology.

FY 2005 Plans: Complete and distribute forensic tools to recover and capture data from operating computers, cellular phones and personal digital assistants. Field counter-encryption tool based on distributed networking. Improve first responder-emergency software tools. Design virtual training simulators for forensic scientists. Complete and field forensic references in explosive residues, improvised explosive device components, commercial explosive, and pipe bombs. Validate and distribute advanced techniques for analysis of deoxyribonucleic acid (DNA) for physical traits and age of biological samples. Provide working versions of computer facial recognition tools. Publish criteria for forensic document examination methodology. Field advanced wireless video surveillance system. Distribute a validated language speaker recognition corpus. Field pocket fingerprint recovery kit, a firearms identification system and an improvised explosive device (IED) forensics software tool.

FY 2006 Plans: Provide report on stable isotope analysis of hair techniques to determine likely geolocation of suspected terrorists. Publish reports on standardized evaluation of latent print developers and statistical analysis of friction ridge matching criteria. Field a three dimensional crime scene modeling system. Develop systems and procedures for mass casualty identification. Coordinate and effect international forensic data exchange. Develop comprehensive steganalysis detection and decryption software.

FY 2007 Plans: Develop efficient gunshot residue testing for non-conventional ammunition. Field comprehensive steganalysis detection and decryption software. Advance evidence collection procedures and processing in chemical and biologically contaminated areas. Design and develop real time remote crime scene forensic support and examinations. Develop a streamlined encompassing forensic processing model for rapid examinations of IED post-blast evidence. Coordinate forensic processes with intelligence gathering systems. Design the next generation of speaker recognition system. Advance the state-of-the-art of computer forensics examinations.

PHYSICAL SECURITY

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	16.245	21.671	11.800	13.991

FY 2004 Accomplishments: Developed a portable, automated tester for walk-through metal detectors to validate compliance with the National Institute of Standards and Technology test standard. Operationally tested an advanced entry-point vehicle/driver identification system. Developed and fielded an enhanced expeditionary version. Evaluated a commercial, automated, under-vehicle inspection system. Published inspection/screening guides for screening rail cars and personnel for explosives or other contraband at entry points. Developed and field tested a lightweight, portable boom and underwater swimmer detection system to protect ships in port. Conducted a proof-of-concept test for a perimeter intrusion detection system using airport ground surveillance radar. Developed a wireless tactical video surveillance system for perimeter intrusion detection. Evaluated commercial smart video systems for detection and assessment of possible vehicle bomb threats. Operationally tested a long-range, optical, intrusion detection, tracking, and assessment system. Evaluated badging technologies for credentialing government employees, contractors, and visitors entering government facilities. Tested on redesigned and/or retrofitted structural and non-structural building components for blast effects from enhanced explosive mixtures. Delivered a simulation and prediction blast injury code for secondary debris field injuries. Developed, tested, and deployed a light, low-cost retrofit polymer armor solution for tactical vehicles that can be applied in the field. Developed a database to archive blast test data and make it easily accessible to government and military planners and engineers. Improved structural design models and validated modeling simulations by performing blast tests on columns and other structural and non-structural components using conventional high explosives and enhanced novel explosives. Performed dynamic testing of commercial-off-the-shelf blast resistant retrofit products. Characterized and calibrated a blast simulator that mimics the effects of enhanced novel explosives and conventional explosives at varying standoff distances and blast strengths. Deployed two web based information library portals that provide historical and on-going reports and research and development information on human lethality in a blast environment as well as blast effects and mitigation.

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Conducted blast performance tests on tactical protective equipment for soldiers and first responders.

FY 2005 Plans: Field test a portable, automated tester for walk-through metal detectors. Develop a remotely operated, concealed weapons detection capability using magnetic anomaly detection. Develop and lab test a faster, more accurate vehicle image recognition system at vehicle entry points. Develop and evaluate an enhanced mobile backscatter x-ray screening system for detecting explosives in vehicles and intermodal cargo containers. Conduct a pilot test of a credentialing system integrating a fingerprint biometric device with a smart card reader to enhance entry point security without hindering throughput. Develop a merchant vessel inspection guide to consolidate existing tactics, techniques, and procedures for Visit, Board, Search and Seizure teams and security personnel. Operationally evaluate a smart video intrusion detection system providing enhanced situational awareness for perimeter and area security. Demonstrate and transition a perimeter intrusion detection and tracking system using airport ground surveillance radar. Operationally test an improved, long-range, optical intrusion detection, tracking, and assessment system. Develop guidance for deployment of non-standard vehicle barriers in tactical and non-tactical applications. Begin development of an integrated security system architecture using existing or new radars, optical devices, and security sensors incorporating a rules-based alerting and secure, digitally authenticated communications. Continue to develop improved polymer materials for blast resistant protective coatings on tactical vehicles. Improve structural design models and validate modeling simulations by performing blast tests on columns and other structural and non-structural components using conventional high explosives and enhanced novel explosives. Promulgate performance criteria for structures in a blast environment. Investigate the use of fiber material to reinforce concrete bridge decks, columns and arches. Continue to research the efficiency of protective equipment in blast environments. Develop robust models of forward base fortifications and how they respond in a blast environment. Publish retro-fit techniques for suspension bridges, arch bridges, movable bridges and long span bridge. Construct a full size urban test facility to develop dynamic computational codes of results of enhanced novel explosives in an urban environment. Perform field testing on bridge structures and bridge components to verify vulnerability to explosive loads. Conduct vulnerability assessment of tunnels against the effects of conventional and enhanced novel explosives.

FY 2006 Plans: Conduct field tests and an operational evaluation of a remotely operated concealed weapons detection system using magnetic anomaly detection. Transition a portable, automated walk-through metal detector tester to commercial production. Develop an automatic remote identification system for vehicle drivers. Develop a paint which will show evidence of tampering when subjected to UV light. Develop a fingerprint-actuated padlock. Develop a portable ticket verifier with trace explosives detection, GPS positioning, and wireless alarm reporting. Develop an integrated suite of explosive detection tools to meet the high-throughput requirements of vehicle ferries. Field test an automatic under-vehicle inspection system. Publish a user manual for emplacing non-standard vehicle barriers in tactical and non-tactical applications. Continue development of an for an integrated security system architecture using existing and new radars, optical devices, and security sensors incorporating a rules-based alerting and secure digitally authenticated information processing. Begin development of a simulator for evaluating tactics, techniques, and procedures for operating a remotely operated weapons system. Develop a low-cost, wireless, self-organizing sensor system for protection in depth. Develop a swimmer interdiction system with a scalable response from notification through use of deadly force. Begin

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development of a harbor/port air defense system which does not disrupt the local electromagnetic spectrum and devices. Identify, assess and evaluate relevant commercial-off-the-shelf blast mitigation and hardening technologies for tunnels, bridges and railways against conventional high explosives and novel enhanced explosives; certify results and convert the information into useful engineering guidance and code. Model and field test existing commercial-off-the-shelf retrofit and hardening technologies to increase tunnel blast resistance. Develop advanced high fidelity instrumentation for measuring the tactical performance of improvised explosives to include thermal, optical, and seismic signatures. Use blast simulator test data for walls, columns, and other structural elements of buildings to validate computer models. Provide enhanced engineering and design guidance for retrofits and new construction. Conduct field tests and computer simulation modeling to demonstrate and determine blast response to field fortifications from enhanced novel explosive detonation. Determine the existing blast threshold capability of substations and cell towers to determine vulnerability and identify levels of protection utilizing commercial-off-the-shelf technology. Validate the integrity of barriers, barricades, bollards, and integral structural blast reinforcement techniques against multiple threat scenarios. Develop biofidelic physical surrogates that accurately represent human physiological response to a blast environment to further advancements in protective equipment.

FY 2007 Plans: Evaluate next generation biometric identification technologies for inclusion in integrated access control systems. Evaluate next generation weapons, explosives, and other contraband screening systems for facilities, public venues, and intermodal cargo terminals. Field test an automatic remote identification system for vehicle drivers. Field test a paint which will show evidence of tampering when subjected UV light. Field test a fingerprint-actuated padlock. Continue development of a portable ticket verifier with trace explosives detection, GPS positioning, and wireless alarm reporting. Field test an integrated suite of explosive detection tools to meet the high throughput requirements of vehicle ferries. Demonstrate an integrated security system architecture using existing and new radars, optical devices, and sensors incorporating a rules-based alerting and secure digitally authenticated information processing. Operationally evaluate a simulator for evaluating tactics, techniques, and procedures for operating a remotely operated weapons system. Field test a low-cost, wireless, self-organizing sensor system for protection in depth. Evaluate a swimmer interdiction system with a scalable response from notification through use of deadly force. Continue development a harbor/port air defense system which does not disrupt the local electromagnetic spectrum and devices. Convert and promulgate data on structural blast reinforcement into meaningful engineering and code guidance to the military, industrial and civil engineering community. Develop and test personal protective gear that improves survivability against injuries from enhanced novel and novel explosive blasts.

SURVEILLANCE, COLLECTION, AND OPERATIONS SUPPORT

	FY 2004	FY 2005	FY 2006	FY 2007
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Accomplishment/Effort/Subtotal Cost	10.757	8.176	7.800	9.327
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FY 2004 Accomplishments: Developed capability of monitoring multimedia broadcast information through automated language translation, key-word search and topic alerting. Improve intelligence analyst automation tools for dealing with large volumes of data including video and audio and including speech technology aids. Integrated multi-sensor systems for improved collection and targeting. Improved facial recognition, speech identification, and other technology biometric to assist in identifying terrorists on a watch list. Developed operational facial recognition database being used by the law enforcement community.

FY 2005 Plans: Develop system to triage and prioritize of foreign language media that includes filtering and fusion of information important to senior decision makers. Develop autonomous, networked collection systems that include next generation imaging sensors. Enhance unattended ground sensors through fusion and integration of multiple sensors. Apply advances in joint tagging, tracking and locating technology to improve maritime tagging and tracking. Improve access to open source media by providing broader language domains. Increased capability for long-range audio surveillance. Develop various plug and play sensors to support various UAV platforms. Integrate facial recognition technology into surveillance systems by including the application of multi-spectral imaging. Transition facial recognition database to the military.

FY 2006 Plans: Integrate multiple tagging, tracking and location technologies as a cue for other sensors or action. Continue to develop maritime tagging and tracking capability. Develop geolocation aids that do not rely on GPS. Improve long-range audio surveillance and processing capabilities. Investigate biometric and other novel technology areas to improve tagging, tracking, locating. Continue UAV sensor development.

FY 2007 Plans: Improve access to open source media through new language processing technologies for multimedia information from degraded input sources. Develop biometric and novel technology areas to improve tagging, tracking, locating. Apply the gains in facial recognition technology to long-range video surveillance. Enhance UAV collection capabilities with multi-sensor integration into plug and play architecture.

TACTICAL OPERATIONS SUPPORT

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	13.605	7.410	4.700	5.996

FY 2004 Accomplishments: Delivered fiber optic antenna extension system for satellite communications radios to provide remote positioning of the antenna from the transmitter using fiber optic connection. Delivered a wireless boat interior communications system for high-speed assault craft. Completed first independent assessment of commercial radiation detectors, using the new American National Standards Institute standard, and catalogued the validated performance. Completed tactical survey of potential terrorist targeted buildings (Commander Navy Region Southwest, the U. S. Naval Academy, and NASA Kennedy Space Center) to improve threat assessment, identification of vulnerabilities, and responder planning. (Congressional Add). Completed two simulated

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large terrorist incident training scenarios to evaluate and exercise coordination of command and control and responder activity involving different federal, military, state and local agencies under the direction of the Asymmetric Warfare Center. Conducted detailed workshop to assess the state of the art for 3D through wall imaging technologies.

FY 2005 Plans: Deliver prototype close quarter battle carbine and a prototype dual sensor night imaging weapons sight. Deliver a line of sight version of the fiber optic antenna extension system. Develop first generation Augmented Reality Training System for tactical assault teams. Improve tactical operator safety of a reduced fragmentation initiation device during explosive breaching missions. Enhance safety and distraction effect of next generation diversionary device for tactical teams. Develop advanced high power in-line sniper scope for enhanced viewing in all lighting conditions. Complete tactical surveys for select critical installations (e.g. Strategic Petroleum Reserve, San Diego International Airport) and conduct additional terrorism event scenarios under Asymmetric Warfare Center direction. Develop a powered ascending device to lift a tactical team member to heights of 100 ft at variable speeds.

FY 2006 Plans: Deploy advanced augmented reality training system to selected tactical response teams. Deliver reduced fragmentation initiation device to select tactical teams to enhance breaching operations. Deliver next generation diversionary device to tactical response teams for operational assessment. Conduct initial testing of a high power in-line sniper scope. Deliver powered climbing device to lift fully equipped assaulter up climbing rope for operational assessment.

FY 2007 Plans: Conduct operational assessment of high power in-line sniper scope. Upgrade and deliver improved augmented reality system based on user feedback. Deliver final assaulter climbing device. Begin development of integrated aim point and day/night scope with improved tactical effectiveness and reduced weight to enhance tactical weapon effectiveness.

TRAINING TECHNOLOGY DEVELOPMENT

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	3.439	13.321	2.200	2.665

FY 2004 Accomplishments: Developed Advanced Distributed Learning (ADL) software tools to provide intelligent tutoring for web-based courses and interoperability among commercial and custom-built learning/training management systems. Completed design and development of technology-enhanced training on small watercraft inspection, personnel screening, rail inspection, suicide bomber countermeasures, application of poly-urea coating for armor enhancement, and IED awareness. Conducted a proof of concept to adapt and enhance existing university programs to support training needs within the combating terrorism community. Fielded ADL training focused on the psychological aspects of terrorism and WMD events, and transitioned CBRN mobile laboratory technician training to the National Guard Bureau WMD Civil Support Team program.

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FY 2005 Plans: Develop of the next generation ADL delivery architecture for DoD. Create ADL software tools to design integrated on-line training and virtual reality training. Design and deliver performance and knowledge based training assessments. Produce a chemical and radiological stimulant kit that is intrinsically safe. Conduct training requirements analyses in support of CBRNE installation response training under the Guardian Program. Develop ADL training in chemical and biological counterterrorism awareness; command, control, and communications; force protection; medical surveillance and recovery; and, consequence management equipment for the Guardian Program. Validate end-user requirements for distributed, web-based simulation technologies in support of regional and large scale terrorism training exercises.

FY 2006 Plans: Analyze intelligent, open communication architectures, environments, tools, and services for integration with DoD delivery architecture. Integrate ADL software design and assessment tools into the DoD ADL delivery architecture. Develop training aids and devices to complement recently fielded TSWG advanced technologies.

FY 2007 Plans: Create knowledge management architectures, tools, and services to integrate performance and mission support systems with DoD ADL delivery architecture. Continue design and development of ADL training in CBRNE counterterrorism awareness; command, control, and communications; force protection; medical surveillance and recovery; and, consequence management. Integrate interactive simulation technologies with training and mission performance support capabilities.

VIP PROTECTION

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	4.732	10.683	4.826	5.997

FY 2004 Accomplishments: Validated advanced vehicle armor design for protection against tungsten carbide armor piercing bullets. Successfully tested of large aluminum oxynitride (AION) transparent armor for multiple hit performance. Delivered advanced cooling vest for wear under body armor and other protective clothing. Completed analysis of ballistic blunt trauma effects on female body armor. Coordinated the development of standards for fully armored passenger vehicles that includes ballistic, blast, transparent armor and performance protocols.

FY 2005 Plans: Continue to coordinate an integrated fully armored passenger vehicle standard, based on ballistic, blast, and transparent armor protocols. Deliver testing and characterization assessment of Spinel transparent armor. Develop processes for producing full scale AION windows in test vehicle. Begin operational evaluation of the full scale AION window performance in typical on and off road scenarios. Complete evaluation of selected environmental effects on body armor performance to improve NIJ body armor standards. Test, evaluate and deliver enhanced deployable shield system to allow rapidly erected VIP protection. Evaluate Instantaneous Personnel Protection Shield System (IPPS) for enhanced VIP protection. Begin development of highly reliable bullet detection system for integration into the IPPS. Evaluate integrated VIP vehicle tamper alerting system. Develop and evaluate laser detection system for windows to provide warning of laser activity. Assemble and integrate components of a rapidly deployable VIP security kit for use in temporary venues. Develop duress system for VIPs to alert protection details of threatening

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situations. Conduct advanced evaluation of body armor performance in multi-hit scenarios and evaluate metrics for dynamic effects of ballistic blunt trauma. Deliver RCIED ECM Joint Testing Protocol to DOD for operational implementation.

FY 2006 Plans: Deliver the Instantaneous Personnel Protection Shield System and continue development of sensor system for automated activation. Deliver VIP vehicle tamper detection and alerting system. Deliver window laser detection system for early warning of laser targeting activity. Deliver deployable VIP security kit. Upgrade previously developed Projectile Data Base to include new threat ammunition and frangible ammunition. Deliver VIP Duress System. Provide upgraded body armor testing standards to address multi-hit scenarios. Develop methodology to assess deterioration of personnel body armor and to determine criteria for taking armor out of service.

FY 2007 Plans: Evaluate methods for rapid detection of a broad range of laser energy that may be directed at VIPs. Provide broadened standards for assessment of body armor over the life of the system. Coordinate the development of advanced lightweight ceramic transparent armor. Assess blast effects on armored passenger vehicles and develop of methods to mitigate damage and personnel injury. Develop a fragmentation and IED blast/fragmentation test protocol to determine effects on VIP and protective detail armored vehicle.

PROGRAM MANAGEMENT

	FY 2004	FY 2005	FY 2006	FY 2007
Accomplishment/Effort/Subtotal Cost	8.362	7.821	5.575	6.662

FY 2004 Accomplishments: Provided program management oversight and technical support for CTTS R&D projects. Augmented the CTTS program office with contract, financial and security management personnel. Managed an additional \$70 million in funds from other agencies. Managed cooperative R&D programs with the United Kingdom, Canada and Israel. Initiated new cooperative R&D agreements with Australia and Singapore. Established interfaces to other government agencies for CTTS-related initiatives and to reinforce interagency and international participation in the identification and prioritization of CTTS mission area requirements. Solicited proposals, via Broad Agency Announcement, for new projects and tasks based on prioritized requirements. Directed the program, planning and execution of projects and associated contracts, including the daily management and reporting for more than 280 separate contracts and tasks. Developed and implemented improvements for the BAA Information Delivery System (BIDS) solicitation process including the establishment of collaborative source evaluation and selection tools. Developed and implemented process improvement initiatives for procurement request tracking and a Business Information System database.

FY 2005 Plans: Provide program management oversight and technical support for CTTS R&D projects including funds from other agencies and management of cooperative R&D programs with international partners. Establish goals, objectives, and plans that will reinforce interagency participation for the identification and prioritization of CTTS mission area requirements. Direct the program, planning and execution for projects and associated contracts using direct and indirect budget allocations. Review and revise existing process and execution plans for CTTS mission area management and internal and external reporting responsibilities.

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FY 2006 Plans: Provide program management oversight and technical support for CTTS R&D projects including funds from other agencies and management of cooperative R&D programs with international partners. Establish goals, objectives, and immediate revisions to plans that will reinforce interagency participation for the identification and prioritization of CTTS mission area requirements. Direct the program, planning and execution for projects and associated contracts using direct and indirect budget allocations. Review and revise existing process and execution plans for CTTS mission area management and internal and external reporting responsibilities.

FY 2007 Plans: Provide program management oversight and technical support for CTTS R&D projects including funds from other agencies and management of international cooperative R&D programs. Establish goals, objectives, and immediate revisions to plans that will reinforce interagency participation for the identification and prioritization of CTTS mission area requirements. Direct the program, planning and execution for projects and associated contracts using direct and indirect budget allocations. Review and revise existing process and execution plans for CTTS mission area management and reporting responsibilities.

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Exhibit R-2, RDT&E Budget Item Justification							Date: February 2005	
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3			R-1 Item Nomenclature: Joint DoD/DOE Munitions PE 0603225D8Z					
Cost (\$ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Total PE Cost DoD/DoE Munitions/P225	23.843	25.202	25.102	25.460	26.613	26.074	26.608	27.220
(U) A. Mission Description and Budget Item Justification:								
<p>(U) The Joint DoD/DOE Munitions Technology Program has the mission of exploration and development of technologies intended to bring about major improvements in non-nuclear munitions technology. A memorandum of understanding between DoD and DOE provides the necessary basis for long-term commitment of resources of the DOE and a similar long-term commitment of the enabling DoD support for this effort. The continuous fusion of DOE technology with Service needs has provided major advances in warfighting capabilities and plays a crucial role in the exploration, development, and transition of new technologies of interest to the Services. The program provides a unique opportunity for the collaboration of DoD and DOE scientists to explore technologies of programmatic interest to both departments, within a structured program of established Departmental reviews and milestones. The interdepartmental collaboration allows exchange of information and the focusing on achievement of goals of interest to the Department, utilizing the substantial investment in the scientific resources of the DOE. The budgeted program funds represented here are supplemented by additional matching DOE funds.</p> <p>(U) Over the last four years, there has been an increased programmatic emphasis on developing technologies of particular value to counter-terrorism capabilities and asymmetric warfare. Initial successes have already emerged from this focus with products currently in the field. The increase in Budget for FY 2004 and beyond was designed specifically to focus additional program efforts on exploring and developing technologies to transform the operational capabilities of the warfighter. Two specific efforts were targeted for this increase: The first is a new and rapidly emerging technology employing inert-loaded explosives which will enable precision lethality munitions usable in urban settings with minimal collateral damage; The second is the significant payoffs in capability and life cycle costs resulting from an understanding of sub-detonon response of energetic materials. This understanding is vital to addressing insensitive munition requirements compliance as well as exploiting deflagration and other sub-detonon response to achieve selectable weapon output. The inclusion of precision lethality munitions within the Joint Program is significant from a number of points of view. The program goal is the development of the understanding as well as the demonstration of the capability for a precision lethality munition, which combines substantially increased lethality within a prescribed region, with a low collateral damage beyond that region. Other anticipated characteristics of the precision lethality munitions are a reduced size over current munitions and satisfaction of insensitive munition requirements. The attainment of this goal requires simultaneous developments in the multiple program areas of energetic materials, computations and modeling, composites, penetration and warhead technology. This integrated effort within the Joint Program is a new approach which we believe will speed the transition of new technology through the development process. This effort has the strong support of all the Services and Special Operations Command. The sub-detonon mode of energetic material response is an area of research which has not received much attention. However, the ability to reliably predict the behavior of energetics subject to various insults such as bullet/fragment impact and thermal cook-off is essential to the</p>								

acquisition approval of all new systems. In addition, this same regime of sub-detonic behavior can be exploited to achieve multi-function, special purpose, and selectable yield weapons. All Services have programs which will greatly benefit from the results of these efforts.

(U) The program effort is divided into five technology areas of interest to Department munitions, each of which is described below. The names of some of the technology areas have been modified to better reflect the content of the projects contained within.

(U) Sensors and fuzing are critical components in every Department munition system. A fuze must ensure personnel safety by preventing unintended weapon detonation, know when to allow arming of a firing mechanism, detect the target through the use of sensors, and initiate detonation when required. With a current need for robust hard target defeat capability, advanced fuze systems must be able to survive and function in increasingly higher-velocity, higher-g penetration environments. One method of surviving high-g environments is through the miniaturization, integration, and/or robust packaging of conventional fuze components such as detonators, switches, transformers, capacitors, and sensors. In support of this technology area this program continues to demonstrate advances in miniaturizing high-voltage Electronic Safe and Arm Devices (ESAD) through research and development of low-energy detonator / booster combinations and miniature capacitive discharge units (CDUs). This focus builds on recent advances in micro-detonic/energetic materials research, and MEMS Safe and Arm Devices (MEMS-SAD). Efforts in this portion of the program generally advance fuze technology development and ultimately provide the DoD and DOE with viable fuzing components for all weapons, particularly hard-target-defeat munitions (penetrators) and small, intelligent low-cost applications (artillery). Over the next five years this portion of the program will work toward demonstrating emerging technologies that support robust, intelligent fuzing that can survive and function in environments exceeding 30,000 G's. Advanced initiation technology is an enabler for the next generation of warheads that will be aimable, target adaptable, and survivable.

(U) There is a requirement in the United States to develop weapons that offer the dual advantages of enhanced lethality against a variety of targets and increased safety of handling, transportation, and logistics. To realize this goal, energetic materials (EM) and their response to planned and unplanned insults must be developed, characterized, understood, and predictable. Lighter and/or less bulky munitions significantly impact the logistics burden on military actions. Similarly, a decrease in hazard classification brought about by the use of insensitive energetic materials and better design will greatly decrease transportation and storage logistics costs. Smarter munitions, capable of selectable, differential output, are another boon to military agility. Hence, there is also need for advanced EMs that can be used in small-scale devices such as distributed fuzing systems. In addition, as the intended environments have become more severe, EM's must survive setback forces in guns and severe impact forces in hard-target penetration applications.

Work in energetic materials is aligned with the recommendations from the DoD 2004 Weapons Technology Area Review and Assessment (TARA) and is coordinated with the national initiative in advanced energetic materials. This aspect of the program is aimed at developing the next-generation of EMs that have increased energy density over those in our current inventory while remaining insensitive to extreme environments. An additional requirement is that the energy be released in an appropriate time scale to allow optimized coupling to the target. For enhanced lethal effects the energy must be released either in the detonation reaction zone, or early enough in the expansion so that it couples to impulse loading or sustains high temperatures. Material ingredients that

contribute to energy release later than that offer no enhancement in lethality. A fundamentally new approach to increasing lethality while simultaneously reducing collateral damage is being investigated. Holding much potential for modern warfighting scenarios, this new material formulation provides increased performance while meeting insensitive munition standards. For microdevices suitable for distributed fuzing systems the requirement on energy release is very exacting in order to sustain reaction propagation in environments with extensive shock and heating losses.

A new area of interest and effort is to understand and characterize the sub-detonic, non-detonation region, of explosive behavior. This response results from stimuli that are insufficient in intensity to initiate a full detonation of the material, but sufficient to cause a sub-detonic response, such as combustion or deflagration. This area of behavior is vitally important to the design of Insensitive Munitions compliant weapons and can be exploited to produce selectable yield, multi-function weapons. Like advanced initiation, advanced energetic materials understanding is an enabling technology for the next generation of weapon systems that will be safer, more affordable, and more lethal.

(U) The ability to accurately predict the behavior of weapons in their operating environment of extreme pressure, temperature, and velocity is essential to the development of lethal, accurate, and cost effective systems. To meet the needs of the DoD and DOE communities, there is a requirement for validated capabilities using high-performance computing hardware and software that are sufficient to carry out a broad class of continuum mechanics simulations where shock waves, nonlinear dynamics, and multi-material gas dynamics are important. In particular, this aspect of the program focuses on numerical and algorithmic improvements to enhance our problem solving capabilities for munitions development, advanced energetics, and target lethality predictions with significantly improved material models that accurately represent the material in dynamic states. Three general classes of codes offer solutions to the varied requirements posed by the defense community in the shock analysis regime. Eulerian shock physics tools are effective for a large number of conventional weapons and advanced energetics related simulations. Anywhere there is very large material deformation and turbulent mixing, Eulerian formulations are the most efficient. A second class of codes addresses the large, nonlinear dynamics that can be important for weapons design and development. Such Lagrangian calculations provide design information that complements information provided by the Eulerian shock physics codes. For example, many penetration problems involve detailed structural mechanics that are not appropriate for Eulerian codes. A third class of tools combines capabilities by using arbitrary Lagrangian-Eulerian (ALE) algorithms to solve the conservation equations appropriate for shock analysis. This class of codes performs a range of simulations such as penetration mechanics, thermal cook-off, and fragment impact where multi-physics phenomena descriptions are required across a wide range of time scales, which cannot be addressed adequately with either Eulerian or Lagrangian codes. These codes and associated validated material models represent the future in modeling complex dynamics encountered in a broad spectrum of applications across the defense community. To date, the Department utilization of these capabilities is primarily in the S&T community. It is desirable to extend developing modeling and simulation tools into the engineering design community and this program will continue to provide supporting computational tools.

(U) There is a worldwide trend to harden more military facilities. Increasingly, these are being buried in layered earth and concrete “cut and cover” constructions, tunneled into mountainsides, or mined into rock far beneath the earth’s surface. Buried structures

accounted for a significant number of targets attacked by our forces during the Gulf, Afghanistan, and Iraq wars, and much of our military planning is being devoted to defeating them. A major thrust of this program continues to be hard target defeat. As hard target weapons evolve, several technical issues need to be addressed. Specifically, penetrators striking targets with obliquity or with high angles of attack experience violent dynamic responses that can fail their cases or interfere with the functionality of fuzes. Similarly, oblique, low velocity target impacts can result in ricochet, undesirable shallow trajectories, or bouncing out of the target. In general, new delivery vehicles tend to be smaller and faster, requiring smaller penetrators that carry less payload and must survive more stressing impacts. Developing improved penetrating weapons depends on a solid understanding of the physics of penetration as well as affordable materials and processes to execute new designs that require more strength and durability from the penetrator. Although we can predict penetration depth with acceptable confidence, there are some targets for which we have insufficient data and experience; consequently, predicting the path a penetrator will take and whether it will survive is much less certain. This program provides a fundamental penetration technology base that addresses many of these issues and enables our future strike weapons. Additionally, warhead concepts which greatly extend the current range of capabilities in speed and tailored target effects are being explored. With increasing emphasis and interest in defeating targets of military interest in civilian areas, and of defeating and neutralizing WMD facilities, the application of energy to target must be thoroughly controlled and understood. This requirement places new demands on warhead output, which are being pursued under this program.

(U) DoD and DOE efforts toward munitions lifecycle technologies including stockpile aging, surveillance, demilitarization and disposal are coordinated under the auspices of this program. The Department has a large and growing inventory of conventional munitions in its demilitarization stockpile. Currently, the stockpile includes more than 400,000 tons and it is expanding by about 70,000-100,000 tons per year. As the long term focus for demilitarization and disposal in DoD turns from open-burn and open-detonation to resource recycle and recovery, alternative technologies are required to turn waste materials into useful products. The technologies developed in this portion of the program enhance DoD capabilities to field safe, cost-effective processes for disposal, resource recovery, and reutilization of munitions and munitions components. For an aged weapons stockpile that has not reached end of useful life, reliability and surety will change with time because of the age-related degradation of constituent materials. Existing stockpile assessment methods typically focus on addressing materials aging and reliability problems after they occur, rather than on anticipating and avoiding future problems or failure mechanisms. The predictive materials aging and reliability portion of this program is focused on improving our ability to understand, measure, predict, and mitigate safety and reliability problems caused by materials aging degradation in weapons systems. Together with complementary demilitarization technologies, this focus provides a base of scientific knowledge and understanding that enhances the Department's ability to efficiently support the late phases of weapon lifecycle. Efficient management of existing stockpile assets is an economically necessary precursor to weapon system modernization.

B. Program Change Summary:

	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>
Previous President's Budget:	24.648	23.319	25.256	25.552
Current FY2006 President's Budget Submission:	23.843	25.202	25.102	25.460
Adjustments to Appropriated Value:	-0.805	+1.883	-0.154	-0.092
Congressional Program Reductions:	-0.186	-0.567		
Congressional Rescissions:				
Congressional Increases:		+2.450*		
Reprogrammings:				
SBIR/STTR Transfers:	-0.619			
Other:			-0.154	-0.092

*Congressional increase will be transferred to DARPA for execution

C. Other Program Funding Summary: N/A**D. Acquisition Strategy. N/A**

E. Performance Metrics: An annual Five Year Plan is prepared for this program which contains detailed descriptions of the approximately forty individual projects under this funding line. Each project description includes a task schedule with associated milestones, whereby progress against the end goals can be measured. Technical progress against these milestones is reviewed by DoD participants at semi-annual Technical Coordinating Group meetings.

Exhibit R-2a, RDT&E Project Justification							Date: February 2005	
Appropriation/Budget Activity RDT&E, Defense Wide/BA 3				Project Name and Number Joint DoD/DOE Munitions PE 0603225D8Z				
Cost (\$ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
DoD/DOE Munitions/P225	23.843	25.202	25.102	25.460	26.613	26.074	26.608	27.220
<p>(U) A. Mission Description and Budget Item Justification:</p> <p>(U) This R&D program is a cooperative, jointly funded effort between DoD and DOE to pursue new and innovative warhead, explosive, and fuze technologies in order to bring about major improvements in non-nuclear munitions. This program supports the development and exploration of new munitions concepts and technology preceding system engineering development. Through our funding arrangement with DOE, DoD resources are matched. More importantly, this relatively small DoD contribution effectively taps the annual billion-dollar DOE RDT&E investment by accessing the specialized skills, scientific equipment, facilities and computational tools not available in DoD.</p> <p>(U) The effort exploits the extensive and highly developed technology base resident in the National Laboratories relevant to achieving the goal of developing capable, cost-effective conventional munitions, and leverages DoD investments with matching DOE investments. The current program supports 44 projects in warhead technology, energetic materials, advanced initiation and fuze development, munitions lifecycle technology, and munitions modeling and simulation. A specific Service laboratory sponsors each of these projects. The program is administered and reviewed by a Joint Technical Advisory Committee composed of members from the Army, Navy, Air Force, Special Operations Command, OSD, and DOE. Projects are peer-reviewed semi-annually by DoD Service Laboratory/Technical Center personnel in order to monitor technical excellence and ensure that the technologies under development address priority DoD needs. The program is integrated with Service efforts through the Project Reliance Weapons Panel and participation in the Defense Technology Area Plan for Conventional Weapons. The program is reviewed under the Technology Area Review and Assessment process. After reviewing the program, the most recent Weapons TARA panel assessed the program as follows: broad range of products transitioned to DoD as a result of program efforts; effectively leverages DOE expertise and funding; critical computational tools provided to DoD; well integrated into Service efforts; Technology Coordination Groups provide an effective forum for technical collaboration.</p> <p>B. Accomplishments/Planned Program</p>								
Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007				
Initiation, Fuzing, and Sensors	5.021	4.920	4.990	4.484				

(U) FY 2004 Accomplishments:

(U) A new project was started with a focus on millimeter scale initiation and detonation. This work attempted to understand the behavior and response of thin layers and small quantities of explosives, as are required for all MEMS based fuzing and microfiresets. This was a key enabling technology for miniature munitions and remains a largely unstudied field. Specific work plans for 2004 included measurement of run to detonation and failure diameter studies on HNS-IV, CL-20 and high surface area PETN. Development and demonstration of improved components and architectures for robust, low-cost, miniature safing, arming and firing systems will continue. Individual control of multiple initiation sites within a warhead using silicon fireset circuits was demonstrated. Initial testing of extrudable explosive formulations was completed with a focus on the energy required for direct slapper initiation. Component development and evaluation continued and commercial sources for a robust manufacturing technology base were explored. An integrated capacitor and switch in a single package was demonstrated for use as a next generation microfuze component. Current state of the art micro-fuze technology was applied and focused on Special Operations Forces (SOF) requirements in order to enhance and expand SOF capabilities in various mission scenarios. The latest miniaturization technology was transitioned to production-type facilities and to the Services in order to begin exploitation. The study to understand and predict instabilities in multiple-slapper, highly miniaturized systems was completed towards the design of highly reliable and uniquely flexible ordnance systems. Experiments were performed that enabled development of the theory and models of explosive behavior in very small geometries (microdetonics). Materials resulting from new formulations and the sol-gel process were characterized and performance tested. MEMS devices were characterized and tested in stressing high-g environments. Completed most subsystems of the miniSAR and formed an industrial partnership to develop components, where appropriate.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Conduct tests to demonstrate and evaluate the utility of rapidly prototyped multipoint initiation systems to enhance the performance of munitions. Evaluate reduction in development cycle time and cost achieved by rapid prototyping, as well as improvement in multi-point bridge performance gained from careful control of individual bridge geometry. Continue component miniaturization and cost reduction efforts. Demonstrate a packaged microtransformer for use in miniaturized munitions. Complete streak photography and VISAR diagnostic measurements for improved slapper detonator efficiency. Perform Detonation Shock Dynamics (DSD) analysis of initiation system transfer into a main charge. Implement viable multipoint diagnostics, such as magnetic probes or PVDF gauges, onto an array for use in warhead evaluation tests. Continue Development of MEMS CDU components. Demonstrate a packaged MEMS-SAD. Complete set of environmental tests on second generation Silicon Fireset assemblies. Implement a 6 kV single n-MCT switch sufficient for initiating a multipoint array. Design a minimum energy slapper and extrudable explosive system for use in adaptable warheads. Towards a miniature, optically charged fireset, complete development of very small 10 layer capacitors and begin integration of nanostructure multilayer capacitor and switch. Continue detonator designs requiring reduced micro joules of stored energy to fire. Complete prototype impact triggered MEMS fuze. Transition rapid prototyping technology. Complete and fly the initial phase 1 version of miniSAR.

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Energetic Materials	6.123	5.911	6.901	7.116

(U) FY 2004 Accomplishments:

(U) Efforts to synthesize, characterize and scale-up new energetic materials with increased or tailored performance and decreased sensitivity were continued. Coordination with the national advanced energetics initiative also continued towards re-invigorating the energetic materials skill base within the Department. A summary report documenting the synthesis and scale up of LLM-105 as a booster explosive was distributed to the energetics and fuzing communities in completion of the effort. FY 2003 advances in sol-gel metal oxide chemistry were applied and focused on applications development and testing in support of specific Service requests for readily processed reactive materials and high performance thermitics. Energy and performance measurements of CO-derived and nitrogen HEDM's macro-samples were completed and the synthesis of additional extended solid HEDMs were explored. In FY 2004, Cheetah 4 released to the DoD community for performance predictions of an extended set of energetic materials. Development of ignition phenomenology models and design of ignition location experiments were completed in support of the effort to validate and expand codes for predicting weapon system performance and response in accident situations. The effort to preserve and transition energetic materials technology generated by the community continued with the distribution of an extended APEX database that will include over 500 energetic materials of different molecular structure. Support of enabling energetic materials technologies for low collateral damage munitions expanded with the development of near-field and far-field product equations of state for the baseline explosive fill selected in FY 2003. Energetic materials requirements for SOF focused microfuzer technology activities were supported through testing of different nano-fuel/oxidizer formulations and incorporation of multi-layer energetic materials into propagation micro-channels.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Continue development of nanoscale, microscale and mesoscale energetic materials with enhanced performance that are less sensitive and cost effective enablers for defense transformation. Demonstrate and characterize sensitivity and burning of hydrogen and nitrogen mixtures with nano-metals. Continue processing, scale-up, and performance characterization of low collateral damage energetic materials. In the area of high nitrogen energetic materials, continue measurements of burn rates and pressure-time histories for burning HN mixtures with nano Al, metals, and MIC; complete performance and sensitivity testing of azo-formamidines. Continue updating APEX explosives database on an 18 month cycle. Complete synthesis of ANTZ based target molecules as a new insensitive energetic material ingredient and synthesis precursor. Complete sol-gel metal oxides weaponization. Complete analysis of Navy fast cookoff experiments. Deliver high explosive grain scale continuum model for use in predicting the performance of plastic bonded explosives.

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Computational Mechanics and Material Modeling	6.112	6.213	7.391	7.216

(U) FY 2004 Accomplishments:

(U) Note that the large increase in funding for this technology area stems from the re-allocation of projects which previously were located in the Energetic Materials area. The increase in funding level does not indicate significant increase in activity. The new projects in this area relate to the modeling of the mechanical properties of explosive, polymers, and the generation of test data to validate the computational models. The development of Eulerian, Lagrangian, coupled and ALE codes relevant to the design and evaluation of munitions continued. Efforts continued in the development, implementation and validation of material constitutive and failure models supporting the simulation of warhead formation and warhead/target interactions. The program also provided a conduit to the improved materials models emerging from the DOE Advanced Strategic Computing Initiative providing high resolution, accurate predictions of materials behavior and failure relevant to the analyses of weapon systems. The transition and support of these tools and models along with user training were provided as needed. A particular growing effort in this year was the development of a mixed phase flow calculational capability to describe inert particle loaded explosives. This capability is essential to the understanding of low collateral damage phenomena.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Continue to develop, extend and apply the hydrocodes and associated materials models for warhead design and evaluation. Ongoing code and material model development will continue to focus on greater accuracy, improved physics, and extension to mixed phase flow problems. Continue to support the transition of these tools, the training, and consulting for the DoD user community. Complete tensile plasticity and damage model extension for use within warhead design codes. Towards a robust, mesh free warhead design tool, begin extension of Dual Particle Dynamic (DPD) methodology to three dimensions. Complete integration of CTH and NEVADA design tools. Complete fragment explosive initiation modeling in support of DoD initiatives. Continue advanced material model implementation for warhead design and evaluation. Validate predictive capability for low collateral damage munition performance and effect..

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Warhead Technology & Integration	3.999	3.272	3.014	4.124

(U) FY 2004 Accomplishments:

(U) Integration of all the components necessary for a low collateral damage munitions concept occurred. Energetic formulation, composite, case, and performance predictions based on modeling to date, were combined in this effort. Near term applications of this technology are believed possible based on these tests. Efforts to provide enabling technologies for defeat of hardened military targets continued. Dynamic compression studies of ES-1 and high-alloy steels were completed and documented. Three axis oblique penetration experiments into concrete targets to generate a data base for the DoD and DOE communities for code and model benchmarking. The focus was on obtaining data that revealed the dynamic rotations of the penetrator during entry and the resulting trajectory. The data provided to the DoD community for use in validating and benchmarking hard target design tools. Several new tasks were initiated to look at penetration in multi-layer targets, angle of attack effects on penetration and payload survivability, and a boosted penetrator concept as a means to increase penetration depth. The development and integration of the computational, explosive, penetration, and composite material technologies required for an enhanced alternative to the use of inert munitions against soft targets in urban areas were accelerated. Low collateral versions of existing bomb, such as Mk 82, are being fabricated and prepared for comparative test evaluation. The processing contribution of metal liner materials to enhanced performance continued with the emphasis on studying special grain boundaries. Previous work in the commercial arena has demonstrated significant mechanical and corrosion resistance properties are achievable through control of grain boundaries. Temperature measurements of shocked materials were applied to a variety of metals shocked to various stress states. Focus continued on the science-based technology projects relating warhead performance to material properties under dynamic conditions as a prelude to improved computational modeling and the transition of improved warhead designs to developmental and fielded weapon systems. The simulations of the Ta liner test-bed experiments continued in order to assess the utility of the new materials models in the warhead design process.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Continue low collateral damage verification and validation testing in comparison with current best baseline munition. Use test data to evaluate simulation capability in predicting target damage. Continue the study of advanced hard target penetrator concepts and adapt designs to state-of-the-art materials and manufacturing methods. Complete instrumented oblique penetration tests using the 3 axis data recorder. Complete target size penetration tests aimed at reducing the cost of penetration tests for the community by obtaining evidence of a size scale effect. Continue target diameter benchmarking efforts in support of size-scale effect testing. Continue improvements in modeling of target entry dynamics and trajectory predictions via field testing and analysis. Complete characterization of low cost, high hardness candidate penetrator materials. In the area of design improvements for hard target penetrators, complete survivability design concepts. Continue improvements to the hard target response predictive capability established in the Peridynamic design tool. Complete push control studies using alternative reactive warhead materials. Continue efforts towards an FY 2006 demonstration of energy coupling enhancement through initiation.

Accomplishment/Effort/Subtotal Cost	FY 2004	FY 2005	FY 2006	FY 2007
Munitions Lifecycle Technologies	2.588	2.436	2.806	2.520

(U) FY 2004 Accomplishments:

(U) Mid-scale testing of sensors that can detect particle emissions in explosive events commenced. The small and mid-scale sensor test results were used to generate a data base and analysis tools for standoff identification and specification of particles generated in detonation events. Disassembly and handling of ADAM mine projectiles were demonstrated. Adapt the robotics technology to the M77 grenade and demonstrate removal of MLRS M77 grenades from a warhead section. The technology for standoff monitoring of OB/OD events at DoD demilitarization sites was transitioned to a commercial partner. In the predictive materials aging and reliability area, measurements of the electrical response of dormant storage munitions electronic components commenced. Under the aging of propellants task, continued to participate in the service life predictive technology (SLPT) program. This consisted of improved characterization of critical chemical and physical aging processes in composite propellants, and formatting that information into constitutive models for into predictive 3-D reactive-diffusion codes. The particulate emissions identification project moved to actual large-scale open-air detonation events, where soil samples near the event have been characterized to provide a baseline signature.

(U) FY 2005 / FY 2006 / FY 2007 Plans:

(U) Complete real time particle size and composition analysis open air testing. Complete isothermal fatigue experiments for solder interconnect reliability studies. Transfer electronic corrosion predictive model to Service demilitarization efforts. Continue identification of critical DoD electronic components susceptible to corrosion failure. Complete studies aimed at determining propellant thermal decomposition kinetics. Continue analysis of DoD aged samples and participation in Predictive Service Life Technology program reviews as requested. Complete MEMS reliability monitor verification tests. Complete testing of stand-off sensor for rocket motor demilitarization. Complete explosive combustion studies for predicting toxic emissions in OB/OD events. Prototype, design, and fabricate M77 grenade handling and safing hardware. Continue identification and analysis of non-plastic encapsulated critical DoD weapon components. Measure age dependent weapon adhesive joint toughness at various temperature levels and high humidity. Apply interfacial fracture mechanics methodology to existing DoD/DOE weapon systems. Continue HX-874 propellant binder aging studies.

C. Other Program Funding Summary: N/A

D. Acquisition Strategy: N/A

E. Major Performers: The work is performed in-house at the three DOE National Laboratories responsible for nuclear weapons RDT&E: Lawrence Livermore, Los Alamos, and Sandia National Laboratories.

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Fiscal Year (FY) 2006 Budget Estimates Exhibit R-2, RDT&E Budget Item Justification						Date: February 2005		
Appropriation/Budget Activity Defense Wide RDT&E, BA3				R-1 ITEM NOMENCLATURE PE-0603400D8Z J-UCAS Advanced Technology Development and Risk Reduction				
COST (\$ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
J-UCAS PE-0603400D8Z	0.000	354.794	0.000	0.000	0.000	0.000	0.000	0.000

A. Mission Description and Budget Item Justification:

The Joint Unmanned Combat Air Systems (J-UCAS) program is a joint effort to develop and demonstrate unmanned combat capabilities for high-threat Suppression of Enemy of Air Defense (SEAD), Information Operations/ Electronic Attack, Persistent Surveillance/Reconnaissance, and related strike missions within the emerging global command and control architecture for the warfighting community. The J-UCAS program combines and expands the efforts that were previously conducted under the DARPA/Air Force Unmanned Combat Air Vehicle (UCAV) program and the DARPA/Navy Naval UCAV (UCAV-N) program. These efforts were targeted towards service-specific needs, however the Department recognized the potential for significant synergy by combining the programs. The accomplishments and ongoing efforts of the X-45A technology demonstrator, as well as the development of the X-47A demonstrator, are reducing the risk of the “operationalized” demonstration system being developed for a joint operational assessment (OA) planned for the FY 2007-2010 timeframe. The J-UCAS concept incorporates the next generation family of demonstrator air vehicles, together with common subsystems (e.g. sensors, payloads, communications) and a Common Operating System to achieve the system’s diverse mission functionality. These common system elements will maximize mission flexibility and operational versatility, while reducing overall costs and maintaining schedule toward a joint OA. The J-UCAS Office operates in close coordination with Service users and other operational components. The program is focused on demonstrating capabilities that support both Services and enable an operational system development decision by the end of the decade. PE 0603400D8Z is for Advanced Technology Development and Risk Reduction. These funds are used for the completion of demonstrations of the X-45A technology demonstrator, continued development of the Boeing and Northrop Grumman demonstrator programs, and the development of common systems technology elements.

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B. Program Change Summary:

	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>
Previous President's Budget:	0.000	284.617	77.785	0.000
Current FY2006 President's Budget Submission:	0.000	354.794	0.000	0.000
Adjustments to Appropriated Value:		+70.177		
Congressional Program Reductions:		-8.823		
Congressional Rescissions:				
Congressional Increases:		+79.000		
Reprogrammings:			-77.785	
SBIR/STTR Transfers:				
Other:				

C. Other Program Funding Summary:

	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>
PE 0604400D8Z, OSD	0.000	217.401	0.000	0.000	0.000	0.000	0.000
PE 0603114N, Navy	117.865	0.000	0.000	0.000	0.000	0.000	0.000
PE 0604731F, Air Force	160.551	0.000	0.000	0.000	0.000	0.000	0.000
PE 0207256F, Air Force	2.305	0.000	0.000	0.000	0.000	0.000	0.000
PE 0603285E, DARPA	41.385	0.000	0.000	0.000	0.000	0.000	0.000
PE 0603400F, Air Force	0.000	0.000	77.800	0.000	0.000	0.000	0.000
PE 0604400F, Air Force	0.000	0.000	272.300	400.100	554.100	780.500	955.200

D. Acquisition Strategy:

The J-UCAS program blends the advantages of both the Advanced Technology Demonstration (ATD) and the Advanced Concept Technology Demonstration (ACTD) concepts to facilitate rapid development and integration of advanced technologies in an experimental system that addresses operational needs. Using the next generation demonstrator air vehicle families, together with common subsystems and a Common Operating System, this nontraditional approach also incorporates key acquisition considerations (i.e., user requirements, comprehensive system lifecycle perspective, and rigorous risk mitigation processes) to provide the necessary insights, operational data and identified options for the services to make an informed decision for accelerated acquisition near the end

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of the decade. This effort is tightly coupled with PE 0604400D8Z (J-UCAS Advanced Component and Prototype Development), which complements the work under this program element to deliver systems for the joint operational assessment.

E. Performance Metrics:

2Q FY 2006 Delivery of 'Build 0', Basic Services Build of the Common Operating System (COS).

2Q FY 2007 Delivery of 'Build 1', Single Ship Build of the Common Operating System (COS).

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Fiscal Year (FY) 2006 Budget Estimates Exhibit R-2a, RDT&E Budget Item Justification						Date: February 2005		
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 3				R-1 ITEM NOMENCLATURE PE-0603400D8Z J-UCAS Advanced Technology Development and Risk Reduction				
COST (\$ in millions)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
J-UCAS PE-0603400D8Z	0.000	354.794	0.000	0.000	0.000	0.000	0.000	0.000

A. Mission Description and Budget Item Justification:

The Joint Unmanned Combat Air Systems (J-UCAS) program is a joint effort to develop and demonstrate unmanned combat capabilities for high-threat Suppression of Enemy of Air Defense (SEAD), Information Operations/ Electronic Attack, Persistent Surveillance/Reconnaissance, and related strike missions within the emerging global command and control architecture for the warfighting community. The J-UCAS program combines and expands the efforts that were previously conducted under the DARPA/Air Force Unmanned Combat Air Vehicle (UCAV) program and the DARPA/Navy Naval UCAV (UCAV-N) program. These efforts were targeted towards service-specific needs, however the Department recognized the potential for significant synergy by combining the programs. The accomplishments and ongoing efforts of the X-45A technology demonstrator, as well as the development of the X-47A demonstrator, are reducing the risk of the “operationalized” demonstration system being developed for a joint operational assessment (OA) planned for the FY 2007-2010 timeframe. The J-UCAS concept incorporates the next generation family of demonstrator air vehicles, together with common subsystems (e.g. sensors, payloads, communications) and a Common Operating System to achieve the system’s diverse mission functionality. These common system elements will maximize mission flexibility and operational versatility, while reducing overall costs and maintaining schedule toward a joint OA. The J-UCAS Office operates in close coordination with Service users and other operational components. The program is focused on demonstrating capabilities that support both Services and enable an operational system development decision by the end of the decade. PE 0603400D8Z is for Advanced Technology Development and Risk Reduction. These funds are used for the completion of demonstrations of the X-45A technology demonstrator, continued development of the Boeing and Northrop Grumman demonstrator programs, and the development of common systems technology elements.

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B. Accomplishments/Planned Program

	FY 2004	FY 2005	FY 2006
Accomplishment/Effort/Subtotal Cost	0.000	354.794	0.000

FY 2005 and FY 2006 Planned Program:

- Continue development of J-UCAS systems, specifically the Boeing and Northrop Grumman demonstrator programs as well as the common operating system and sensors.
- Prepare for joint Operational Assessment (OA).

C. Other Program Funding Summary:

	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>
PE 0604400D8Z, OSD	0.000	217.401	0.000	0.000	0.000	0.000	0.000
PE 0603114N, Navy	117.865	0.000	0.000	0.000	0.000	0.000	0.000
PE 0604731F, Air Force	160.551	0.000	0.000	0.000	0.000	0.000	0.000
PE 0207256F, Air Force	2.305	0.000	0.000	0.000	0.000	0.000	0.000
PE 0603285E, DARPA	41.385	0.000	0.000	0.000	0.000	0.000	0.000
PE 0603400F, Air Force	0.000	0.000	77.800	0.000	0.000	0.000	0.000
PE 0604400F, Air Force	0.000	0.000	272.300	400.100	554.100	780.500	955.200

D. Acquisition Strategy:

The J-UCAS program blends the advantages of both the Advanced Technology Demonstration (ATD) and the Advanced Concept Technology Demonstration (ACTD) concepts to facilitate rapid development and integration of advanced technologies in an experimental system that addresses operational needs. Using the next generation demonstrator air vehicle families, together with common subsystems and a Common Operating System, this nontraditional approach also incorporates key acquisition considerations (i.e., user requirements, comprehensive system lifecycle perspective, and rigorous risk mitigation processes) to provide the necessary insights, operational data and identified options for the services to make an informed decision for accelerated acquisition near the end of the decade. This effort is tightly coupled with PE 0604400D8Z (J-UCAS Advanced Component and Prototype Development), which complements the work under this program element to deliver systems for the joint operational assessment.

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E. Major Performers:

The Boeing Company, St. Louis, MO

The Boeing Company, Seattle, WA

Northrop Grumman Corporation, El Segundo, CA

Northrop Grumman Corporation, Rancho Bernardo, CA

Northrop Grumman Corporation, Palmdale, CA

Lockheed Martin, Palmdale, CA

The Johns Hopkins University, Baltimore, MD

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