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Exhibit R-2, RDT&E Budget Item Justification		Date: February 2006
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	R-1 ITEM NOMENCLATURE: WMD Defense Technologies; 0602717BR Re-titled FY 2005 from Strategic Defense Technologies	

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Total 0602717BR Cost	112.436	108.929	105.021	108.658	113.493	113.116	115.084
Project BB Small Business Innovative Research*	0.000	2.415	2.509	2.521	2.557	2.561	2.564
Project BC Force Protection & Technology Applications	1.498	1.806	1.679	1.713	1.751	1.752	1.755
Project BG Nuclear Operations	25.099	25.024	22.312	23.962	25.280	22.848	22.955
Project BH System Survivability	85.839	79.684	78.521	80.462	83.905	85.955	87.810

*In year of execution, funding is executed under PE 0605502BR "Small Business Innovative Research"

A. Mission Description and Budget Item Justification:

The mission of the Defense Threat Reduction Agency (DTRA) is to safeguard America and its allies from weapons of mass destruction (WMD) by reducing the present threat and preparing for the future threat. This mission directly reflects several national and DoD-level documents to include the National Security Strategy, Unified Command Plan (UCP), National Strategy to Combat WMD (NSPD-17), Counterproliferation Interdiction (NSPD-20), National Strategy for Combating Terrorism, National Military Strategy, Strategic Planning Guidance (SPG), Contingency Planning Guidance (CPG), National Military Strategy for Combating WMD, National Military Strategic Plan (NMSP) for the War on Terrorism (WOT), Joint Strategic Capabilities Plan (JSCP) (including the Nuclear Annex), Security Cooperation Guidance (SCG), Quadrennial Defense Review (QDR), Nuclear Posture Review (NPR), and Defense Transformation Planning Guidance (TPG). To achieve this mission, DTRA has identified principal objectives along with strategies and tasks to ensure the objectives are met. Three of these objectives are deter the use of WMD, reduce the present threat and prepare for the emergent future threat. A focused, strong threat reduction technology base is critical to achieving these objectives and is closely tied with the operational support programs that make up its combat support mission. DTRA has taken the steps to develop this technology base and provide a foundation for transformational activities within the WMD arena as delineated in the TPG.

This program element provides the essential technologies and operational support to deter the use of weapons of mass destruction and prepare for the projected WMD threat. It includes funding for assessments and development of strategies, concepts and strategic nuclear and WMD deterrence options. In addition, it provides funding for development and testing of special equipment, necessary facilities, and other

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associated costs necessary for the development of the technology base needed to support the national deterrent policy and military strategy. Supported initiatives include, but are not limited to, the following development efforts:

- Programs focused on assessing, enhancing and maintaining the survivability and operability of nuclear deterrent forces.
- Operational support programs focused on activities such as balanced survivability assessments, operational assessments, nuclear physical security technology development, and assessments of various OPTEMPO concerns arising from chemical, biological, radiological, and nuclear environments.
- Support to the Office of the Secretary of Defense (OSD), JCS and Combatant Commands in war planning, force structure options, logistics, WMD mitigation operations and stockpile programs.
- Developing and validating advanced technology to provide enhanced WMD Training supporting Joint Mission Essential Tasks (JMETS) for forces and coordination of DoD WMD training requirements.
- Nuclear weapon effects survivability technology programs focus on:
 - Radiation hardened microelectronics technology that enables DoD space and missile systems to survive and operate in a space environment or in a nuclear radiation environment after a nuclear attack.
 - Simulator technology that enables simulation of the nuclear environments from a nuclear burst.
 - Assessments technology that develops design protocols, hardware, and software enhancing the ability of mission essential systems to survive a nuclear attack and to operate after a nuclear attack.
 - Detector technology that rapidly develops/converts radiation sensor, dosimetry and biological technologies for integration into real-time forward deployed tools for characterization of radiologically hazardous environments that impact warfighter mission and command and control decisions.

Nuclear sustainment technologies and projects support the viability and credibility of the nuclear force as well as development of nuclear environment survivability for the Integrated Ballistic Missile Defense System. The nuclear sustainment program, driven by the specific taskings of the National Security Strategy, National Military Strategy, the Nuclear Posture Review, and the Joint Strategic Capabilities Plan, has two projects, i.e., Nuclear Operations and System Survivability. Nuclear Operations develops and supports the National Nuclear Mission Management Plan; nuclear and WMD training expertise for the DoD; surety risk and hazard analyses; nuclear planning systems; nuclear deterrent option analyses; technical support for Nuclear Weapons Council (NWC) and nuclear Command, Control, Communications, Computers, and Intelligence (C4I) requirements; and WMD threat mitigation analyses.

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The System Survivability Project develops radiation hardened microelectronics to support DoD mission requirements for C4ISR assets, simulator technology to validate nuclear survivability requirements of military systems, assessments technology to model the response of critical national infrastructure after a nuclear weapon detonation, and nuclear detection and radiation dosimetry tools. It also provides technology to support the Congressional mandated Nuclear Test Personnel Review. These development areas directly support the development of survivable and reliable systems for the warfighter.

Nuclear Sustainment projects comprise a critical component of the ability of the Department to meet the technology and sustainment challenges posed by the emerging international environment and the National Military Strategy. The coverage of the projects ranges through countering WMD threats to the maintenance of the national strategic nuclear deterrent.

Operational support of the Combating WMD mission integrates support to the Joint Staff and OSD with support to the Combatant Commands. Support to the Joint Staff and OSD drives policy and doctrine development. Support to the Combatant Commanders turns policy into operational plans that are executable.

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B. Program Change Summary:

(\$ in Millions)	FY 2005	FY 2006	FY 2007
Previous President's Budget	112.488	106.708	112.882
Current President's Budget	112.436	108.929	105.021
Total Adjustment	-0.052	2.221	-7.861
Congressional program reductions			
Congressional reductions		-1.579	
Congressional increases		3.800	
Reprogramming			
Classified Program Transfer			
Other Program Adjustments	-0.089		-7.861
SBIR/STTR Transfer	0.037		

Change Summary Explanation:

- The decrease in the FY 2005 funding profile from the previous submission to the current President's Budget is the result of a Small Business Innovative Research (SBIR) funding transfer and a reduction to support the Department of Energy. During the year of execution, SBIR funding is consolidated into PE 0605502BR "Small Business Innovative Research" for execution.
- The decrease in FY 2006 from the previous submission to the current President's Budget is the result of the FY 2006 DoD Appropriation Act (P.L. 109-359) that contained several undistributed Congressional reductions that were proportionally applied to the entire DTRA RDT&E program. This program received a -\$1.579 million reduction. Additionally, this program received Congressional increases in the amount of \$3.800 million.
- The net decrease of \$7.861 million in FY 2007 from the previous submission to the current President's Budget reflects program reprioritization offset by an increase of \$1.619 million for non-pay purchase inflation. The decrease primarily reflects the realignment of funding within DTRA research and development resources to initiate a Basic Research program to support areas that are critical to

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the Department of Defense maintaining technological superiority. The decrease also reflects funding realignments in support of the Strategic Command (STRATCOM). DTRA's program priorities are linked to the Combatant Commanders.

- Funding is used to support high priority combat support requirements in accordance with current planning, assumptions and associated requirements, address critical infrastructure requirements and implement the business reform initiative. It also balances the program consistent with strategic priorities within DTRA and the DoD.
- The resulting program provides for a flexible combat support structure; focused science and technology investments, to include such critical areas as WMD target defeat and nuclear weapons effects technologies; enhanced consequence management capabilities; force protection, infrastructure protection and dual-use homeland security initiatives; as well as the streamlining and transformation of the supporting business practices and workforce.

C. Other Program Funding Summary: See Exhibit R-2a.

D. Acquisition Strategy: Not Applicable.

E. Performance Metrics: Cost, schedule and performance are monitored via a combination of Earned Value Management System, Cost Schedule Status Reporting, and Cost Funds Status Reports.

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Exhibit R-2a, RDT&E Project Justification	Date: February 2006
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	PROJECT NAME AND NUMBER: 0602717BR Project BB – Small Business Innovative Research

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Project BB - Small Business Innovative Research*	0.000	2.415	2.509	2.521	2.557	2.561	2.564

*In year of execution, funding executed under PE 0605502BR “Small Business Innovative Research”

A. Mission Description and Budget Item Justification:

To prepare for critical future WMD mitigation technology needs, WMD related advanced technology programs will invest in a balanced program of high leverage technologies that will yield improved WMD capabilities across a broad range of WMD defeat, WMD Defense, and an innovative science and technology programs. DTRA maintains a specific effort with minority and disadvantaged business; to include Historically Black Colleges and Universities/Minority Institutions and businesses. Each program and investment will focus, to the maximum extent feasible, on innovative WMD related technologies in support of future WMD mitigation capabilities. An important goal of each effort is to identify, develop, and demonstrate WMD related innovative technologies which will dramatically improve WMD Defense and Defeat performance.

B. Accomplishments/Planned Program:

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007
Small Business Innovative Research	0.000	2.415	2.509

FY 2005 Accomplishments:

- Not Applicable.

FY 2006 Plans:

- Fund 45.4 percent of DTRA SBIR investment including:
 - Up to ten Phase I SBIR contracts from proposals from FY 2006 topic areas including WMD Dispersal Device Defeat, Advanced X-ray Simulator; Next Generation Blast Mitigation, Weapons of Mass Destruction (WMD) Hazard Modeling and Simulation, Integrated WMD Toolset Near Real Time Response, Chemical/Biological Agent Deny and Defeat, Enhanced Deep Earth Penetration Capability, and Energetic Materials and Weapon Concepts.

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- Up to two Phase II SBIR contracts to perform full research and development on promising FY 2005 Phase I efforts.
- Share of incremental funding of FY 2005 Phase I and FY 2004 Phase II SBIR contract awards.

FY 2007 Plans:

- Fund 44.7 percent of DTRA SBIR investment including:
 - Up to ten Phase I SBIR contracts to perform feasibility studies on FY 2007 topics.
 - Up to two Phase II SBIR contracts to perform full research and development on promising FY 2006 Phase I efforts.
 - Share of incremental funding of FY 2006 Phase I and FY 2005 Phase II SBIR contract awards.

C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Not Applicable.

E. Major Performers: Not Applicable.

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Exhibit R-2a, RDT&E Project Justification		Date: February 2006
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	PROJECT NAME AND NUMBER: 0602717BR Project BC– Force Protection & Technology Applications	

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Project BC - Force Protection & Technology Applications	1.498	1.806	1.679	1.713	1.751	1.752	1.755

A. Mission Description and Budget Item Justification:

This project develops assessment and mitigation technologies to conduct integrated, multi-discipline assessments of critical national/theater mission systems leading to the development of investment strategies for improved survivability. This project also ensures that assessment training programs, engineering designs, and new construction embody sound force protection, vulnerability mitigation, and collective protection principles. Some of the project's products and services include:

- Balanced Survivability Assessments (BSA)
- Vulnerability out-briefs and written reports
- Overall vulnerability trend data
- Multi-disciplined technical engineering expertise support

B. Accomplishments/Planned Program:

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007
Balanced Survivability Assessments	1.498	1.806	1.679

FY 2005 Accomplishments:

- Conducted balanced survivability and integrated vulnerability assessments of DoD facilities and systems as tasked by OSD, Combatant Commands, and the Joint Staff. Conducted balanced vulnerability assessment of defense and critical national infrastructure facilities and systems. Conducted architectural analyses to determine systemic vulnerabilities.

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FY 2006 Plans:

- Conduct balanced survivability and integrated, multi-discipline assessments of critical national/theater mission systems as tasked by OSD, Combatant Commands, and the Joint Staff. Conduct balanced vulnerability assessment of defense and critical national infrastructure facilities and systems. Conduct architectural analyses to determine systemic vulnerabilities.

FY 2007 Plans:

- Conduct balanced survivability and integrated, multi-discipline assessments of critical national/theater mission systems as tasked by OSD, Combatant Commands, and the Joint Staff. Conduct balanced vulnerability assessment of defense and critical national infrastructure facilities and systems. Conduct architectural analyses to determine systemic vulnerabilities.

C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Not Applicable.

E. Major Performers: Not Applicable.

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Exhibit R-2a, RDT&E Project Justification		Date: February 2006
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2		PROJECT NAME AND NUMBER: 0602717BR Project BG – Nuclear Operations

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Project BG - Nuclear Operations	25.099	25.024	22.312	23.962	25.280	22.848	22.955

A. Mission Description and Budget Item Justification:

These programs directly support the National Military Strategy, including the dictates of the Nuclear Posture Review (NPR), and are directed by the JCS in the Joint Strategic Capabilities Plan (JSCP) Nuclear Annex. This project for this Program Element encompasses two activities:

- Nuclear Programs.
- Combating WMD Support.

These programs are responsive to the oversight of the Nuclear Weapons Council and they provide critical support to the Combatant Commands, Services, JCS and OSD.

Nuclear Programs.

- Nuclear Weapons Surety:
 - As tasked by the DoD Nuclear Weapon System Safety Program, the surety programs provide Combatant Commands, Services, and JCS with technical analyses, studies, research, and experimental data necessary to identify and quantify risks of plutonium dispersal and Loss of Assured Safety (LOAS) due to accidents, fires or natural causes during peacetime operations of the nations nuclear weapon systems. Additionally, these programs will provide studies necessary to quantify the probability of success against targeted terrorist attacks on DoD facilities, while leveraging these risk assessment advances.
 - MIGHTY GUARDIAN Force-on-Force evaluations aid in satisfying requirements for the Air Force and Navy of providing absolute denial of access to nuclear weapons in all environments, from storage to transit. The results of the evaluations identify security vulnerabilities to weapons systems in various environments. The Air Force and Navy identify projects that require research and development to demonstrate, test, and evaluate systems prior to Service procurement to successfully plan and conduct force-on-force evaluations and associated engineering studies that accurately evaluate the adequacy of DoD, Service, and Combatant Command nuclear security policies.

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- Physical security projects in support of Combatant Commands and Services, new and innovative technologies are developed for the protection of nuclear resources. Following proof-of-concept, these projects are transitioned to the Services for advanced development, procurement, and fielding.
- Stockpile Sustainment. As tasked, continue to operate as the Department of Defense Executive Agent for Annual Certification support related stewardship and sustainment activities. Provide support to senior program managers and decision makers concerning issues associated with maintaining and improving the aging stockpile; senior level committees that identify and develop programs to improve the reliability and sustainability of the nuclear stockpile; and an outreach program to educate DoD planners and managers about issues associated with sustaining the nuclear stockpile.
- Stockpile Operations Support: In support of national requirements necessary to maintain a viable nuclear deterrent, the Defense Integration and Management of Nuclear Data Services (DIAMONDS) and the Nuclear Management Information System (NUMIS) provides automated tools which enable users to maintain, report, track and highlight trends affecting the nuclear weapon stockpile activities ensuring continued sustainability and viability of the nuclear stockpile.

Combating WMD Support.

- Provide comprehensive combating WMD support to the DoD, as tasked by the Strategic Planning Guidance, the Contingency Planning Guidance, the Joint Strategic Capabilities Plan (JSCP), and other directing documents. Combating WMD encompasses all three pillars of the National Strategy – Nonproliferation, Counterproliferation, and Consequence Management and the eight mission areas – treaties and agreements, threat control and reduction, WMD interdiction, WMD elimination, offensive operations, active defense, passive defense, and consequence management. Support to the DoD includes direct support to the Combatant Commands, Services, Joint Staff, and OSD.

B. Accomplishments/Planned Program:

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007
Nuclear Programs	18.094	18.049	17.935

FY 2005 Accomplishments:

- Nuclear Weapon Surety Thrusts:

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- Continued Weapon storage facility modeling and testing safety requirements and criteria. Developed and populated the Nuclear Surety Information Center database to utilize and archive completed assessments, studies, tools, and test programs. Improved evaluation of enduring stockpile weapons in support of the U.S. Air Force and U.S. Navy.
- Conducted a Mighty Guardian Force-on-Force test of off-base convoy forces at Camp Guernsey, WY. Enhanced exploratory research on physical security equipment and technology designed to increase protection of the nuclear stockpile.
- Improved nuclear storage facility fire suppression capabilities based on Fire Hazard Analysis results and new technology.
- Began analyses of abnormal environmental scenarios for nuclear weapons systems.
- Stockpile Sustainment Program thrusts:
 - Provided support to the Threat Reduction Advisory Committee and other high level committees that identify and develop programs to improve the reliability and sustainability of the nuclear stockpile.
 - Supported annual certification and stockpile stewardship for continued safety and reliability of U.S. nuclear stockpile in the absence of underground testing.
 - Developed and improved the "Nuclear Deterrent Support Program" into a more robust "Nuclear Deterrent and WMD Support Program", with new initiatives under all the Combating WMD Pillars (Non-Proliferation, Counterproliferation, and Consequence Management).
 - Continued enhanced technical support to the Nuclear Weapons Council (NWC) and Joint Advisory Committee (JAC); supported development of the Nuclear Weapons Stockpile Plan and the Requirements and Planning Document and other annual high-level nuclear stockpile reports.
 - Improved the development and presentation of tailored nuclear weapons expertise and sustainment education modules through expanded outreach efforts to the War Colleges, Service Academies, and operational units.
- Stockpile Operations thrusts:
 - Provided national nuclear weapon reporting and tracking systems in peacetime, crisis, and wartime and ensure DoD's capability to rapidly verify continued custody of all nuclear weapons while sustaining, maintaining and improving the capabilities of the Defense Integration and Management of Nuclear Data Services (DIAMONDS) worldwide. Fielded remaining Air Force OCONUS sites with Defense Integration and Management of Nuclear Data Services (DIAMONDS) hardware and software. Began software development of DIAMONDS for Navy nuclear weapon custodial sites and completed initial migration of Nuclear Management Information System (NUMIS) database architecture into DIAMONDS.

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FY 2006 Plans:

- Nuclear Weapon Surety Thrusts:
 - Conduct hazard analysis research and development of nuclear weapon fire involvement modeling simulations for the Air Force for use in the Integrated Weapons of Mass Destruction Tool Kit (IWMDT) and Nuclear Capabilities Services (NUCS). Conduct fire prevention and suppression hardware development, and fact finding for the production of a Uniform Facility Criteria for DoD nuclear weapon capable storage and maintenance buildings. These efforts are responsive to the DoD Directive and Manual on Nuclear Weapons Systems Safety (DoDD 3150.2). Continuing efforts involve modeling and testing necessary to respond to weapon storage facility and weapon system safety requirements and criteria.
 - Mighty Guardian IX in March 2006 will conduct Force-On-Force test at Whiteman Air Force Base, MO to evaluate nuclear security policy as it applies to Weapons Storage Areas. Additionally, execute one out-of-cycle test to determine delay times and breaching methods for security systems at underground nuclear storage areas to support Mighty Guardian X scheduled for execution in FY 2007.
 - Conduct exploratory research on physical security equipment and technology designed to enhance protection of the nuclear stockpile.
- Stockpile Sustainment Program thrusts:
 - Continue to provide support to DoD senior leadership and decision makers concerning issues associated with nuclear stockpile and improvements associated with specific weapons systems. This includes support to the Threat Reduction Advisory Committee and other high level committees that identify and develop programs to improve the reliability and sustainability of the nuclear stockpile. Continue to provide an outreach program, which educates planners and managers about the nuclear stockpile.
- Stockpile Operations thrusts:
 - Defense Integration and Management of Nuclear Data Services (DIAMONDS): Efforts this year include initiating the redesign of the reporting and fielding system at all Naval sites; initiating the planning phase for the Decision Support Module for DIAMONDS and integrating the Nuclear Management Integration System (NUMIS) into the existing DIAMONDS architecture.

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FY 2007 Plans:

- Nuclear Weapon Surety Thrusts:
 - Continue hazard analysis research and development of nuclear weapon fire involvement modeling simulations for the Air Force for use in the Integrated Weapons of Mass Destruction Tool Kit (IWMDT) and Nuclear Capabilities Services (NUCS). Conduct fire prevention and suppression hardware development, and fact finding for the production of a Uniform Facility Criteria for DoD nuclear weapon capable storage and maintenance buildings. These efforts are responsive to the DoD Directive and Manual on Nuclear Weapons Systems Safety (DoDD 3150.2). Continuing efforts involve modeling and testing necessary to respond to weapon storage facility and weapon system safety requirements and criteria.
 - Mighty Guardian X in March 2007 will conduct Force-On-Force test at Kirtland Air Force Base, NM to evaluate nuclear security policy as it applies to Underground Storage Areas. Additionally, Mighty Guardian XI in September 2007 will conduct Force-On-Force test in the Air Force Space Command’s missile fields to evaluate nuclear security policy as it applies to missile silos. Conduct exploratory research on physical security equipment and technology to enhance protection of the nuclear stockpile as determined by the Services.
- Stockpile Sustainment Program thrusts:
 - Continue to provide support to senior program managers and decision makers concerning issues associated with nuclear stockpile and improvements associated with specific weapons systems. This includes support to the Threat Reduction Advisory Committee and other high level committees that identify and develop programs to improve the reliability and sustainability of the nuclear stockpile. Continue to provide an outreach program, which educates planners and managers about the nuclear stockpile.
- Stockpile Operations thrusts:
 - Defense Integration and Management of Nuclear Data Services (DIAMONDS): To continue providing nuclear reporting and tracking systems, stockpile information and Joint Nuclear Weapons Publications to the nuclear weapon community. Continued progress and emphasis includes, planning and preliminary design of advanced/interactive Joint Nuclear Weapons Publication System (JNWPS) in DIAMONDS; completion of DIAMONDS fielding at Naval sites not previously fielded; continuation and completion of Decision Support Module development for DIAMONDS, and the completion of the redesign of the DIAMONDS reporting system.

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Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007
Combating WMD Support	7.005	6.975	4.377

Retitled in FY 2005 from Combatant Commands/Forces/Security Support

FY 2005 Accomplishments:

- Enhanced European Theater Nuclear Support Program to provide in-theater nuclear and WMD support to EUCOM, NATO, and SHAPE.
- Restructured support to Commander, USSTRATCOM to conduct strategic and operational level planning with OSD, Joint Staff, and other Combatant Commands, as well as develop global WMD situational awareness and an interagency coordination and requirements assessment capability. Restructured internal planning within DTRA to continue to develop Agency contingency and support plans in support of the Combatant Commands combating WMD plans. Supported the initial development of the National Military Strategy for Combating WMD for Joint Staff and OSD that will provide a strategic framework to dissuade, deter and defeat potential adversaries' use of WMD against the U.S., its forces, allies and friends.

FY 2006 Plans:

- Restructure the European Theater Nuclear Support Program to provide improved in-theater nuclear and WMD support to EUCOM, NATO, and SHAPE.
- Complete the development of the DoD CONPLAN for combating WMD for USSTRATCOM. Develop Combating WMD policy/doctrine capability to provide support to Joint Staff and OSD over the full range of WMD issues. Complete the development of a combating WMD planning capability to support the Combatant Commands by rapidly responding to requests to address Combating WMD challenges within theater war plans, and by supporting Contingency Planning Guidance taskings. Complete development of DTRA support plans capability to the COCOMs and for DTRA contingency plans.

FY 2007 Plans:

- Complete restructuring of the European Theater Nuclear Support Program to provide improved in-theater nuclear and WMD support to EUCOM, NATO, and SHAPE.
- Enhance and sustain DTRA support plans capability to the COCOMs and for DTRA contingency plans

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C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Not Applicable.

E. Major Performers: Science Applications International Corporation (SAIC) and Northrop Grumman.

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Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Project BH - System Survivability	85.839	79.684	78.521	80.462	83.905	85.955	87.810

A. Mission Description and Budget Item Justification:

These activities directly reflect the National Military Strategy, supporting the provisions of the Nuclear Posture Review. Current and future warfighters and weapon systems, including the associated Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR), missile defense and support systems/equipment, must be able to survive and operate effectively through a spectrum of hostile environments. Planned efforts emphasize the development and demonstration of innovative and cost-effective technologies to sustain the functional survivability of U.S. and Allied Forces and systems when confronted with threats from advanced conventional weapons, special weapons and limited nuclear attack.

This project constitutes the DoD’s resident science and technology expertise in nuclear and related survivability matters. It develops and demonstrates affordable strategies and hardening technologies for U.S. systems and forces; transfers the technical products to acquisition program offices; conducts component, subsystem, system and end-to-end performance tests and assessments as requested by the Services and Combatant Commands; and provides support to the Office of the Secretary of Defense on technical and policy matters that relate to the acquisition of survivable systems and strategic system sustainment.

This project encompasses activities divided into four business areas as described below: Radiation Hardened Microelectronics, Simulation Technology, Assessment Technology and Radiation Detection Technologies.

The Radiation Hardened Microelectronics area responds to DoD space and missile system requirements for radiation-hardened microelectronics and photonics technology to support mission needs. The non-availability of this technology would adversely impact system survivability, performance, weight and cost. This program develops and demonstrates radiation-hard, high performance prototype microelectronics to support the availability of radiation-hardened microelectronics and photonics for DoD missions from both private sector and government organizations. The Accelerated Technology Development Program established the capability to fabricate radiation hardened 150 nanometer Complementary

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Metal Oxide Semiconductor (CMOS) technology at two domestic radiation hardened semiconductor suppliers, BAE SYSTEMS and Honeywell Defense Space and Electronic Systems (DSES).

The Simulation Technology area maintains test capability to produce a radiation environment similar to that of a nuclear detonation. These nuclear weapons effects (NWE) simulators are used to validate nuclear survivability requirements for DoD missile and space systems, conduct research in radiation effects, and validate computational models. Since the underground testing (UGT) moratorium, above ground simulators have provided the only means to provide realistic, cost effective nuclear test environments. The NWE simulators are used by the Defense Agencies, the Services and other federal departments (such as DOE) to evaluate the impact of nuclear environments on their respective systems. As military systems and concepts evolve, especially in the area of electronics, optics, sensors, and guidance systems, parallel changes in simulator technology are required, e.g., survivable optical components for missile defense and micro-electromechanical systems require unique radiation test environments. DTRA has a joint collaboration with DOE to maintain a minimum suite of simulators to support system survivability testing and stockpile stewardship requirements.

The Assessments Technology focuses on ensuring that critical national systems (infrastructures, facilities, and command and control systems) can survive and operate in the event of a nuclear weapon detonation, and it provides nuclear and radiological modeling and simulation predictions for use by decision makers. It provides products and assistance to system program offices, agencies, the services, combatant commanders and the National Command Authority. It develops tools that assess the vulnerabilities of mission essential infrastructure, nuclear missile interceptors, strategic radar systems, strategic command and control networks, computers, sensors, satellites, and other critical warfighting systems. This activity provides nuclear electromagnetic pulse technical expertise to assist DoD in ensuring the Nation’s Nuclear Command and Control System and other mission essential systems can operate in a nuclear electromagnetic pulse environment. The activity also provides DoD’s nuclear design and protection standards to ensure new and existing systems (e.g. command and control facilities and aircraft) are designed and built to survive and operate in nuclear environments.

Detection Technologies develops or exploits radiation sensor, dosimetry and biological technologies and integrates them into real-time, forward-deployed tools for characterizing radiologically hazardous environments. Its products protect the health and welfare of U.S. service personnel and allied forces by monitoring human survivability during operations on the radiological/WMD battlefield or in areas of suspected WMD development or release. Lessons learned from the Nuclear Test Personnel Review Program (O&M-funded) will allow warfighters and

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peacekeepers to quantify and mitigate the risk in radiological settings (i.e., limited nuclear exchanges, terrorist actions, radiological dispersal weapons, and other radiation risk scenarios).

B. Accomplishments/Planned Program:

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007
Radiation Hardened (RH) Microelectronics	58.399	37.373	38.039

FY 2005 Accomplishments:

- Completed RH Microelectronics (RHM) Accelerated Technology Demonstration (ATD) of RH 150nm bulk silicon and silicon-on-insulator (SOI) technologies. ATD technology resulted in a decrease in power by a factor of 12, performance increase by a factor of 5 and density increase by a factor of 20. This advanced technology is available for systems such as Trident D5 Life Extension, Transformational Satellite Communications (TSAT), and Space Based Radar (SBR).
- Demonstrated RH Electronic Design Automation (EDA) 250nm design capability to support the design of complex hardened digital and Analog/Mixed-Signal (A/M-S) circuits.
- Completed demonstration of RH 250nm A/M-S technology required for systems with very high onboard data and signal processing requirements.
- Developed very high speed (1 GHz) electronics radiation test capability needed to validate complex, high performance payloads.

FY 2006 Plans:

- Demonstrate radiation hardened (RH) 150nm bulk silicon and silicon-on-insulator prototype integrated circuits and develop next generation RH 90nm test structures to support radiation effects characterization.
- Demonstrate RH EDA 150nm design capability for digital technology.
- Demonstrate RH 250nm Read Out Integrated Circuit (ROIC) to support Space Surveillance and Tracking System (STSS) and other national asset systems. Demonstrate RH 150nm A/M-S technology for systems with ultra-high onboard data processing requirements for advanced throughput and functionality.

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- Demonstrate very high speed (1 GHz) electronics radiation test capability. Evaluate advanced semiconductor structures, designs, layout and fabrication methods and materials to support nuclear hardening and survivability.

FY 2007 Plans:

- Demonstrate radiation hardened 150nm bulk silicon and SOI technologies in the following integrated circuits: 16M Static Random Access Memory (SRAM), structured Application Specific Integrated Circuit (ASIC), and 250Kgate Field Programmable Gate Array (FPGA). These devices will support systems that include TSAT, SBR and other National C4ISR space assets. Demonstrate innovative radiation hardening methods for 90nm technology.
- Demonstrate RH EDA 150nm design capability for combined digital and A/M-S technologies to support complex integrated circuit designs for STSS, TSAT, and other National C4ISR space assets.
- Demonstrate RH 150nm A/M-S prototype integrated circuits with power, speed and reliability performance improvements over state-of-the-art single chip device capabilities to support a wide range of military assets with complex electronic payloads that must operate in a nuclear environment.
- Develop and validate radiation testing protocols to support characterization of very high speed electronics.

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007
Simulation Technology	12.149	22.574	21.276

FY 2005 Accomplishments:

- Simulator Technology Research and Development. Completed radiation source research on the Decade Simulator by demonstrating a three-fold increase in generation of X-rays on Decade for testing survivability of optical sensor systems (i.e., mirrors, cameras, satellite windows that hold cameras, telescopes in space, etc.). Obtained engineering data for design of Modular Debris Mitigation System (MDMS). Budget limitations made it necessary to cease operations of the Decade simulator at Arnold Engineering Development Center, Tullahoma, Tennessee. Continued testing and analysis for cold and warm X-ray sources necessary for testing survivability of optics, sensors, guidance and electronic systems and identified new approaches for improved testing. Demonstrated proof of concept energy storage technology that will greatly reduce size and complexity of NWE simulators. Initiated Joint Nuclear Simulator Working Group (JNSWG) with Sandia National Laboratories (SNL) to foster DTRA

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and DOE technical collaboration in areas of nuclear weapon simulator technologies, and to avoid overlap in capabilities and maximize efficiency of existing infrastructure.

- **NWE Test Capabilities.** Maintained DoD Nuclear Weapons Effects test capability in support of DoD and DOE research and test requirements. DTRA's Nuclear Weapons Effects simulators consist of a suite of four simulators – Double-EAGLE, PITHON, Pulserad 1150 and Modular Bremsstrahlung Source (MBS) – located at the West Coast Facility (WCF) in San Leandro, California. Completed 223 test days on the WCF simulators. Implemented improvements/repairs in hot X-ray, data acquisition systems and diagnostics to support customer test requirements. Implemented 30% improvement in generation of X-rays for testing survivability of electronic systems (i.e., military communication equipment, control boxes/ data cables inside a missile, computers, power supplies, power generators, etc.) in a nuclear environment.

FY 2006 Plans:

- **Simulator Technology Research and Development.** Building on FY 2005 results, demonstrate a 20% increase in generation of X-ray energy/unit area at WCF for testing optical sensor system survivability. Perform continued testing and analysis for achieving the (5-year) goal of a 2-fold increase in X-rays with a factor-of-two improvement in pulse width for electronics testing. Demonstrate 150% improvement in output of compact primary energy storage technology. Continue DoD and DOE collaborations via the JNSWG. Working through the Joint Nuclear Simulator Working Group (JNSWG), conduct experiments on SNL's Saturn simulator with the goal of achieving a 2-fold increase in Saturn's capability to produce X-rays for optical system survivability testing.
- **NWE Test Capabilities.** At WCF, implement 50% improvement in generation of X-ray-s energy/unit area for testing electronic systems. Continue necessary improvements/repairs for hot X-ray capability and data acquisition to support customer requirements. Continue to maintain WCF test capability for DoD and DOE system developers. Scheduled users include: the Trident Nuclear Missile system, Air Force ICBMs, Advanced Extremely High Frequency (AEHF) Satellite system, Space Based Infrared Radiation (SBIR) Satellite system, and DOE Sandia National Laboratories (SNL) stockpile stewardship programs. Conduct planned 296 total test days on four WCF simulators.

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FY 2007 Plans:

- Continue testing and analysis for achieving the (5-year) goal of a 2-fold increase in X-rays with a factor-of-two improvement in pulse width for electronics testing at the WCF. Transition innovative high spectral fidelity X-ray source technology and diagnostics to improve nuclear weapons effects simulation and model validation. Continue DoD and DOE collaborations via the JNSWG. Working through the JNSWG, conduct experiments on SNL’s Saturn simulator to demonstrate a 2-fold increase in Saturn’s capability to produce X-rays for optical system survivability testing and develop an associated Modular Debris Mitigation System. Building on this and other previous work, plan experiment on SNL’s ZR to achieve a 2-fold increase in X-rays over Z for optical system survivability testing.
- Continue to maintain simulators and improve test capability to support long term testing by DoD and DOE system developers. Improve operational efficiency by introducing new technologies. Continue pulsed power improvements/repairs to Double Eagle and complete improvements/repairs for DAS and hot X-ray capability. Planned users include: the Trident Nuclear Missile system testing, Advanced Extremely High Frequency (AEHF) Satellite system testing, Space Based Infrared Radiation (SBIR) Satellite system tests, and other DoD and DOE systems developers

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007
Assessments Technology	14.478	16.907	18.085

FY 2005 Accomplishments:

- Initiated Missile Defense Radar simulator development to provide a means to verify that the defense radar system can operate in a nuclear weapon environment. Transitioned this sub-activity to Simulation Technologies within System Survivability.
- Provided nuclear electromagnetic pulse hardening and survivability support to key Missile Defense facilities in Alaska and the Nuclear Command and Control System to ensure the United States Missile Defense System and the Nuclear Command and Control System can operate in nuclear environments. Facilities included the Pentagon’s National Military Command Center and the power system and satellite terminal in Alaska.
- Initiated develop of modern, net-centric nuclear weapon effects modeling and simulation capabilities supporting combatant commands and defense agencies. Capabilities, integrated from over 70 legacy codes, include all nuclear and radiological

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modeling and simulation for nuclear targeting, consequence assessments, predicting effects on key systems, critical military system survivability designs, and battle simulations. Began developing a joint U.S. and United Kingdom modeling and simulation accreditation process to ensure Department of Defense verification, validation, and accreditation standards are met.

FY 2006 Plans:

- Continue to provide nuclear electromagnetic pulse (EMP) hardening and survivability support to the Joint Staff, Defense Information Systems Agency (DISA), and the Missile Defense Agency (MDA). Planned locations include Fort Greely, Alaska and Cheyenne Mountain Air Station Complex. Assist DoD in developing electromagnetic pulse survivability standards, criteria, and response to the EMP Commission. Develop an automated, remote capability to perform electromagnetic hardness maintenance/surveillance for Missile Defense communications networks ensuring systems remain protected against EMP. Develop affordable test techniques to verify electromagnetic protection against EMP for critical infrastructure and facilities. Coordinate with DISA to identify and harden the future net-centric Nuclear Command and Control System based on DoD's communication architecture.
- Continue developing the modern, net-centric nuclear weapon effects modeling and simulation capabilities supporting combatant commands and defense agencies. Finalize developing and implement the joint US and United Kingdom modeling and simulation accreditation process begun in FY 2005.
- Conduct nuclear height of burst analysis for US Pacific Command forces supporting their contingency planning operations and support/conduct Ballistic Missile Defense System (BMDS) nuclear weapon effect survivability assessments to assist in verifying BMDS systems can survive and operate in nuclear weapon effect environments.
- Initiate a three year effort to improve the electromagnetic pulse modeling and prediction capabilities on DoD and civilian infrastructure and systems. This effort includes verifying and validating data and applying new methods (statistical approach) to predict how systems respond to electromagnetic pulses.

FY 2007 Plans:

- Continue to provide nuclear electromagnetic hardening and survivability support to the Joint Staff, DISA, and MDA. Planned locations include Fort Greely, Alaska and Cheyenne Mountain Air Station Complex. Assist DoD in developing electromagnetic pulse (EMP) survivability standards, criteria, and response to the EMP Commission. Develop an automated, remote capability to

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perform electromagnetic hardness maintenance/surveillance for Missile Defense communications networks ensuring systems remain protected against electromagnetic pulses. Develop affordable test techniques to verify electromagnetic protection against EMP for critical infrastructure and facilities.

- Continue the three year effort to improve the EMP modeling and prediction capabilities on DoD and civilian infrastructure and systems. This effort includes verifying and validating data and applying new methods (statistical approach) to predict how systems respond to electromagnetic pulses.
- Provide the initial operating capability for the modern, net-centric nuclear weapon effects modeling and simulation capabilities supporting combatant commands and defense agencies. The initial phase will include selected capabilities, integrated from over 70 legacy codes, for nuclear and radiological modeling and simulation for nuclear targeting, consequence assessments, predicting effects on key systems, critical military system survivability designs, and battle simulations. Accredited all modeling capabilities through the joint US and United Kingdom process. Begin developing the concept for four dimensional (3D plus time) nuclear weapon effects modeling and simulation to provide decision makers state of the art visual predictions to assist in wargaming and weapon effect predictions.
- Support/conduct Ballistic Missile Defense System (BMDS) nuclear weapon effect survivability assessments to assist in verifying BMDS systems can survive and operate in nuclear weapon effect environments.

Cost (\$ in Millions)	FY 2005	FY 2006	FY 2007
Detection Technologies*	0.813	2.830	1.121

* Retitled to Detection Technologies in FY 2005 (Previously titled: Human Survivability).

FY 2005 Accomplishments:

- Completed first phase radiation biodosimetry effort (successful laboratory exposure monitoring) and initiated second phase (integrated field prototype) development. This blood microassay will allow field assessment of radiation exposure immediately following a radiological event.
- Initiated low cost individual dosimeter development efforts to achieve next generation individual warfighter dosimeters. When completed, these dosimeters will allow remote monitoring and recording of radiation exposure data.

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- Transitioned aerial radiation hazard mapping system development to PE 0603160BR, Project BI for advanced system development following proof-of-principle demonstration. This effort provides the basis for a FY 2006 Joint/Advanced Concept Demonstration in combination with Project BI results.

FY 2006 Plans:

- Initiate focused effort to develop an in situ Electron Paramagnetic Resonance (EPR) tool to measure lifetime radiation exposure from teeth non-destructively. The EPR assay provides lifetime while blood dosimetry provides recent exposure leading to a long term intrinsic record.
- Complete second phase (integrated field prototype) development of a radiation biodosimeter to assay individual radiation exposure after a radiological event. Testing of this field prototype is scheduled to initiate in FY 2007 but will require extensive utilization of voluntary human exposure tests. On completion and validation of results, this system will transition to the DoD medical community.
- Continue low cost individual dosimeter development efforts to achieve next generation individual warfighter dosimeters. These efforts will include second phase developments of promising approaches.
- Initiate efforts to develop a portable mercuric iodide-based gamma-ray sensitive imaging instrument for portable scanning of suspicious containers by troops in the field. This effort is initiated under a Congressional Adjustment titled: “Advanced Portable Mercuric Iodine Imaging Technology for Chemical, Biological, Radiological Nuclear and Explosive (CBRNE) Special Operations”.

FY 2007 Plans:

- Continue a focused effort to develop an in situ Electron Paramagnetic Resonance (EPR) tool to measure lifetime radiation exposure from teeth non-destructively. This effort is scheduled to produce a testable prototype in FY 2008.
- Initiate extensive human trials of the integrated field prototype radiation biodosimeter to assay radiation exposure of individuals post radiological-event with the goal of ensuring that the blood microassay is consistent over the full human population. On completion and validation of results, this system will transition to the DoD medical community.

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- Complete spiral one development of low cost individual dosimeters to achieve the next generation of individual warfighter dosimeters. Spiral two development will increase integration and ensure that all systems are compatible with DoD battlefield communications standards.

C. Other Program Funding Summary: Not Applicable.

D. Acquisition Strategy: Jointly develop with other DoD organizations and DOE an optimum set of simulators and supporting technology. Operational support for the DTRA West Coast Facilities and for R&D will be procured from industry. Limited competition may be utilized due to the lack of qualified companies and expertise required. Specialized R&D, test and analytical expertise will be obtained from the Naval Research Laboratory and Sandia National Laboratories (Simulation Technology).

E. Major Performers:

- **Radiation Hardened Microelectronics.** BAE Systems, Honeywell Inc.
- **Simulation Technology.** L-3 communications Pulse Sciences Division, Naval Research Laboratory, Alameda Applied Sciences Corporation, Sandia National Labs.
- **Assessments Technology.** SAIC, ARA, L3/Titan, and MRC.