RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 2002
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	**R-1 ITEM NOMENCLATURE** Nuclear Sustainment & Counterproliferation Technologies; 0602715BR

COST (In Millions)	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	Cost to Complete
Total 0602715BR Cost	310.7	296.4	0	0	0	0	0	Realigned
Project BB Small Business Innovative Research	3.0	3.7	0	0	0	0	0	Realigned
Project BC Force Protection & Technology Applications*	14.6	6.2	0	0	0	0	0	Realigned
Project BD Weapons Effects Technologies**	59.8	90.6	0	0	0	0	0	Realigned
Project BE Testing Technologies & Integration	9.4	10.7	0	0	0	0	0	Realigned
Project BF CP Operational Warfighter Support***	35.6	64.4	0	0	0	0	0	Realigned
Project BG Nuclear Operations	140.7	46.3	0	0	0	0	0	Realigned
Project BH System Survivability****	47.6	74.4	0	0	0	0	0	Realigned

*FY 2001 DERF Supplemental provided $5.5M related to this project. Funding is not reflected in this table.
**FY 2001 DERF Supplemental provided $5.2M related to this project. Funding is not reflected in this table.
***FY 2001 DERF Supplemental provided $23.15M related to this project. Funding is not reflected in this table.
****FY 2001 DERF Supplemental provided $65K related to this project. Funding is not reflected in this table.

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A. Mission Description and Budget Item Justification

The mission of the Defense Threat Reduction Agency (DTRA) is to safeguard America and its friends from weapons of mass destruction (WMD) by reducing the present threat and preparing for the future threat. This mission directly reflects the National Military Strategy, supports the provisions of Joint Vision 2010 and is specifically directed by the JCS in the Joint Strategic Capabilities Plan (Nuclear Annex). 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 to deter the use of WMD, reduce the present threat and prepare for the future threat. A focused, strong threat reduction technology base is critical to achieving these objectives. DTRA has taken the steps to develop this technology base.

This budget submission provides the essential technologies to deter the use of WMD and prepare for the WMD threat. These technologies can be grouped into two areas, Counterproliferation (CP) technologies and Nuclear Sustainment technologies and projects. CP technologies to include antiterrorism will help DTRA prepare for the WMD threat and support civil and military response to WMD use. Nuclear sustainment technologies and projects support the viability and credibility of the nuclear force as well as development of survivability technology for Theater Missile Defense and National Missile Defense in a nuclear environment.

CP Technologies:

The DTRA is the DoD focal point for programs and activities to reduce the threats posed by WMD proliferants. New, forward-thinking activities have been identified and prioritized to support the DTRA mission and the DoD CP strategy for responding to the full spectrum of crises and preparing now for an uncertain future. The CP programs support national guidance, the DTRA strategic vision, and Service and CINC operational customers. This program element provides the innovative technologies and concepts underpinning all CP programs.

A. Mission Description and Budget Item Justification (cont'd)

- Examination of existing U.S./Allied capabilities to hold hardened, deeply buried targets at risk; evaluation of capabilities against known or projected potential targets; and evaluation of new technologies for possible application against known shortfalls.
- Targeting and Intelligence Community (IC) support to warfighters that provides functional vulnerability assessments of hostile foreign systems.
- Development of WMD analysis and simulation tools for the warfighter including target planning and assessment; hazardous materials transport and collateral effects prediction; consequence assessment; and anti-terrorism/force protection.
- Development and application of state-of-the-art nuclear weapons effects models to support nuclear weapon stewardship and system hardness design.
- Development, improvements and test engineering for the unique DoD test and simulation facilities (to include infrastructure) and enabling technologies that are used to evaluate the impact of hostile environments from conventional, nuclear, and other special weapons on military or civilian systems or targets.
- Mission vulnerability assessments of strategic U.S./Allied systems leading to strategies for improved survivability. Provides input to assessment training programs, structural engineering designs and practices, communications and information operations, and security and WMD protective measures to support sound mission survivability, vulnerability mitigation, and collective protection principles. Five dedicated teams accomplish up to 30 assessments per year.

Nuclear Sustainment:

The nuclear sustainment program, driven by the specific taskings of the National Strategy, National Military Strategy and the Joint Strategic Capabilities Plan, has two projects, i.e., Nuclear Operations and System Survivability.

A. Mission Description and Budget Item Justification (cont'd)

- Nuclear Operations develops and supports the National Nuclear Mission Management Plan; Nuclear and WMD Emergency Response Capability; an enhanced WMD consequence management (CM) capability to include a CM Advisory Team (CMAT); nuclear and WMD training expertise for DoD; surety risk and hazard analyses; nuclear planning systems; nuclear deterrent option analyses; technical support for Nuclear Weapons Council (NWC) and nuclear C4I requirements; and WMD threat mitigation analyses.
- The System Survivability Project develops simulator technology (nuclear, blast, thermal, radio frequency (RF) propagation, and optical/infrared (IR) background effects), electronics technology (radiation-hardened microelectronics, balanced electromagnetic hardening technology, radio frequency threat reduction), assessment and protection technology, and provides technology to support the Congressionally mandated Nuclear Test Personnel Review. These development areas directly support the development of survivable and reliable systems for the warfighter.

Together, the Counterproliferation Technologies and 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 from counter-terrorism through conventional conflict through countering WMD threats to the maintenance of the national strategic nuclear deterrent.

In addition, the Advanced Systems and Concepts Office (ASCO) develops and maintains an evolving analytical vision of necessary and sufficient capabilities to protect the United States and allied forces and citizens from nuclear, biological, and chemical (NBC) attack; and identify gaps in these capabilities and initiate programs to fill them.

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B. Program Change Summary

	FY 2001	FY 2002	FY 2003
FY 2001 President's Budget Request(Feb 2000)	230.9	237.8	244.7
FY 2002 Amended President's Budget Request(June 2001)	214.9	295.1	240.1
FY 2003 President's Budget Request (Feb 2002)	310.7	296.4	0*

*Moved to new program elements

Change Summary Explanation: Changes in FY 2001 from the FY 2001 President's Budget Request (Feb 2000) and FY 2002 Amended President's Budget Request (June 2001) are direct results of Congressional emphasis in the areas of Nuclear Weapons Effects, Discrete Particle Methods, Thermionics technology, and funding for Counterproliferation Studies at the Monterey Center. These Congressional adds are offset by Congressionally directed funding realignments to nuclear sustainment and counterproliferation technology program efforts. Changes in FY 2002 from the FY 2001 President's Budget Request (Feb 2000) and the FY 2002 Amended President's Budget Request (June 2001) reflect funding received for efforts associated with a classified program ($98M). FY 2001 and FY 2002 reflect the transfer of $5M in each year to the Navy in support of BROACH. The FY 2002 column also reflects the Department of Defense direction to increase funding of Zebra-Chip in the amount of $10M (FY 2001 $500K) and increase the level of funding in support of DTRA's Terrorist Device Detection and Defeat efforts at an additional $5M from the FY 2001 funding level. In addition, FY 2002 reflects an addition of $60M -- the result of the new administration's effort to reemphasize the need for continued R&D and DoD's evaluation of how best to use additional R&D funding. These funds will be used to accelerate and expand our capabilities to defeat hard targets and develop capabilities to utilize new thermobaric and energetic material technology. These funds will also be used to develop advanced technology for providing radiation hardened electronics to ensure the reliable operation of our military forces and systems in WMD environments. DoD has unique needs for radiation hardened microelectronics that are met by

~~leveraging commercial microelectronic products. These efforts to improve our capabilities to~~ defeat hard targets, develop understanding and tools to take advantage of new materials and to improve survivability of active defense systems will significantly improve our capabilities. Changes in FY 2003 from the FY 2001 President's Budget Request (Feb 2000) and the

B. Program Change Summary (cont'd)

FY 2002 Amended President's Budget Request (June 2001) are a result of a $1.8M Congressional add for Discrete Particle Methods, $2.8M add for Thermobaric Warhead Development, and $1.5M add for Radiation Hardened Microelectronics as well as Congressional reductions amounting to $4.9M. In FY 2003, this program element is being split into two new program elements: WMD Defeat Technologies and Strategic Defense Technologies.

Project BB – Small Business Innovative Research (SBIR) – This project provides the means for stimulating technological innovation in the private sector, strengthens the role of small business in meeting DoD research and development needs; fosters and encourages participation of minority and disadvantaged businesses in technological innovation; and increases the commercial application of DoD supported research and development results. These efforts are responsive to PL 106-554.

FY 2001 Accomplishments

Small Business Innovative Research ($3,042K)

Supported the Small Business Administration (SBA) National Direction by actively seeking small business contractors to perform innovative research.

Executed Agency-approved SBIRs.

FY 2002 Plans

Small Business Innovative Research ($3,716K)

Support the Small Business Administration (SBA) National Direction by actively seeking small business contractors to perform innovative research.

Execute Agency-approved SBIRs.

FY 2003 Plans

Funding and activities realigned to Project BB in PE 0602716BR and 0602717BR.

Project BC – Force Protection and Technology Applications - This project supports Assessment and Mitigation Technologies, which conducts mission vulnerability assessments of strategic U.S./Allied systems to facilitate the development of investment strategies for improved survivability, to include nuclear command and control. This program also ensures that assessment training programs, engineering designs, and new construction embody sound force protection, vulnerability mitigation, and collective protection principles. DTRA technologies and expertise are applied to enhance U.S. capabilities across the spectrum of the counterproliferation and force protection missions. These may include development of sensor technologies for initially identifying the consequences of weapons of mass destruction (WMD) through countering or protection against this threat. Some of the program's products and services include the Balanced Survivability Assessments (BSA), the Smart Building program's strategic facility construction design and cost estimates, vulnerability out-briefs and written reports, overall vulnerability trend data, National and NATO conferences for Underground Facility Managers, and multi-disciplined technical engineering expertise support and the Congressionally mandated Thermionics program (FY01 only).

FY 2001 Accomplishments

Balanced Survivability Assessments ($6,541K)

Conducted in conjunction with O&M funding, twenty-three balanced survivability assessments on DoD facilities as tasked by CINCs, the Joint Staff, and OSD Command, Control, Communications (C3I).

Continued integrated vulnerability assessment of defense and critical national infrastructure facilities.

Smart Building Program ($5,787K)

Completed the Smart Building (SB) retrofits for enhanced WMD protection to include: Chemical, Biological and Radiological (CBR) filtration, overpressurization, back-up power supply, air locks and decontamination stations.

Project BC – Force Protection and Technology Applications (cont'd)

Completed the final phase of the software and equipment for the two consequence assessment centers – Unclassified for Olympic Coordination Center, and Classified for Joint Operations Center.
Collaborated and conducted external and internal tracer gas tests.
Provided technical support to the Command Post and Field Training Exercises.
Initialized Operational Capability of integrated SB system.
Completed an operational counter-WMD cell within Joint Operations Center (JOC) for on-site and reach-back technical support, and provide training as appropriate.
Completed assessment of the counter WMD integrity of the as-built JOC.

Thermionics Program ($2,300K)

Continued thermionics research and development
Continued microminiature thermionics converter development

FY 2002 Plans

Balanced Survivability Assessments ($1,835K)

Conduct balanced survivability and integrated vulnerability assessments on DoD facilities as tasked by CINCs, the Joint Staff, and OSD/ C3I.
Continue integrated vulnerability assessment of defense and critical national infrastructure facilities.

Smart Building Program ($4,349K)

Finalize Operational Capability of integrated Smart Building (SB) system.
Provide on site technical support for special events.
Begin lessons learned upgrade efforts.
Begin decommissioning of SB system.

FY 2003 Plans

Funding and activities realigned to Project BC in PE 0602717BR.

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Project BD - Weapon Effects Technologies – This project provides for the development and application of products and services to meet Weapons of Mass Destruction (WMD) and other special weapon effects challenges. This is accomplished using state-of-the-art science and engineering capabilities, including advanced first principles analysis, engineering modeling, simulation and networking technologies, and precision laboratory scale and field testing capabilities (supported by Project BE-Testing Technologies and Integration). The project integrates and applies these advanced capabilities to support decision making in the face of rapidly evolving WMD threats in both military and civilian sectors. Products being developed include WMD target planning and assessment tools, WMD hazardous materials transport and collateral effects prediction tools, tools and technologies used to mitigate the effects of WMD on facilities and people, and consequence assessment/management tools to evaluate and respond to WMD events. Additionally, this project develops the enabling technologies used to produce anti-terrorist/force protection tools. This project also develops technologies to support force protection assessments and forensic analysis of terrorist events as well as advanced blast mitigation/retrofit techniques. Such tools developed on this project are used to enable other projects including Project BC-Force Protection and Technology Applications, and Project BF-CP Operational Warfighter Support. Also, they are made available to civilian, anti-terrorism and disaster response support organizations.

This project also maintains the capability to address nuclear weapon effects problems. This involves development and application of state-of-the-art nuclear weapon effects models to DoD for survivability, operability, and employment planning applications. In addition, the project maintains a national archive of nuclear phenomenology, involving perishable nuclear test data and expert interpretation, weapon effects models that encode our knowledge base, and a modern computer-based architecture for retention and access to such archives. These capabilities are used in direct support of the warfighter and are used to enable other projects including Project BG-Nuclear Operations and Project BH-System Survivability.

In direct support of these products and services to the warfighter, this project also provides and maintains a world-class High Performance Computing (HPC) architecture with

Project BD - Weapon Effects Technologies (cont'd)

high band-width communications required for direct support to the warfighter. This service enables the application of state-of-the-art first principles models to WMD problems and supports the development of improved models and migration to advanced computing architectures.

In addition, this project includes funds for which the Department of Defense has provided direction to DTRA, to initiate a new subproject known as Z-Chip (also referred to as the Study of Conceptual DoD Health Surveillance and Biodefense System). These funds are to be used to initiate development of the next-generation chip-based micro-sensor array pathogen detection technology and demonstrate the capability to fuse patient point-of-care data using health surveillance software. The system utilizes diagnosis in the early stages of disease when patients present respiratory symptoms to identify the threat agent and to recommend appropriate prophylaxis and treatment.

Also included in this project are civilian salaries required to directly support the development of products and services provided by this project. Additionally, this project contains resources added by Congress for the Monterey Center for Counterproliferation Studies.

As part of the Secretary of Defense's recent Strategic Review, additional funds of $60M were added to: begin development of the capability to defeat a broad spectrum of biological threat agents, develop nuclear effects and output models and precision lethality tools for warfighter/CINC and service acquisition program office support, and begin efforts to assess nuclear test readiness.

FY 2001 Accomplishments

Targeting Support ($9,128K)

Released Munitions Effects Assessment (MEA) 4.0 windows based weaponeering planning tool (MEA 3.1) is a validated tool for the Joint Munitions Effects Manual (JMEM) for attacking tunnel facilities.

Project BD - Weapon Effects Technologies (cont'd)

Released IMEA 4.1 that includes the following capabilities: an interface to HPAC 4.0, the Guided-Weapon Trajectory Software (GWTS), and multiple hit/multiple crater algorithm (Common Layer Cratering Library).

Performed verification & validation testing to submit an accreditation support package to the Joint Technical Coordinating Group for Munitions Effects (JTCG/ME) to obtain accreditation.

Completed precision tests for validating Lethality/Vulnerability (L/V) models that are used in the Integrated Munitions Effects Assessment (IMEA).

Completed tests on Former German Democratic Republic Command, Control, Communications, and Intelligence (C3I) equipment and develop functional defeat model.

Conducted precision tests on reinforced concrete and masonry walls and steel deck slabs, and integrate engineering level models into MEA.

Developed multiple shot wall damage algorithms for MEA 5.0.

Integrated the initial set of weaponeering tools into the Integrated Target Planning Tool Set (ITPTS 1.0). Assured compatibility with the Defense Intelligence Agency (DIA) ATHENA database and the JCS/J2T Joint Targeting Toolbox.

Upgraded structural response and ground-shock propagation methodologies for Ground-Shock Vulnerability Number (GVN) Improvement.

Phenomenology and Advanced Computing ($20,164K)

Completed non-ideal airblast phenomenology update in direct response to request of U.S. Army, by initial distribution of PC airblast code.

Completed development of the EMP (Electromagnetic Pulse) targeting models for Strategic Command (STRATCOM).

Partially completed development of the STRATCOM C4 Assessment Toolset (STRATCAT) and transferred the version of the tool to STRATCOM.

Began the phase-out of the Graybeard nuclear test data review and archival on airblast, cratering & ejecta, dust & fallout, electronics interaction, and biological effects.

Project BD - Weapon Effects Technologies (cont'd)

Provided scientific and technical information services and products as the DOD-wide repository for test photos, films, data, test records, and other information products.

Continued review and archiving of perishable nuclear environmental radiation, thermo-mechanical, and electromagnetic test data.

Continued computational support by providing annual support for the Scientific Computing Communications Network and maintain High Performance Computing (HPC) equipment for the DTRA Telegraph Road Data Center, such as increased memory and additional Central Processing Units (CPUs) to extend the life of existing systems and enable them to accommodate additional workload from decommissioning of older vector machines.

Provided classified access capabilities for the DTRA Telegraph Road Data Center.

Continued support of National Missile Defense/Theater Missile Defense with detailed nuclear phenomenology and analysis to aid in the development of models of system operation in nuclear environments.

Completed detailed first principle upgrade of EMP tools to include Source Region EMP (SREMP) Tool sets.

Completed detailed benchmark calculations of delivery system impact on nuclear weapon output spectrum.

Initiated upgrade of high/low altitude nuclear environment to assess nuclear effects on military system design.

Provided initial upgrade for ground shock prediction methodologies utilized by DIA and STRATCOM for the Ground Shock Vulnerability System used in Strategic Integrated Operational Plan (SIOP) planning.

Published and distributed Nuclear Weapon Effects textbooks.

Project BD - Weapon Effects Technologies (cont'd)

Hazard Prediction and Assessment Capability (HPAC)/Consequence Assessment Tool Set (CATS) ($11,126K)

Delivered HPAC 4.0 to STRATCOM, JFCOM, and other CINCs. Incorporate nuclear weapons accident module, NBC messaging capability, missile intercept module, smoke and obscurants module, and initial urban transport capability.

Completed development of high-resolution probabilistic weather capability necessary for target planning of WMD facilities to support the warfighter.

Delivered CATS 4.6 to JTF-Civil Support, JFCOM and other CINCs and civil support first-responders, such as National Guard WMD Civil Support Teams and state emergency operations centers.

Extended casualty estimation to chemical and biological warfare agents, matching current nuclear effects casualty estimation.

Completed initial development of industrial hazardous material source term modeling for HPAC.

Evaluated urban modeling capability at 2001 Presidential Inauguration using the HPAC and new urban sub-models in concert with Joint Forces Command (JFCOM).

Provided counter-terrorism planning and urban transport and dispersion modeling capability for joint DoD/DoE support in preparation for Salt Lake City Winter Olympics.

Completed verification and validation efforts between existing DOE and DTRA transport and dispersion codes.

Provided collateral effects, consequence assessment analyses, and reachback technical support for all HPAC and CATS applications to Joint Staff (J2-Targeting), JFCOM (JTF-Civil Support), CENTCOM and EUCOM, in response to exercises and contingency operations.

Advanced Systems and Concepts Office (ASCO) ($6,567K)

Researched nuclear, chemical, and biological weapon threats and responses.

Surveyed prospects for nuclear proliferation as well as its implications for deterrence and other tools of coercive threat management.

Project BD - Weapon Effects Technologies (cont'd)

Assessed the utility of preventive threat reduction, that collection on non-coercive tools ranging from reciprocated unilateral action to orchestrated international agreements.

Assessed the feasibility of a DoD Health Surveillance and Biodefense System (Z-Chip); studied advanced chemical and biological operations in contaminated environments; evaluated efforts to enhance attribution in bio-weapon attacks (bio-forensics); supported National Academy of Sciences study of bio-detector technology; assessed the relative lethality of missile-delivered nuclear, chemical, and biological munitions, WMD-related training scenarios, and approaches to food supply assurance.

Infrastructure ($8,787K)

Provided for payment of civilian salaries.

Monterey Center for Counterproliferation Studies ($4,000K)

Congressionally added funding

FY 2002 Plans

Targeting Support ($17,777K)

Develop initial Battle Damage Assessment (BDA) program and begin BDA tool software requirement specifications (SRS) and software program specification (SPS).

Complete development of MEA 5.0 and ITPTS 2.0 to support the final CP2 ACTD demonstration DIPOLE ZODIAC and the tunnel defeat demonstration.

Perform high-fidelity analyses and precision tests to produce blast mitigation and retrofit criteria for use in joint Blast Effects Estimation Model.

Complete development of a high fidelity, physics-based computer code for DoD High Performance Computing Program capable of generating reliable data for lethality/vulnerability model development for WMD counterforce applications.

Begin development of the capability to defeat a broad spectrum of biological threats (dry/wet spores, viruses, toxins). Establish relationships between weapons concepts, their effects and biological threat agent vulnerabilities.

Project BD - Weapon Effects Technologies (cont'd)

Refine baseline two-dimensional Discrete Particle Model that was developed in FY01 into a full three-dimensional model capable of addressing problems associated with extreme (blast/shock) loading of reinforced concrete structures.

Phenomenology and Advanced Computing ($28,713K)

Provide online (password protected) scientific and technical information services and products as the DoD-wide repository for test weapon effects photos, films, data, test records, and other information products.

Complete archiving of perishable nuclear environmental radiation, thermomechanical, and electromagnetic test data.

Provide support for Scientific Computing Communications Network and High Performance Computing (HPC) equipment, an enabler of weapon effects research and prediction.

Improve simulation of high altitude regime nuclear burst effects important for National Missile Defense (NMD) to provide improved prediction of debris location and energy deposition, critical parameter for NMD operability.

Continue educational seminars on the use of nuclear prediction tools for application to Ballistic Missile Defense Office (BMDO) and communications systems.

Begin integration of nuclear weapon disturbed environments into space weather program.

Complete hostile environment (nuclear interceptor output) definition for reentry body upgrade program.
Begin to develop and apply modern ground shock phenomenology prediction tools and validation databases for Deeply Buried Targets.
Generate nuclear weapons output from threat weapons (Red Book) using high-performance computers.
Provide support to STRATCOM in the field of nuclear phenomenology and associated tools to include upgrade to the Integrated Nuclear Computational Aids, development of an Electromagnetic Pulse (EMP) Vulnerability Number Engagement Tool, and responding to questions on space and EMP environments.
Provide high-altitude nuclear effect (HANE) data for the National Missile Defense Program

Project BD - Weapon Effects Technologies (cont'd)

Assess reducing underground test readiness from three years to three months, resolve safety issues and demonstrate resolve.

Hazard Prediction and Assessment Capability (HPAC)/Consequence Assessment Tool Set (CATS) ($15,650K)

Deliver HPAC 4.0.1 to JFCOM, STRATCOM, EUCOM and other CINCs and service organizations. Incorporate industrial hazardous material source with human effects, airborne chemical reaction and deflagration effects and integrated urban transport.
Deliver HPAC-CATS (Nuclear) prototype for testing to STRATCOM.
Deliver CATS-JACE web-based consequence assessment software to JFCOM and other primary and support CINCs in buildings due to infiltration and in-the-building releases.
Develop initial high-resolution weather forecasting model to incorporate mesoscale methodologies from the Navy, Air Force, Colorado State University, and DTRA.
Continue development of urban transport and dispersion modeling capability through collaboration with United Kingdom and scaled testing.
Provide counter-terrorism support and urban transport and dispersion modeling capability for joint DoD/DOE support during designated special events.

Advanced Systems and Concepts Office (ASCO) ($8,036K)

Commission and perform a wide array of study efforts to address areas of force protection and operations; homeland defense and countering terrorist attacks; strategic issues; and other unconventional threats and vulnerabilities.

Complete studies on a chemical weapon next generation agent assessment; assess casualties for a multilayer biological defense; conduct game theory applications to offense-defense strategies; continue studies of advanced chemical and biological threats and operations in contaminated environments; and further develop the conceptual plan for an integrated national bio-forensics capability.

Accomplish broad spectrum WMD intelligence collection gaps and needs assessment.

Zebra-Chip ($10,000K)

Validate bio surveillance software/network point-of-care capability.

Project BD - Weapon Effects Technologies (cont'd)

Demonstrate PCR-based initial operational capability for point-of-care pathogen detection.

Develop and demonstrate DNA-based multi-agent biological detection chip.

Develop and demonstrate anti-body-based multi-agent biological detection chip.

Infrastructure ($10,465K)

Provide for payment of civilian salaries.

FY 2003 Plans

Funding and activities realigned to Project BD in PE 0602716BR.

Project BE – Testing Technologies and Integration – This project provides a unique national test-bed capability for Weapons of Mass Destruction (WMD) facility characterization, weapon-target interaction, and WMD facility defeat for various types of test/demonstration functions to respond to operational needs. The project develops, provides and maintains test-beds used by the DoD, the Services, the CINCs and other federal agencies to evaluate the implications of WMD, conventional, and other special weapon use against U.S. military or civilian systems and targets. This project leverages fifty years of testing expertise to investigate weapons effects and target response across the spectrum of hostile environments that could be created by proliferant nations or terrorist organizations with access to advanced conventional weapons or WMD (nuclear, biological and chemical). Specific programs supported by this project include: (1) Hard Target Defeat (HTD); (2) Anti-terrorism (AT); (3) CP Counterforce Advanced Concept Technology Demonstration (ACTD); and (4) Special Operations Forces (SOF). This project maintains testing infrastructure to support warfighters, other government agencies, and friendly foreign countries testing requirements on a cost reimbursable basis. This project also develops strategy and planning for a WMD test-bed infrastructure focusing on nuclear, biological, and chemical facilities, and the hard and deeply buried facilities in which activities are often located. The project provides support for full and sub-scale tests that focus on weapon-target interaction with fixed soft and hardened facilities to include aboveground facilities, cut-and-cover facilities and deep underground tunnels. Specific activities include testbed design and construction, instrumentation and data collection, test coordination and execution, and post-test analysis and documentation. This project directly supports Projects BC, BD, and BF, and, in PE 0603160BR, Project BJ and BK.

FY 2001 Accomplishments

Test-Bed Operation and Support ($6,968K)

- Supported broad customer base including friendly foreign nations in the conduct of weapon-target interaction and WMD defeat tests.
- Provided an inventory of unique targets, infrastructure support, and expertise for conduct of major integrated test programs, including instrumentation maintenance,

Project BE – Testing Technologies and Integration (cont'd)

gauge installation, data recording, source diagnostics, environmental support, safety support, experiment installation, experiment fielding, and test fielding. Specific WMD (nuclear, biological and chemical) programs supported by this project included HTD and CP ACTD.

The number of tests supported this year were 11 for CP2 ACTD, 8 supporting antiterrorism, 5 supporting tunnel defeat and 10 supporting general R&D Service requirements and general knowledge base enhancement. Approximately 10 tests were major ACTD Demonstrations.

Field Support ($991K)

Continued to provide infrastructure support for maintenance of government vehicles, transportation of equipment, communications, utilities for facilities, rental of facilities, supplies, custodial service, and procurement of equipment in support of test execution.

Nevada Test Site (NTS) Environmental Remediation ($842K)

Continued systematic environmental assessment and remediation on the tunnel complexes at NTS for which DTRA is responsible.

Developed Corrective Action Plan for N-tunnel muck pile and Corrective Decision Document for T-tunnel muck pile.

Simulator Technology ($600K)

Maintained Large Blast Thermal Simulator (LB/TS)in a caretaker status, which included one systems test to assure the operational status of the device.

Developed a design package for modification of the nitrogen driver tube section to be replaced with compressed air.

FY 2002 Plans

Test-Bed Operation and Support ($8,665K)

Continue to provide unique national test-bed capabilities for weapon-target interaction and WMD programs. Expect to support 5 major CP2 ACTD demonstrations, 15 Hard Target

Defeat demonstrations, 6 antiterrorism information tests and 10 general phenomenology tests.

Project BE – Testing Technologies and Integration (cont'd)

Provide an inventory of unique targets, infrastructure support, and expertise for conduct of major integrated test programs, including instrumentation maintenance, gauge installation, data recording, source diagnosis, environmental support, safety support, experiment installation, experiment fielding, and test fielding.

Field Support ($1,461K)

Continue to provide infrastructure support for maintenance of government vehicles, transportation of equipment, communication, utilities for facilities, rental of facilities, supplies, custodial service, and procurement of equipment in support of test execution.

Simulator Technology ($590K)

The original Large Blast and Thermal Simulator(LB/TS) will receive the following upgrade: Driver tube section and end caps are being modified to be used with common compressed air rather than the nitrogen driving gases used in the past. This should allow a more inexpensive test with the same fidelity.

Continuation of LB/TS in caretaker status.

FY 2003 Plans

Funding and activities realigned to Project BE in PE 0602716BR.

Project BF – CP Operational Warfighter Support - This project will provide targeting and Intelligence Community (IC) support, exercise CP technologies and products with the users, develop DoD compliant simulations that exploit CP models for target planning and collateral effects prediction, and demonstrate CP capabilities in operationally realistic environments. The technical approach is to integrate technologies developed in other CP projects, to conduct a full spectrum of tests to verify capability enhancement, to expose customers to these capabilities in exercises, wargames and demonstrations, to integrate CP technologies into customer operations, and to support use of these capabilities during contingency operations. This project focuses on four thrusts that support outside customer requirements. The four thrusts are a Hard Target Defeat (HTD) program, a Weapons of Mass Destruction (WMD) Assessment and Analysis Center (WMDAAC), Nuclear Infrastructure Threat Reduction (NITR), and Commanders-in-Chief (CINC) Planning Support. The CP Operational Warfighter Support project provides the bridge between the CP technology base and operational community needs. The overall project goal is to support the Joint Chiefs of Staff (JCS), the warfighting CINCs and Services/agencies engaged in countering WMD threats and to protect the U.S. and its allies against military or terrorist use of WMD.

Hard Target Defeat Program. The United States and its allies face a growing threat related to critical military targets hidden within and shielded by hardened, deeply buried tunnel complexes. These complexes may house biological/chemical/nuclear weapons production or storage facilities; command, control, and communications facilities; and theater ballistic missiles and their transporter-erector-launchers (TELs). An objective of this project is to examine the existing U.S. and Allied capabilities to hold hardened, deeply buried tunnel targets at risk, thereby defining a current performance baseline. Any deficiencies will be identified and the ability of planned systems to address these deficiencies will be assessed. Finally, new technologies needed to mitigate remaining shortfalls will be evaluated as candidates for new hard target defeat acquisitions. Activities respond to warfighting requirements derived from the Hard and Deeply Buried Target Defeat Capstone Requirements Document, and to the RDT&E priorities of the Office of the

Project BF – CP Operational Warfighter Support (cont'd)

Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD(AT&L)). Funds added as a result of the Secretary of Defense strategic review for FY02 are being used to develop technologies identified in the Hard and Deeply Buried Target Defeat Science & Technology Plan.

Targeting and IC Support, part of Hard Target Defeat, provides functional vulnerability assessments of hostile foreign systems in support of warfighter and IC requirements. It assists the CINCs and IC in target planning against hard and deeply buried facilities. The assessments leverage databases, methodologies, and technical expertise developed during Balanced Survivability Assessments (PE 0602715BR, Project BC). Details of specific individual assessments are classified.

This project focuses weapon/target interaction and target planning tool technology base efforts completed in Project BD on tunnel applications. The program depends on test planning and execution support from Project BE. Products from this project are transitioned to PE 0603160BR, Project BK for Command, Control, Communications, and Intelligence (C3I) facility demonstration and the Thermobaric Weapon (TW) demonstration. Efforts in this program provide part of the technology base needed for counterproliferation activities conducted in other DoD programs.

WMD Assessment and Analysis Center. The WMDAAC provides the warfighter with the capabilities and understanding for countering the use and effect of Weapons of Mass Destruction (WMD) through the advancement of simulation technology, assessment of operational impact, and the development of collaborative capabilities. Specifically, the WMDAAC: 1) develops advanced simulations from first-principles physics models produced in other projects in this program element (extensively Project BD). WMDAAC personnel provide an interface between DTRA model developers and the weapons effects simulation community to

ensure maximum utility of DTRA models in distributed interactive simulations through compliance with High Level Architecture (HLA) standards and protocols.2) The WMDAAC uses

Project BF – CP Operational Warfighter Support (cont'd)

these advanced simulations to assist the warfighter in quantifiably assessing operational theater plans and post-attack warfighting effectiveness and to develop alternatives to mitigate the effects of WMD. 3) The WMDAAC develops and adapts capabilities to project information through advanced visualization techniques and to facilitate collaboration at widely dispersed locations. Commercial and government developed technologies are selected and proven in a research environment, and then transitioned to the DTRA Operations Center and/or other warfighter customers. 4) The WMDAAC provides warfighters and first responders with ready access to mature computer models, WMD databases and expert field assistance and training. The end result is to provide more realistic models and simulations of the effects of WMD for use in training, analysis, experimentation, and acquisition. Models and simulations will support the fielding of joint and service M&S system developments (e.g., Joint Simulation System (JSIMS), Joint Modeling and Simulation System (JMASS), Joint Warfare System (JWARS)).

Nuclear Infrastructure Threat Reduction (NITR) Program. The NITR program is designed to provide the National Command Authority (NCA) and combatant commands a coordinated capability to deny critical nuclear weapon production, processing, fabrication and storage capability of an adversary, minimize collateral effects, and support consequence management of nuclear accidents/incidents within the combatant commander's area of operations (AOR). NITR technologies include pre-attack planning, target response and collateral effects prediction; a variety of radiometric and nuclear sensors for facility damage and collateral effects assessment; and strategies to ensure structural damage to targeted components and mitigate damage to surrounding components. Additionally, this program will enhance our ability to predict the consequences of terrorist action against accidents in nuclear facilities. The program depends on test planning and execution support from Project BE.

CINC Planning Support. This activity develops modeling and simulation tools and applies them to support warfighters in development of war plans. It produces

Project BF – CP Operational Warfighter Support (cont'd)

theater and campaign level simulation. These tools are used in a program called War Planning Support (WPS) to assess/analyze war plans or to evaluate the benefits of new technology on improved warfighter efficiency and effectiveness. Two tools currently being developed are the Integrated Theater Engagement Model (ITEM) and the Synthetic Exercise Environment (SEE).

FY 2001 Accomplishments

Hard Target Defeat Demonstrations ($10,330K)

- Conducted functional defeat demonstrations using current inventory weapons on the full-scale simulated missile operations tunnel facility #1 at the Nevada Test Site (NTS).
- Determined reconstitution time for functional defeat attacks on missile operations facilities (tunnel facility #1).
- Completed construction of the NTS tunnel facility #2 to be used for functional defeat demonstrations of tunnel facilities housing C3I functions.
- Started installation of equipment necessary for functional defeat demonstrations on the C3I tunnel facility #2 at NTS.

Hard Target Defeat Technology ($14,526K)

- Continued development and validation of remote site geologic characterization technology.
- Conducted geologic material properties tests for the NTS tunnel facility #2.
- Continued functional characterization and modeling of C3I and WMD tunnel facilities.
- Identified mission critical equipment and vulnerabilities for C3I tunnel facilities.
- Continued penetration testing for rock and damaged concrete focusing on multiple attacks on the same aimpoint.

Continued advanced weapon/payload testing to identify and quantify defeat mechanisms and evaluate effectiveness for C3I and WMD tunnel facilities.

Continued development of improved/new weapon and target interaction models addressed in Project BD under munitions effects assessments to include in-tunnel equipment response, and reconstitution for C3I and WMD tunnel facilities.

Project BF – CP Operational Warfighter Support (cont'd)

Continued support for other DoD and military service hard target defeat-related activities.

Continued placement and integration of targeting models into automated weaponeering tools.

Continued evaluation of signatures for hard target defeat applications.

Continued targeting and IC support by conducting assessments of hostile facilities based on JCS and CINC priorities. Details are classified.

WMD Assessment and Analysis Center ($8,573K)

Transformed high fidelity, physics-based models and databases into a flexible and extensible framework for providing credible virtual targets including associated weapon effects, target responses, and induced environments. Integrated the resulting system into the Wisconsin Air National Guard Training Range at Volk Field to provide realistic, repeatable, non-destructive training for air-to-ground attack crews.

Implemented DoD High Level Architecture (HLA) requirements for the Operational Multi-scale Environment model with Grid Adaptivity (OMEGA) and Hazard Prediction and Assessment Capability (HPAC) 4.0 enabling the use of these models in DTRA and other government simulations to include Joint Warfare Systems (JWARS), Joint Simulation Systems (JSIMS), Joint Semi-automated Forces (JSAF), etc.

Completed a Weapons Effects Federation Object Model for integration of blast and penetrating weapon codes in nuclear, biological, chemical, and radiological environments.

Continued to support research and development of WMD simulation activities within critical programs such as JWARS and JSIMS by developing tools that will analyze

effects of WMD weapons from a single-weapon, detailed view to a theater-wide, aggregate view.

Continued technical and advanced simulation support to CINC-sponsored exercises worldwide and consequence analysis support for National Special Security Events, exercises, and wargames.

Project BF – CP Operational Warfighter Support (cont'd)

Continued research into high-speed data connectivity for operational and research and development customers including the use of Defense Information Systems Network-Leading Edge Services (DISN-LES) and CINC21 ACTD advanced communication connectivity for warfighting CINCs with multiple remote users and deployed teams.

NITR Collateral Effects ($1,538K)

Developed target planning tool architecture design, software development documentation plan and verification and validation plan.

Developed and integrate generic enrichment and reprocessing facility model with fault tree and vulnerability modeling into prototype targeting tool.

Developed integration plan for prototype tool into Munitions Effects Assessment tool.

Developed weapon storage facility model to include vulnerability and collateral effects characteristics.

Developed nuclear component fragility modeling and testing plan.

Transferred nuclear aspects of collateral effects to Project BD.

NITR Systems Assessment/Weapons ($575K)

Identified and assess weapon system elements that enhance the capability to attack and defeat NITR related targets in virtually any weather with minimum collateral effects.

Identified and assess nuclear, radiometric and other sensors and sensor fusion strategies that facilitate pre-strike planning, attack, and post-strike damage and collateral effects assessment of NITR related targets.

Documented results and conclude systems assessments.

FY 2002 Plans

Hard Target Defeat Demonstrations ($13,360K)

Complete installation of equipment necessary for functional defeat demonstrations on the C3I tunnel facility #2 at NTS.

Conduct simulated C3I operations at the NTS tunnel facility #2 to support signature/sensor evaluations.

Project BF – CP Operational Warfighter Support (cont'd)

Initiate functional defeat demonstrations using advanced weapon concepts on the C3I tunnel facility #2 at NTS.

Construct tunnel portal test facilities at White Sands Missile Range (WSMR) to evaluate operational tactics and standoff weapon systems prohibited at NTS.

Hard Target Defeat Technology ($37,359K)

Continue development and validation of remote site geologic characterization technology.

Develop functional characterization models of C3I and WMD tunnel facilities.

Identify mission critical equipment and vulnerabilities for WMD tunnel facilities.

Continue penetration testing for rock and damaged concrete focusing on multiple attacks on the same aimpoint.

Continue advanced weapon/payload testing to identify/quantify defeat mechanisms and evaluate effectiveness for C3I and WMD tunnel facilities.

Conduct development and lethality testing of a classified weapons concept for C3I tunnel facilities.

Develop improved weapon/target interaction models to include the response of critical C3I and WMD equipment to advanced payload environments.

Continue support for other DoD and military service hard target defeat-related activities.

Develop structural and functional battle damage assessment for C3I and WMD tunnel facilities, for incorporation into the Munitions Effects Assessment (MEA) tunnel module.

Continue evaluation of signatures for hard target defeat applications.

Initiate development of a functional defeat capability to assure critical component and network centric kills for targets invulnerable to physical defeat.

Assess ground shock and tunnel blast lethality issues to determine minimum collateral effects application of nuclear weapons against hard targets.

Initiate development of an advanced payload for improved lethality to address hard and deeply buried target problem.

Project BF – CP Operational Warfighter Support (cont'd)

Initiate development of high-payoff novel explosive concepts using advanced energetic materials to enable defeat of targets currently invulnerable to weapons solutions.

Accelerate development of a thermobaric payload optimized for hard and deeply buried targets and WMD agent kill applications.

Continue targeting and intelligence community support by conducting assessments of hostile facilities based on JCS and CINC priorities. Details are classified.

WMD Assessment and Analysis Center ($8,987K)

Demonstrate a Weapon Effects Federation Object Model (WE FOM) incorporating physics-based models and databases of targets, weapons, and post-strike effects. Continue WMD modeling interface definition for JSIMS, JWARS, and JMASS. Support the USJFCOM Millennium Challenge exercises.

Complete integration of urban dispersion model into web-enabled Weapons Analysis Lethality Tool Set. Begin follow-on Joint Weapons Effects Analysis Tool Set.

Begin Airbase Effects Assessment for Chemical and Biological Weapons.

Demonstrate utility of weapon effects simulations for DTRA weapon effects testing for both planning and post-test analysis.

Demonstrate utility of HLA federations in WMD effects simulation for Millennium Challenge '02.

Demonstrate utility of Global Broadcast System, a DoD one-way broadband transmission system, for WMD consequence management support during Millennium Challenge '02.

Continue joint efforts to develop high-fidelity physics-based models and databases of targets, weapons, and post-strike effects that support real/near-real time viewing of dynamic weapons effects in a simulated environment to include the effects of WMD, conventional weapon effects, and 3D visualization of target.

Continue research and development of collaborative tools to ensure effectiveness and compatibility with the customer by developing and demonstrating to warfighters and first responders portable automated access capabilities to DTRA products using advanced CINC21 ACTD communication technologies and knowledge management.

Project BF – CP Operational Warfighter Support (cont'd)

Continue exercise participation (CINC 21 ACTD, Fleet Battle Management Experiments, US Forces Korea Ulchi Focus Lens), training, and development of WMD information resources.

CINC Planning Support ($4,721K)

Produce Synthetic Exercise Environment (SEE) database and cartographic products for AIMING FIST 2002 exercise.

Identify SEE upgrade tasks through SHAPE Users Group.

Implement SEE Atlantis digital terrain mapping enhancements.

Conduct SEE follow-on feasibility study.

Identify upgrade tasks for Integrated Theater Engagement Model (ITEM) to meet customer requirements.

Complete War Planning Support (WPS) to SHAPE.

Continue phased WPS to MARFOR/CPF (USPACOM), CNE (USEUCOM), and USCENTCOM.

Respond to anticipated WPS requirements for USFK/CFC.

Continue WPS to the Commanding General 32nd AAMDC with completion of newly integrated Theater Missile Operations Campaign Plan Methodology for USFK/CFC, and transitioning applications to USCENTCOM Area of Responsibility (AOR) requirements.

FY 2003 Plans

Funding and activities realigned to Project BF in PE 0602716BR.

Project BG – Nuclear Operations – These programs directly reflect the National Military Strategy, support the provisions of Joint Vision 2010, and are directed by the JCS in the Joint Strategic Capabilities Plan (JSCP) Nuclear Annex. This project has been reorganized into three activities: 1) Nuclear Programs, 2) CINC/Forces/Security Support and 3) a new activity--WMD (Nuclear) Protection and Response. Responsive to the oversight of the Nuclear Weapons Council, they provide critical support to the CINCs, Services, JCS and OSD. This project continues the realignment begun by DTRA at its inception so as to deal with the emerging 21st Century strategic landscape, and is divided into the three areas as described above:

Nuclear Programs.

Nuclear Weapons Surety: As tasked by the DoD Nuclear Weapon System Safety Program, the surety programs will provide CINCs, Services, and JCS with technical analysis, studies, research, and experimental data to identify and quantify risks of plutonium dispersal and Loss of Assured Safety (LOAS) due to accidents, fires or natural causes during normal, peacetime operations of the nations nuclear weapon systems. Additionally, studies to quantify the probability of success of targeted terrorist attacks on DoD facilities, leveraging these risk assessment advances.

Nuclear Mission Management Plan (NMMP): As tasked by Deputy Secretary of Defense and Director, Defense Research and Engineering (DDR&E), and in support of national requirements to maintain a strategic nuclear deterrent, conduct assessments and develop long-range plans, the continued development of the DoD Nuclear Mission Management Plan is designed to provide a comprehensive, integrated DoD roadmap for the sustainment and viability of U.S. nuclear forces, personnel, and infrastructure.

Stockpile Sustainment: Continue to act as DDR&E's Executive Agent for Annual Certification and Dual Revalidation and support related stewardship and sustainment activities.

Project BG – Nuclear Operations (cont'd)

Stockpile Operations Support: In support of national requirements to maintain a viable nuclear deterrent, this program provides automated tools to maintain, report, track and highlight trends affecting the nuclear weapon stockpile. It will provide crucial business process and information support to ensure continued sustainability and viability of the nuclear stockpile.

CINC/Forces/Security Support. As tasked by the JSCP and DoD Directives, these programs will provide CINCs, Services, JCS and DoD with focused analyses in support of nuclear planning and operations and WMD threat mitigation as they pertain to the combat survivability of the forces. Additionally, they provide the DoD nuclear physical security applied research and force-on-force (FoF) testing programs to help insure the security of our nuclear forces. Provides technical support and curriculum development and enhancement for the Defense Nuclear Weapons School (DNWS), to include other WMD support, and other DoD nuclear training activities.

WMD (Nuclear) Protection and Response. As a new activity and in direct support to the National Military Strategy, these programs will promote initiatives to detect the surreptitious introduction and use of weapons of mass destruction against the U.S. and its allies thereby protecting our citizens and critical infrastructures. Potential adversaries, whether nations, terrorist groups or criminal organizations, will be tempted to use asymmetric means of war such as weapons of mass destruction to counter U.S. conventional weapon superiority. Promoting such initiatives enhances deterrence and proactively supports the agency's mission of WMD threat reduction.

FY 2001 Accomplishments

Classified Program ($97,860K)

Project BG – Nuclear Operations (cont'd)

Nuclear Programs ($13,688K)

Nuclear Weapon Surety Thrusts:

- Continued the B-2 Weapon Safety System Assessment (WSSA).
- Completed the WSSA for dual capable fighter aircraft in Europe.
- Completed the C-17 Aircraft Transportation Safety Study.
- Continued Storage Vault Blast Effects Testing and Analysis.
- Conducted modeling and testing to respond to weapon and weapon system safety requirements and criteria.
- Completed the development and continued the validation of the Storage Facility (Lightning) Tester.
- Continued the development and population of a weapon safety database of completed assessments, studies, and test programs.
- Began Phase II Small Business Innovative Research (SBIR)– Automated Vulnerability Evaluation for Risks of Terrorism (AVERT) and Isis Fire Modeling Program.

Stockpile Sustainment Program Thrusts:

- Conducted annual certifications, at Presidential direction, of the continued safety and reliability of the U.S. nuclear stockpile in the absence of underground testing.
- Began harmonization of NMMP and DOE's stockpile stewardship.
- Provided personnel, as tasked by Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs (ATSD(NCB)), for participation on the joint DoD-DOE Dual Revalidation teams, to conduct a multi-year, in-depth evaluation of the continued safety and reliability of specified weapons in the nuclear stockpile.
- Continued evaluation of the W80 in support of the Air Force.
- Prepared an annual performance report, as directed by Presidential Decision Directive #15(PDD), on the DoD stockpile sustainment accomplishments and future plans.

Provided technical support to the Nuclear Weapons Council (NWC).
Published FY 2002 Edition of the NMMP.

Project BG – Nuclear Operations (cont'd)

Stockpile Operations Thrusts:

Developed and initiated beta testing on Defense Integration and Management of Nuclear Data Services (DIAMONDS) capability package 1 which included developing and implementing the initial Unsatisfactory Reporting System, limited Joint Nuclear Weapon Publications access to on-line publications, and development of Maintenance Bay module. In addition, completed the initial integration of the Special Weapons Information Management System data into DIAMONDS. Successfully linked Air Force Product Support Center, Defense Threat Reduction Agency, and Sandia (DOE), with secure communications to support DIAMONDS data transmission and access to stockpile information, tools, and data.

CINC/Forces/Security Support (9,799K)

Completed Phase 2 assessment of outyear nuclear command and control requirements for NATO/SHAPE/Allied Command Europe.

Maintained USEUCOM/SHAPE European Theater Nuclear Support Program to provide in-theater nuclear and WMD support to EUCOM and NATO.

Initiated a program to fully integrate the planning processes and target data sets of STRATCOM, regional CINC plans and NATO nuclear planning capability.

Provided a quality forum for the development of assessments of the impact of technology on the capability of the nuclear forces and plans to sustain the U.S. nuclear deterrent policy and strategy.

Completed the WMD operational analysis for CENTCOM/USFK/TRANSCOM dealing with chemical threats to U.S./Allied military operations.

Jointly with the Counterproliferation (CP) Support and Operations Directorate, initiated a War Plans Support Program for the CINCs. Objective is to provide operational analyses dealing with theater planning WMD issues supporting the

development of CINC CONOPS, CONPLANS and OPLANS. USFK and CENTCOM are focus for FY 2001 program.

Project BG – Nuclear Operations (cont'd)

Completed award of Strategic Deterrence Program to support full range of nuclear and WMD Consequence Management Issues; nuclear policy support and the assessment of the full range of nuclear/WMD issues for DoD components.

Initiated NATO Nuclear Command and Control (C2), Quadrennial Defense Review Analytical Support program.

Conducted Force-on-Force exercise program focused on U.S. forces in USEUCOM/USAFE using the Mighty Guardian series.

Expand the support of the AFSPACECOM/STRATCOM security analyses of ICBM forces.

Initiate planning to support U.S. Navy potential Mighty Guardian Exercise.

Continued to directly support the curriculum development for the Defense Nuclear Weapons School.

Continued to serve as the DoD Executive Agent for nuclear weapons training and education.

Continued to expand and enhance expertise outreach training program across DoD.

WMD (Nuclear) Protection and Response ($19,366K)

Provided ability to accurately and quickly identify source of production of special nuclear material used in weapons or improvised devices.

Facilitated rapid and reliable identification of the source of shielded nuclear material (SNM) involved in a nuclear/radiological event/incident.

Developed portable, mobile, and rapidly deployable radiation detection and measurement system, a portion of which will be comprised of remote sensors linked to central receiving/processing station via radio frequency (RF) signals.

Provided CINC Technical Support Groups (TSG) ability to employ the system based on intelligence cueing.

Developed and field passive and active SNM detection systems where capable of detection in cases where SNM is shielded; current detectors technologies do not perform well when SNM is shielded for gamma and/or neutron emissions.

Project BG – Nuclear Operations (cont'd)

Conducted applied research and development in order to enhance the capabilities of DoD to consistently defeat Improvised Nuclear Device (IND)/Radiological Dispersal Device (RDD) through the use of developed technologies, tools, and techniques.

Began development of tools and capability for rapid attribution of the source of a nuclear event.

FY 2002 Plans:

Nuclear Programs ($20,346K)

Nuclear Weapon Surety Thrusts:

Conduct modeling and testing to respond to weapon and weapon system safety requirements and criteria.

Continue the development and population of a weapon surety database and interface to utilize and archive completed assessments, studies, tools and test programs.

Analyze and quantify Nuclear Detonation Safety Exceptions (NDSEs).

Complete the B-2 Weapon System Safety Assessment.

Complete validation and certification approval of the Storage Facility Tester.

Complete Storage Vault Blast Effects Testing and Analysis.

Continue Phase II SBIR – AVERT model and Isis model.

Begin developing desktop tool based on Storage Vault Blast Effects Testing and Analysis.

Begin Lightning Effects Testing and Analyses (Air Terminal Testing).

Begin development of electrical system Penetration Tester.

Continue to support abnormal environment scenario development and analysis for nuclear weapons systems (includes other NDSE analyses).

Stockpile Sustainment Program thrusts:

Conduct annual certifications, at Presidential direction, of the continued safety and reliability of the U.S. nuclear stockpile in the absence of underground testing.

Project BG – Nuclear Operations (cont'd)

Provide personnel, as tasked by Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs (ATSD(NCB)), for participation on the joint DoD-DOE Dual Revalidation teams, to conduct a multi-year, in-depth evaluation of the continued safety and reliability of specified weapons in the nuclear stockpile.

Continue evaluation of enduring stockpile weapons in support of the Air Force and Navy.

Prepare an annual performance report, as directed by PDD on the DoD stockpile sustainment accomplishments and future plans.

Continue technical support to the NWC.

Begin developing third edition of the NMMP.

Begin developing and presenting tailored nuclear weapons expertise and sustainment modules through Outreach 21 efforts to the War Colleges and warfighting units.

Stockpile Operations thrusts:

Develop and implement DIAMONDS capability package 2 which includes additional enhancements to Maintenance Bay and Unsatisfactory Reporting System modules as well as field additional integrated modules based upon user priorities and feedback while continuing to enhance fielded modules. In addition, identify additional functionality and opportunity to integrate weapon tracking systems and stockpile management functions. Link partial CONUS nuclear storage sites and additional organizations with secure communications to support DIAMONDS data

transmission and access to stockpile information, tools, and data communications to support DIAMONDS data transmission and access to stockpile tools and data.

CINC/Forces/Security Support ($8,506K)

Maintain USEUCOM/SHAPE European Theater Nuclear Support Program to provide in-theater nuclear and WMD support to EUCOM and NATO.

Jointly with the CP Directorate, continue the War Plans Support Program for the CINCs. Objective is to provide operational analyses dealing with theater WMD planning issues supporting the development of CINC CONOPS, CONPLANS and OPLANS.

Project BG – Nuclear Operations (cont'd)

Continue support to STRATCOM and regional CINCs with specific nuclear and WMD threat analyses in support of SIOP preparation, development of integrated effects models, direct planning support to regional CINCs, and specified applications for the Deterrence Framework analytic structure.

Continue to execute the Strategic Deterrence Program to support full range of nuclear and WMD Consequence Management Issues, provide nuclear policy support and the assessment of the full range of nuclear/WMD issues for DoD components.

Complete targeting program to fully integrate the planning processes and target data set of STRATCOM, regional CINC plans and NATO nuclear planning capability.

Conduct Force-on-Force exercise program focused on U.S. forces in USEUCOM/USAFE using the Mighty Guardian series.

Complete support of the AFSPACECOM/STRATCOM security analyses of ICBM forces.

Plan to support U.S. Navy potential Mighty Guardian Exercise.

Initiate new program to examine and evaluate the future impacts of technology on political/military/economical trends-focused on WMD/Consequence Management (CM)/Nuclear proliferation.

Complete NATO Nuclear C2, Quadrennial Defense Review Analytical Support program.

Continue to directly support the curriculum development for the Defense Nuclear Weapons School.

Continue to serve as the DoD Executive Agent for nuclear weapons training and education.

Begin development of a comprehensive WMD Training program.

Continue to expand and enhance expertise outreach training program across DoD.

WMD (Nuclear) Protection and Response ($17,417K)

Develop portable, mobile, and rapidly deployable radiation detection and tracking system, a portion of which will be comprised of remote sensors linked to central receiving/processing station via RF signals. Continue effort and begin integration of detection arrays with communication and analytical software. Expand upon mobile prototype, and continue software development toward future deployment of

Project BG – Nuclear Operations (cont'd)

three attended or unattended variants, including mobile, maritime, and stationary or portal.

Provide CINC Technical Support Groups (TSG) ability to employ the system based on intelligence cueing. Continue effort and expand to varied geographic and operational environments to evaluate operability.

Develop and field passive and active SNM detection systems capable of detection in cases where SNM is shielded; current detector technologies do not perform well when SNM is shielded for gamma and/or neutron emissions. Continue effort by funding scientific review panel and technical support to review studies and proposals to determine promising track for detailed research.

Produce through development and adaptive engineering detection equipment capable of rapid and standoff detection of radioactive materials across a broad spectrum of operational environments including uncertain and hostile. Develop equipment that without significant degradation is waterproof, shockproof, and resistant to extreme conditions and sustained employment. Develop lighter weight and smaller detector systems for more diverse field employment.

Integrate through new concept design or adaptive engineering multiple detection sensor systems to facilitate standoff operator detection of radioactive material

and passive or active trigger, alarm, destruct, or detection devices targeting the operator.

Establish administrative support structure to support technical reporting and document production of R&D development efforts. Reporting program must have broad enough scope to permit publication at classified and unclassified levels, and permit literature review and exploration of existing technologies to eliminate duplicating or redundant efforts, and exploit dual or multiple-use technologies.

Conduct operational analysis of commercial, vendor, "off-the-shelf", laboratory-produced concept design, or theoretical radiation detection devices in order to determine relative efficiencies, capabilities, and technologies to further enhance

Project BG – Nuclear Operations (cont'd)

the ability to develop, procure, and employ reliable and current technologies for radioactive material detection.

Enhance tools and capability for rapid attribution of the source of a nuclear event.

FY 2003 Plans

Funding and activities realigned to Project BG in PE 0602717BR and Project BG in PE 0602716BR.

Project BH – System Survivability – These programs directly reflect the National Military Strategy, support the provisions of Joint Vision 2020, and are directed by the JCS in the Joint Strategic Capabilities Plan (Nuclear Annex). 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; 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 CINCs; 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.

Project BH is divided into the five business areas described below: Radiation Hardened Microelectronics, Simulator Technology, Operability Assessments, Balanced Electromagnetic Hardening, and Human Risk and Technology.

FY 2002 reflects an addition of $17M, which resulted from the Secretary of Defense strategic review that stressed the importance of developing technological solutions to critical defense problems including ensuring the availability of radiation hardened microcircuits for survivable military systems, enabling the survivability of critical nuclear command and control networks and support for the development of an affordably survivable national missile defense.

Project BH – System Survivability (cont'd)

Radiation Hardened Microelectronics. Responds to DoD space and missile system requirements for hardened microelectronics and photonics technology to support mission needs. The non-availability of this technology would adversely impact system survivability, performance, weight and cost. The program involves the development and demonstration of technology to support the fabrication of radiation-hardened microelectronics and photonics for DoD missions through private sector and government organizations. This is achieved through the development and demonstration of enabling technologies to ensure the continued availability of special materials and radiation-hardened microelectronics and photonic devices.

Simulator Technology. This program is being revised to respond to the Defense Science Board Task Force on Nuclear Effects Simulation that recommended that DTRA pursue developing some of the capability lost with the moratorium on underground testing. Since the underground testing (UGT) moratorium, simulators have provided the only remaining experimental test bed for the development and validation of radiation-hardened DoD systems. The intensity and fidelity of these simulators do not match that of the UGT testbed, but, through this program, the agency develops, provides and maintains unique DoD radiation test facilities and enabling technologies that are used by the Defense Agencies, the Services and other federal departments (such as DOE) to evaluate the impact of hostile environments on military systems that support missions in the air, on land, at sea, or in space. The program also develops technologies to improve the intensity, fidelity, reliability, reproducibility, and cost effectiveness of existing and future simulators (including radiation sources, power flow and conditioning components, energy storage, diagnostics, instrumentation, other test support equipment, debris shields, and numerical models and computer codes for radiation sources and pulsed power components and test beds); develops concepts, plans, and risk reduction strategies for affordable next-generation

radiation simulators with substantially improved intensity and fidelity; support improvements to the two existing test centers, one at Maxwell Physics International (MPI) in San Leandro, California, and one at the Arnold Engineering

Project BH – System Survivability (cont'd)

Development Center (AEDC) in Tullahoma, Tennessee; and installs and characterizes upgrades to the new Decade x-ray simulator and to existing radiation simulators at MPI.

Assessments and Protection Technology. Directly responds to warfighter and acquisition program survivability needs by providing solutions, including development of affordable technologies and methodologies for system-level and family-of-system-level assessments, systems hardening, and testing of the effects of nuclear weapons. Includes development and demonstration of cost-effective system design and test qualification techniques to produce hardware that can be tested without the need for underground nuclear tests. Provides testable system design protocols and modeling and simulation (M&S) tools for system designers and users of nuclear effects simulators.

Balanced Electromagnetic Hardening. Provides the necessary science and technology to ensure protection and survival of military battlefield and civilian infrastructure electronic systems against multiple electromagnetic (EM) environments, including nuclear electromagnetic pulse (EMP), high power microwaves (HPM), as well as WMD threats. Designs and develops innovative, low-cost, balanced EM protection and test technologies for weapon systems; C3; and supporting infrastructure systems to the CINCs, Services and other DoD agencies. Includes development of high-power electromagnetic source technology for warfighting applications and hardening technologies for emerging radio frequency (RF) threats.

Human Risk and Technology. Applies lessons learned from the Nuclear Test Personnel Review Program (O&M-funded) to allow warfighters and peacekeepers to quantify/mitigate the risk

in post-Cold-War settings (i.e., limited nuclear exchanges, terrorist actions, radiological dispersal weapons, and other radiation risk scenarios) by developing field measurement and dosimetry systems to support military radiological guidelines for the protection of human resources. This provides direct support to warfighters by predicting and quantifying the operational impact of nuclear, biological and chemical (NBC) and conventional battlefield

Project BH – System Survivability (cont'd)

soldier effectiveness on NBC battlefields; providing performance and cost analysis to support the Defense Acquisition Board; and joint efforts with system program offices to apply the Agency's expertise and technologies to specific Service applications.

FY 2001 Accomplishments

Radiation Hardened Microelectronics ($19,902K)

- Demonstrated prototype radiation hardened memory circuits capable of storing one million bits of information and retaining the information in the absence of power.
- Completed the qualification, for space applications, of radiation hardened memory circuits capable of storing four million bits of information.
- Demonstrated technology to support the development of a radiation hardened processor circuit capable of providing at least 100 million instructions-per-second operation.
- Demonstrated advanced technology to support the development of radiation hardened circuits capable of processing both analog and digital information.
- Demonstrated a radiation hardened 24 million (4 million gates) transistor circuit array to support satellite and missile onboard data processing needs.
- Tested and evaluated combined electrical and optical technology for wideband data processing applications.
- Demonstrated Single-Event-Transient (SET) mitigation methods for very deep submicron microelectronics.

Simulator Technology ($14,173K)

Operated and improved DTRA's radiation simulators to support nuclear weapons effects testing requirements.
Continued user data acquisition system (UDAS) upgrade, integration and certification at the Decade Radiation Test Facility.
Replaced obsolete instrumentation at the Decade Radiation Test Facility.
Completed hardware modifications to the Decade Quad for the cold x-ray mode at AEDC.
Demonstrated high-fidelity (>5 keV) cold x-ray source for advanced radiation simulators using a high-energy test facility ("Z") at Sandia National Laboratories.

Project BH – System Survivability (cont'd)

Demonstrated a large-area (>700cm^2) debris shield system for application to cold x-ray testing on the Decade Quad.
Initiated the deployment of a monolithic plasma-opening switch on the Decade Quad.
Continued the development of technology to dramatically improve the capability of non-nuclear x-ray test facilities.
Continued the development of improved-efficiency, long-implosion, cold x-ray sources in support of Decade and future x-ray simulators.
Began development of radiation magnetohydrodynamic modeling and simulation tool for use in cold x-ray source development.
Continued development of pulsed power components for faster simulators.

Assessments and Protection Technology ($6,667K)

Continued to modify the Electronic Battle Book (EBB) database to include multiple link assessment due to nuclear weapons detonation for USSPACECOM exercises and assessments.
Completed Military Strategic and Tactical Relay (MILSTAR) transition operability assessment.
Developed nuclear environment software modules for integration with Hardware-in-the-Loop (HWIL) facilities.

Conducted testing of Early Warning Radars (EWRs) in support of National Missile Defense (NMD) program upgrades. Developed radar disturbance mitigation techniques for NMD ground-based radar (GBR) and Upgraded EWRs (UEWRs).
Provided infrared (IR) scene testing of National Missile Defense/Theater Missile Defense (NMD/TMD) sensors.
Supported IR and communications testing of Space-Based Infrared Satellite (SBIRS).
Continued communication/radar atmospheric effects participation in operational/warfighting exercises.
Completed development of an advanced IR scene generator.
Continued development of the Wideband Channel Simulator.
Continued development of flexible network assessment tool for analyzing various nuclear weapons effects on system performance.

Project BH – System Survivability (cont'd)

Completed the development of thermal structure response (TSR) test methodology for application to weapon systems operating in nuclear environments.
Began development of a Commercial-Off-The-Shelf (COTS) operability and survivability protocol for designing and testing systems containing COTS parts.
Improved and refined testable hardware toolkit delivered to program offices and government contractors in FY00.

Balanced Electromagnetic Hardening ($6,106K)

Developed a unified EM environmental effects protection design tool.
Conducted integrated EMP and High Power Microwave (HPM) test methods study.
Conducted case study on EM effects on civilian infrastructures supporting key DoD missions.
Performed High Altitude EMP (HEMP) test of the National Military Command Center.
Continued Mission Degradation Analysis (MIDAS) case study on civilian infrastructure. computers against RF threats.

Completed loan arrangement with service partner on high power microwave source modification.

Lead a joint working group of Navy and Air Force representatives to investigate the phenomenology of HPM effects on electronic circuits and how they can be better protected.

Completed EM Infrastructure 2010 (EM INFRA 2010, Case Study 1) and delivered an RF model to determine the RF fields within a structure/building.

Human Risk and Technology ($783K)

Continued development and evaluation of radiation protection standards and risk measures applicable to personnel/equipment for U.S. Armed Forces, NATO and The Technical Cooperation Program (TTCP) review.

Implemented "lessons learned" from the Nuclear Test Personnel Review, the Radiation Experiments Command Center, field exercises and experiments to personnel dosimetry, spectrometry operational dose recording and military standardized procedures.

Project BH – System Survivability (cont'd)

Adapted/developed operational radiological measurement and spectrographic systems to unmanned aerial vehicle (UAV) platforms.

Evaluated a conceptual biological dosimetry capability during a field exercise.

Investigated new methods/agents for decontaminating mission-essential equipment that is radiologically contaminated above military guidelines.

Facilitated the adaptation and integration of human response and behavioral representations into the appropriate agency and outside agency programs.

FY 2002 Plans

Radiation Hardened Microelectronics ($39,801K)

Demonstrate prototype radiation hardened 4M-Gate Array.

Demonstrate prototype embedded non-volatile memory.

Demonstrate 16M multi-chip module static random access memory.

Develop and demonstrate the initial technology base to support the demonstration of radiation hardened very deep submicron microelectronics integrated circuits as part of the USD(AT&L) accelerated radiation hardened Microelectronics Technology Roadmap.
Demonstrate radiation hardened 0.25-micron complementary metal oxide semiconductor/silicon-on-insulator technology for low-power microelectronics.
Demonstrate functional, integrated electronic design automation for deep submicron technologies.
Initiate the process development of a radiation-hardened cryogenic readout circuit.

Simulator Technology ($17,238K)

Support customer test requirements at DTRA test facilities.
Demonstrate a hot bremsstrahlung radiation source on Decade Quad with the monolithic plasma-opening switch.
Continue development of cold x-ray sources for Decade and other simulators, leading to factor-of-two improvement in yield.
Begin to develop diagnostics for user test support and for source development.
Continue radiation magnetohydrodynamic modeling and simulation.

Project BH – System Survivability (cont'd)

Assessments and Protection Technology ($8,501K)

Continue to modify the Electronic Battle Book (EBB) database to include multiple link assessment due to nuclear weapons detonation for USSPACECOM exercises and assessments.
Continue NMD requirements development support for version C1 of the NMD initial capability.
Continue Navy Theater Wide (NTW) requirements development support.
Complete development of flexible network assessment tool for analyzing various nuclear weapons effects on system performance.
Initiate USSPACECOM operability assessment of tactical warning/attack assessment (TW/AA) system considering impacts of future NMD system integration.
Complete development of the Wideband Channel Simulator.

Support NMD hardware-in-the-loop (HWIL) testing.
Start development of a Visible Display Simulator to support Spaced Based Infra-Red Systems (SBIRS) Low testing and other future customers.
Support NMD In-Flight Information Control System (IFICS) testing.
Develop nuclear environment software modules for integration with HWIL facilities.
Conduct testing of EWRs in support of NMD program upgrades. Develop radar disturbance mitigation techniques for NMD GBR and EWRs.
Provide IR scene testing of NMD/TMD (Theater Missile Defense) sensors.
Support IR and communications testing of Space-Based Infrared Satellite (SBIRS).
Continue communication/radar atmospheric effects participation in operational/ warfighting exercises through operational assessments.
Complete development of subsystem controller microcircuitry for fast circumvention and recovery (C&R) after radiation exposure.
Deliver Testable Hardware Toolkit Version 2.0
Begin development of a thermostructural response (TSR) toolkit.
Apply subsystem controller microcircuitry for fast circumvention and recovery after radiation exposure to Global Positioning System recovery.

Project BH – System Survivability (cont'd)

Continue development of a COTS operability and survivability protocol for designing and testing systems containing COTS parts.

Balanced Electromagnetic Hardening ($7,834K)

Develop MIDAS interim software prototype for extracting and applying infrastructure data from/to existing infrastructure databases.
Develop RF Circuit Protection Phenomenology theory to predict the effect of transformed, coupled signals to circuits as well as develop theoretical approaches to harden circuit components.
Complete HEMP assessment and verification test of National Military Command Center.
Develop integrated EM protection measures/technologies for battlefield systems.

Perform HEMP assessment and test for Cheyenne Mountain Complex (CMC) and USSTRATCOM Center Command.

Update MILITARY-HANDBOOK-423, HEMP Protection for Fixed and Transportable Ground Base C4I Facilities.

Integrate the substrate protection technology in to existing COTS/Non Developmental Items (NDI) and MILSPEC equipment and prove its effectiveness in protecting sensitive receivers from powerful RF attacks.

Investigate the use of upper microwave or millimeter wave regimes for upset/interference with electronics.

Human Risk and Technology ($1,029K)

Continue development and evaluation of radiation protection standards and risk measures applicable to personnel/equipment for US Armed Forces, NATO and The Technical Cooperation Program (TTCP) review.

Deliver initial UAV-based radiological measurement package.

Deliver a standardization agreement for operational dosimetry recording to the Technical Cooperation Program to ensure dosimetry standards are consistent among participating countries.

Conduct a radiological decontamination exercise.

Project BH – System Survivability (cont'd)

Facilitate the adaptation and integration of human response and behavioral representations into appropriate agency and outside agency programs.

FY 2003 Plans

Funding and activities realigned to Project BH in PE 0602717BR.

C. Other Program Funding Summary: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 2002
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	**R-1 ITEM NOMENCLATURE** Nuclear Sustainment & Counterproliferation Technologies; 0602715BR

D. Execution (Entities receiving 10% or more of total funding available in the PE/FNC.):

Labs/Centers-N/A
Universities-N/A
FFRDCs-N/A
Contractors-N/A
Other-N/A