

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE June 2001					
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2				R-1 ITEM NOMENCLATURE Nuclear Sustainment & Counterproliferation Technologies; 0602715BR					
COST (In Millions)	FY 2000	FY 2001	FY 2002						Cost to Complete
Total 0602715BR Cost	267.7	214.9	295.1						Realigned
Project AB Test & Simulation Technology	60.8	0.0	0.0						Realigned
Project AC Weapon Systems Lethality	24.3	0.0	0.0						Realigned
Project AE Weapon Safety & Operational Support	94.2	0.0	0.0						Realigned
Project AF Weapon System Operability	46.0	0.0	0.0						Realigned
Project AG Scientific Computations & Information Systems	24.0	0.0	0.0						Realigned
Project AI Hard Target Tunnel Defeat and NTS Sustainment	10.1	0.0	0.0						Realigned
Project AL Classified Program	1.5	0.0	0.0						Terminated
Project AN Thermionics	2.9	0.0	0.0						Completed
Project AQ Deep Digger	3.9	0.0	0.0						Completed
Project BB Small Business Innovative Research	0.0	4.5	3.7						Continuing
Project BC Force Protection & Technology Applications	0.0	14.0	6.2						Continuing
Project BD Weapons Effects Technologies	0.0	60.8	81.0						Continuing
Project BE Testing Technologies & Integration	0.0	9.3	10.8						Continuing
Project BF CP Operational Warfighter Support	0.0	33.7	65.9						Continuing
Project BG Nuclear Operations	0.0	44.2	46.3						Continuing
Project BH System Survivability	0.0	48.4	81.2						Continuing

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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 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.

As it completes its second year of operation, DTRA has successfully overcome several challenges in focusing agency organization and resources to the threat reduction mission within the National Military Strategy. The DTRA Strategic vision and plan now support the agency's efforts in creating a credible, integrated and baseline budget from legacy programs and resources. Realignment of the research and development programs resulted in a restructure of the agency to deal with the emerging strategic landscape instead of preserving the past. The project structure in this PE for FY 2001 and out reflects this realignment.

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 nuclear environment survivability for Theater Missile Defense and National Missile Defense.

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

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.

- 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,

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structural engineering designs and practices, communications and information operations, and security and WMD protective measures to support sound mission

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

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.

- 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

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conventional conflict through countering WMD threats to the maintenance of the national strategic nuclear deterrent.

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

In addition, the Advanced Systems and Concepts Office (ASCO) develops and maintains an evolving analytical vision of necessary and sufficient capabilities to protect 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.

It should be noted that information concerning Project AL is classified per DoD Directive 0-5205.7, Para B.2.f. Additionally, funding for this project ended in FY00.

B. Program Change Summary

	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
Previous President's Budget	214.5	230.9	237.8
Current President's Budget	267.7	214.9	295.1

Change Summary Explanation: Changes in FY 2001 are direct results of Congressional emphasis in the areas of Nuclear Weapons Effects, Discrete Particle Methods, Thermionics technology and Monterey Center for Counterproliferation Studies, offset by funding adjustments in support of nuclear sustainment and counterproliferation technology program efforts. FY 2001 and FY 2002 reflect the transfer of \$5M in each year to the Navy in support of BROACH. The FY 2002 estimate also reflects Department of Defense direction to increase funding for the Zebra-Chip initiative to \$10M (FY 2001: \$500K) and increase the level of funding in support of DTRA's Terrorist Device Detection and Defeat efforts by an

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additional \$5M from the FY 2001 funded level. The FY 2002 program reflects an addition of \$60M, the result of the new administration's effort to reemphasize the need for continued research and development within the DoD. These funds will be used to accelerate and

B. Program Change Summary (cont'd)

expand our capabilities to defeat hard targets and develop capabilities to utilize new thermobaric and energetic material technology. Additionally, these funds will 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. The DoD has unique requirements for radiation hardened microelectronics that are met by leveraging commercial microelectronic products. Efforts to improve our capabilities to defeat hard targets, to develop an understanding of the materials and the tools required to take advantage of these new materials, and to improve survivability of active defense systems will notably improve DTRA's capability to meet its fundamental mission of reducing the WMD threat.

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Project AB - Test & Simulation Technology - Development of effective, survivable, and economical weapon systems requires robust testing technologies and simulation capabilities to support acquisition managers, nuclear effects researchers, and decision-makers. This project develops, provides and maintains unique DoD test and simulation facilities and enabling technologies that are used by the Defense Agencies, the Services and other federal agencies to evaluate the impact of hostile environments from conventional, nuclear and other special weapons on military or civilian systems and targets. These facilities provide blast, thermal, electromagnetic pulse, mechanical impulse, ionizing radiation and radio frequency propagation environments and testbeds to support DoD and national test requirements. This project leverages fifty years of testing expertise to investigate weapons effects and target response to a spectrum of hostile environments that could be created by proliferant nations or terrorist organizations with access to advanced conventional weapons or weapons of mass destruction (nuclear, biological and chemical).

The project includes the upgrade of existing simulators and test support technologies to extend the utility and life of simulators, the decommissioning of under-utilized simulators, and the development of new simulators to support emerging customers from DoD/Department of Energy (DOE), National Security Agency (NSA), and U.S. Allies. Additionally, it provides the innovative, enabling technologies that make simulator enhancements and new facilities technically feasible and cost effective. Specific programs in this project include: 1) Based on user test requirements, maintain two existing test centers--one at Maxwell Physics International in San Leandro, California, and one at Arnold Engineering Development Center (AEDC) in Tullahoma, Tennessee, including the development, construction and checkout of the new Decade x-ray facility; development of technologies to provide enhanced radiation sources on the Decade simulator. 2) Development of communications and radar propagation effects simulators, and infrared and optical scene generators; partnership with Sandia National Laboratories (DOE) to develop technologies in energy storage, power flow, plasma switches, debris shields, and radiation sources that are applicable to stockpile stewardship and DoD strategic systems sustainment. 3) Characterization, optimization and operation of the Large Blast/Thermal Simulator (LB/TS)

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at White Sands Missile Range (WSMR), including the demonstration of a non-ideal airblast simulation capability. 4) Maintenance of the Advanced Research Electromagnetic Simulator

Project AB - Test & Simulation Technology (cont'd)

(ARES) electromagnetic pulse (EMP) facility at Kirtland AFB. 5) Operation and maintenance of the Thermal Radiation Test Facility (TRTF) at Kirtland AFB. 6) Target defeat assessments for precision-guided and special weapons against Weapons of Mass Destruction (WMD) related targets. 7) Refurbishment, maintenance, characterization, and evaluation of the Magnetic Flyer Plate Facility for testing of stockpile systems in cooperation with the Department of Energy, U.S. Navy's Strategic Systems Programs, Lawrence Livermore National Laboratory, and Sandia National Laboratory. This Project is applicable to stockpile stewardship and DoD strategic systems sustainment.

The project provides test beds for full- and sub-scale tests that focus on weapon-target interaction with fixed, hardened facilities to include hardened aboveground bunkers, cut-and-cover facilities and deep underground tunnels. This effort supports the Services' requirements for hard target defeat testing and emphasizes teaming with the Services to assess weapon-target interaction of existing and developmental weapon systems. Specific activities include test bed design and construction, instrumentation and data collection, test coordination and execution, and post-test analysis and documentation.

This project relies on hardening and simulation technologies (Testable Hardware and Aboveground Testing/Underground Testing (AGT/UGT) Correlation) funded under Project AF and supports the evaluation of weapons lethality accomplished in Projects AC and AI. Funded programs support JCS Joint Warfighting Capabilities: Control Space, Counterproliferation, Discriminate Attack, Global Reach and Situational Awareness, and also provide support to STRATCOM, EUCOM, USFK (PACOM), and JFCOM.

FY 2000 Accomplishments

Test & Simulation (\$29,810K)

Developed mitigation techniques for User Early Warning Radars (UEWR) and Ground-Based Radar (GBR) in a nuclear-disturbed environment for incorporation into Radar Nuclear Effects Corruption and Simulators (RNECS) to support testing.

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Continued communication/radar atmospheric effects simulator participation in operability assessment/warfighting exercises.

Supported MILSTAR and In-flight Interceptor Systems (IFICS) upgrades.

Project AB - Test & Simulation Technology (cont'd)

Developed advanced optical scene generator techniques and capabilities to support testing of Ballistic Missile Defense Organization (BMDO) infrared (IR) sensors.

Continued development of Wideband Channel Simulator.

Continued to provide high explosive (HE) simulation infrastructure and test support, and maintained Permanent High Explosives Test Site (PHETS) facility at WSMR and Chestnut Site at Kirtland AFB.

Continued to refurbish test target facilities at WSMR.

Completed LB/TS Non-Ideal Air Blast (NIAB) development and tests and continued testing of vehicles against nuclear airblast and thermal effects.

Continued HE infrastructure support of CP 2 Advanced Concept Technology Demonstration (ACTD), Antiterrorism and Hard Target Defeat (HTD) Testing.

Continued phenomenology testing of penetration of weapons into rocks and into damaged concrete to support HTD.

Continued penetration testing into limestone and completed testing into damaged concrete to support HTD.

Continued ACTD infrastructure support of Joint Air-to-Surface Standoff Missile (JASSM) test support of three fundamental target types.

Radiation Simulators (\$21,876K)

Continued to support ongoing nuclear weapons effects (NWE) testing programs by maintaining DTRA's suite of radiation simulators.

Upgraded cold x-ray, debris-free test capabilities on Double-EAGLE at Maxwell.

Initiated and completed Advanced Concepts Experiments (ACE-4) research and development testbed closure.

Closed ACE-4 Research and Development Facility at Maxwell Physics International, San Diego, California, under budget with no further environmental actions required by the County of San Diego Health Department.

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Met initial demonstration and correlation of reflex triode performance objectives as required by strategic and space systems customers.

Project AB - Test & Simulation Technology (cont'd)

Provided NWE systems survivability testing support to Air Force Strategic Programs, Department of Energy and Navy Programs, and National Missile Defense/Exoatmospheric Kill Vehicle (NMD/EKV).

Upgraded control systems on radiation simulators at Maxwell Physics International for improved reliability.

Completed enhanced remote on-line simulator access data encryption and access control capabilities design review.

Demonstrated a 30% increase in the hot x-ray dose and improved reproducibility on the Decade Quad.

Continued the development of power flow and high-dose and high-dose-rate hot x-ray technologies to support improved fidelity and intensity of Decade x-ray sources.

Initiated development of active debris mitigation techniques for debris-free exposures on the Decade Quad greater than 500 cm².

Continued the development of improved efficiency long-implosion cold x-ray sources in support of Decade and future x-ray simulators.

Demonstrated and characterized high-fidelity plasma radiation sources on the Z facility at Sandia National Laboratories.

Completed conversion of high-density plasma models to high-performance computers.

Completed the development of the Compact X-Ray Simulator and completed the demonstration phase at a system developer's plant.

Demonstrated distributed laser-produced x-ray source technology.

Continued risk reduction planning and the development of technology to dramatically improve the capability of non-nuclear x-ray test facilities.

Weapon/Target Interaction (\$8,068K)

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Conducted operational tunnel defeat demonstrations using existing and developmental weapons.
 Demonstrated reconstitution times and costs after each demonstration.
 Collected signatures of the tunnel facility for characterization before, during, and after each weapon application.

Project AB - Test & Simulation Technology (cont'd)

Exercised target planning tools through each of the participating CINCs.
 Initiated construction of tunnel facility #2 of a different functional type in a different geology.
 Conducted weapon lethality experiments to evaluate new weapons for functional defeat of tunnel facilities.

Small Business Innovative Research (\$1,092K)

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

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Project AC - Weapons Systems Lethality - This project addresses the lethality of the full spectrum of weapons, including advanced conventional and nuclear weapons, against the target base of today and tomorrow -- ranging from ultra-hard underground facilities to above ground, unhardened surface facilities and other special facilities that may be associated with the production, storage or deployment of weapons of mass destruction (WMD). Helping to maintain the continued effectiveness of the nuclear deterrent, this project also seeks to provide decision-makers and warfighters expanded conventional weapon options against well-protected, high-priority targets. The project relies extensively on advanced numerical methods, as well as laboratory scale experiments, intermediate and full-scale field tests and operational test data to quantify functional and physical damage criteria and collateral effects. Project results will be provided to operational planners through PC-Based analytic prediction and visualization tools, multimedia hypertext databases, and technical manuals. Central to this support is an automated expert system to assist in pre-strike target planning and post-strike battle damage assessment. Technology developed in this project will also enable civil agencies to assess engineering designs to mitigate direct and collateral damage from terrorist attacks such as occurred at the Oklahoma City Federal Building, Khobar towers attack in Saudi Arabia, and the U.S. Embassies in West Africa. Additionally, the technology developed directly supports force protection issues, operations other than war and DoD support to civil authority.

On a broader scale, improvements in weapon effects and target response codes will be used to upgrade and expand physics-based modeling and simulation. These improved codes include: coupled finite difference-finite element codes, structure-medium interaction codes, groundshock propagation codes suitable for jointed and/or layered media and high resolution dynamic codes capable of predicting the transport of hazardous aerosol clouds over complex terrain. The understanding of weapon-target interaction resulting from this project will support the generation of weapon system requirements for the changing worldwide target base and provide a quantitative basis for planning contingency operations against high value targets. It will also improve the understanding of target/weapon

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Project AC - Weapons Systems Lethality (cont'd)

interactions and their consequences for battle damage prediction and assessment. The project also allows the assessment of collateral effects from counterforce attacks, military strikes, terrorist action, incident or accident from nuclear facilities.

Project AC also includes the development of advanced weapons hardware technology. It supports the development of high power electromagnetic (EM) source technology for warfighting applications and hardening technologies for emerging radio frequency (RF) threats.

FY 2000 Accomplishments

Nuclear Weapon Effects Phenomenology (\$5,692K)

Distributed finished Volumes 1 and 3 of Nuclear Weapon Manual and Output Handbook. Completed evaluation of targeting techniques for high enthalpy tunnel airblast for STRATCOM.

Completed initial 2-dimensional nuclear weapon output calculations for strategic systems.

Completed Electromagnetic Pulse Vulnerability Number (EMP-VN) system development for STRATCOM and DIA.

Completed electronic interactive version of the Effects Manual-1 (EM-1) nuclear phenomenology/effects series.

Completed the development of a lethality and collateral effects assessment tool for nuclear strikes on a full spectrum of Weapons of Mass Destruction (WMD) targets for NATO and STRATCOM.

Implemented High-Altitude EMP (HEMP) and Source Region EMP Targeting Applications (SREMP TAPS) tools for DIA-specified potential threat weapons.

Continued the development of models of long term impact of nuclear hazards on the ecosphere.

Completed the ground motion analysis of Degelan tests.

Initiated non-ideal airblast phenomenology update.

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Project AC - Weapons Systems Lethality (cont'd)

Completed fallout microphysics modeling leading to updated fallout code.
 Completed development of a proof-of-concept software tool to link geospatial technology, computer aided design information and database information on personnel and asset location to assist planning response for terrorist attacks on buildings.

Technical Information (\$978K)

Completed EM-1 Chapter 21 and continued to update EM-1 Chapter 22.
 Continued Project Graybeard archiving efforts.

Applications of Nuclear Weapons Expertise (\$9,567K)

Developed a prototype Munitions Effects Assessment (MEA) for application of nuclear weapons to defeat WMD targets, agents and material.
 Developed both physical/functional defeat models for enhanced warhead concepts such as high temperature incendiary.
 Developed advanced solid-state technology for microwave applications with a service partner.
 Integrated RF detection device ("Witness Chip") into existing commercial-off-the-shelf (COTS) and military specification (MILSPEC) equipment.
 Completed the joint assessment of mobile telecommunications hardware susceptibility to radio frequency threats.
 Incorporated innovative monolithic integrated circuit (MMIC) limiter device using substrate conduction into a sensitive communication receiver in cooperation with the Office of Naval Research.
 Investigated various advanced composite materials to develop a frequency selective shielding capability to pass desired signals, but inhibit damaging signal frequencies.

Weapon Target Interaction (\$5,971K)

Delivered Lethality/Vulnerability models for reinforced-concrete wall damage due to internal and soil bursts to MEA 4.0.

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Project AC - Weapons Systems Lethality (cont'd)

Released Integrated Munitions Effects Assessment Version 3.9 (IMEA 3.9) to support the Counterproliferation Advanced Concept Technology Demonstration 2 (CP ACTD) and Tunnel Defeat Demonstration (TDD) programs. IMEA 3.9 includes a full three-dimensional (3-D) modeling capability, an initial nuclear weapons effects capability, and integration with additional lethality tools to address angle-of-attack and penetration into damaged concrete.

Initiated an independent Verification, Validation and Accreditation (VV&A) of MEA 3.9 in accordance with the Joint Technical Coordinating Group for Munitions Effects (JTTCG/ME) procedures that includes the Tunnels Module.

Conducted an Integrated Target Planning Tool Set (ITPTS) functionality demonstration that accessed intelligence data from the Defense Intelligence Agency (DIA) Project ATHENA, generated a physical model, weaponeered, and performed a hazard assessment.

Completed an anti-terrorism (AT) analysis of the National Military Command Center, vital facilities in Washington, DC, and embassies for Department of State, and assisted in the analyses of high-interest facilities in the Washington, DC area.

Completed a forensic analysis of East African terrorist bombings in association with the Federal Bureau of Investigation (FBI).

Demonstrated an advanced computational structural dynamics (CSD) code using advanced numerical methods.

Developed new, fast-running algorithms for use in AT Planner, using the best available computational fluid dynamics (CFD) codes to define blast loads, and CSD codes to assess structural and personnel hazards.

Conducted precision wall damage tests on hardened reinforced concrete walls.

Continued enhancement of Protective Structures Analysis and Design System (PSADS).

Established a Conventional Weapons Effects (CWE) Database to archive current and previous CWE experiments and operational exercises.

Completed a Battle Damage Assessment (BDA) of high-value targets in Kosovo, in association with DIA.

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Completed a Force Protection Analysis of key Command and Control Complexes in Kosovo, Korea, and Turkey in coordination with the Force Protection Division.

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Project AC - Weapons Systems Lethality (cont'd)

Initiated collaborative Verification and Validation (V&V) efforts between DTRA and DOE's Lawrence Livermore National Laboratory. This effort supported code-on-code transport and dispersion validation comparisons, leveraged complementary capability, and ensured database consistency (e.g., toxicological and material properties). Conducted meteorology data collection campaign in a domestic urban setting in support of urban transport modeling. Initiated integration of multi-scale weather prediction tools. Efforts in collaboration with DOE Laboratories. Developed methodology and prototyped high resolution probabilistic weather forecasting capability. Delivered Hazard Prediction and Assessment Capability 3.2.1 to warfighter.

Test and Simulation (\$1,335K)

Demonstrated High Explosive (HE) charge design for tunnel airblast simulation. Executed proof-of-principle simulated nuclear airblast in tunnel simulation.

Small Business Innovative Research (\$758K)

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

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Project AE - Weapon Safety and Operational Support - This project is critical to the maintenance of a safe, secure and reliable nuclear deterrent. Stockpile support efforts in this project include nuclear weapons stockpile technology for weapon system sustainment, probabilistic risk-based system safety assessments, and nuclear physical security policy/requirements validation. Reliability efforts include participation and assistance to Dual Revalidation, Annual Certification, and the Stockpile Stewardship Program. This project performs research and development in support of nuclear contingency planning, force structure deployment and employment options, innovative nuclear command and control concepts, nuclear mission planning, vulnerability assessments, safety assessments, advanced survivability concepts, and theater missile defense against Weapons of Mass Destruction (WMD) delivery systems and warheads. Vulnerability assessments of DoD and Allied fixed and mobile Command, Control and Communications (C3) assets subjected to WMD effects are also part of this project. This project includes Modeling and Simulation Center efforts to integrate weapons effects into High Level Architecture (HLA) compliant environments to support operational training and exercise. Technical support and curriculum development and enhancement for the Defense Nuclear Weapons School (DNWS) and other DoD nuclear training activities are also provided.

This project is in direct support of Presidential Decision Directives (PDD) and taskings and requirements from OSD, the Joint Staff and CINCs. Relevant directives include National Security Strategy of Engagement and Enlargement, National Security Science and Technology Strategy, National Military Strategy, Joint Strategic Capabilities Plan, Presidential Decision Directives, Defense Planning Guidance, and prioritization memorandums from CINCs. These efforts have been closely coordinated with Joint Staff, OSD offices, CINCs and Services, Department of Energy, Federal Emergency Management Agency and the Federal Bureau of Investigation. The thrust of this project supports the JCS Joint Vision 2010 Warfighting Capabilities of Dominant Maneuver, Precision Engagement, and Full-Dimensional Protection.

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Project AE - Weapon Safety and Operational Support (cont'd)

FY 2000 Accomplishments

Classified Program (\$53,900K)

Nuclear Operations (\$23,115K)

- Continued the safety assessment for the dual capable fighter aircraft in Europe.
- Completed the safety assessment of the B-52H aircraft.
- Continued B-2 Weapon System Safety Assessment (WSSA).
- Continued the development of the Storage Facility (Lightning) Tester.
- Continued the test planning for the System-Level Fire Experiment.
- Continued the development and population of the WSSA database to archive completed WSSAs.
- Continued Storage Vault Blast Effects Testing and Analysis.
- Began the C-17 Aircraft Transportation Study.
- Conducted Phase I Small Business Innovative Research (SBIR) - Intentional Acts Project for Navy Strategic Systems Program Office.
- Continued development of portable, mobile, and rapidly deployable radiation detection and measurement system, comprised of remote sensor linked to central receiving/processing station via Radio Frequency (RF) signals.
- Continued to conduct Forces Support nuclear and WMD technical analyses as required by OSD, Services, Joint Staff, and Nuclear Weapons Council (NWC) on force structure, weapons safety and security, theater missile defense, counterproliferation, planning and international military and political security issues.
- Continued to conduct technical analyses to support CINCs, concerning nuclear and WMD operational force planning, counterproliferation, nuclear forces, command and control, and regional security issues in light of the changing international security environment.
- Continued to provide deterrence framework analyses as requested by CINCs and OSD.
- Continued to provide workshops and area focus reports, examining the future international context as it impacts nuclear and WMD options, planning requirements and deterrence.

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Project AE - Weapon Safety and Operational Support (cont'd)

Continued to support NATO nuclear planning, especially analyses of future C4I and planning systems for nuclear operations and WMD threat analyses.

Continued to support European Theater issues (Joint Theater Surety Management Group, High Level Group, dual capable aircraft operations, NATO WS3 vaults, Replacement Training Weapon (RTW)).

Continued to provide nuclear support for Pacific Command (PACOM) operational issues/nuclear options.

Continued to provide Prediction Calculation (PdCALC) system support and integration with U.S. Army Nuclear and Chemical Agency (USANCA) nuclear effects model.

Continued to provide Single Integrated Operational Plan (SIOP) support for Strategic Command (STRATCOM) J-5.

Continued to provide WMD threat analysis for Central Command/US Forces Korea/Transportation Command (CENTCOM/USFK/TRANSCOM), focused on the chemical threat to air and infrastructure operations.

Maintained support to NATO nuclear exercises Able Staff, Able Ally and Able Crystal.

Provided analytical support in assessing STRATCOM's capability to effectively meet national objectives involving the SIOP, based on potential changes to the threat, national policy, and force structure.

Conducted an annual force-on-force (FoF) exercise to evaluate and validate policy standards as designated by the Security Policy Verification Committee (SPVC). Conduct FoF exercise in coordination with Air Force Space Command (AFSPACECOM) and 20th Air Force for ICBM security.

Completed SHAPE Survive to Operate (STO) analysis for NATO out-of-area operations.

Continued to provide quick-turn analysis on WMD consequences issues for OSD, Services, and Joint Staff and provided weapons effects analysis to weapons Project Officer's Groups and weapons modification programs as required.

Continued development of an integrated reporting system for automated reporting of Nuclear, Biological, Chemical (NBC) activity and hazard predictions.

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Continued to provide support to the CINC planning staffs on NBC capability and impacts on warfighting capability.

Project AE - Weapon Safety and Operational Support (cont'd)

Continued to develop mission and consequence analysis for HQ Air Combat Command (ACC) Agent Defeat Weapon phase studies and Analysis of Alternatives (AOA's).

Continued to provide analysis to the CINCs in support of their counterproliferation development missions.

Began development of Defense Integration and Management of Nuclear Data Services (DIAMONDS) program to automate and integrate support for nuclear weapons business processes and data at the Service, CINC and National levels.

Education/Training to Maintain Core Competencies (\$646K)

Continued to provide nuclear operational training support to CINCs, Services, and OSD.

Continued development of DoD nuclear weapons and WMD and education training program.

Continued development, improvement, and integration of course materials for the DNWS.

Continued to support DoD and CINC exercises and wargames with WMD/target response analysis.

Continued to expand expertise outreach program to OSD and War Colleges.

Initiated expertise outreach training to Joint Staff (J-38).

Developed WMD Command, Control and Coordination Course.

Nuclear Weapons Stockpile Programs (\$1,065K)

In support of stockpile stewardship and reliability, continued participation in, and support to, the Dual Revalidation and DOE Baseline programs with research, technical analysis, and assessment reports.

Continued to provide technical support and recommendations to OSD, Joint Staff, Services, STRATCOM and other Combatant Commanders related to weapons safety, reliability, and performance.

Continued support to the Annual Certification program and support to the services' weapons life-extension programs.

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Continued to provide management and technical support to DoD programs for sustainment of the nuclear deterrent. Continue development and update of the DoD Nuclear Mission Management (NMMP) as directed.

AE - Weapon Safety and Operational Support (cont'd)

Began development of the Advanced System Survivability Evaluation Tool (ASSET) Program, which will use a combination of codes, models, simulators, and legacy test data to evaluate weapons system survivability, in support of requirements to maintain a survivable nuclear stockpile.

Modeling and Simulation (\$9,097K)

Continued to upgrade and refine operations of the WMD Assessment and Analysis Center. Completed the development of a three dimensional, physics-based, weapons effects simulation, which includes weather modules, underground target data, and the effects of enhanced payloads.

Continued to provide technical and advanced modeling and simulation support to CINC sponsored exercises world-wide.

Continued to provide an integrated program for analysis and testing of alternate strategies, force employment options and technologies in a WMD environment, using state-of-the-art simulations.

Continued to provide technical and operational consequence analysis support for exercises and wargames.

Completed the development of a WMD module to allow the assessment of WMD operational plans, using existing joint theater-level simulations.

Continued to implement the Analysis and Assessments program to provide real-time support to Services through enhanced infrastructure, deployment teams, integrated models, and technical support.

Continued to update and refine support database per CINCs, Services, and Joint Staff guidance and continue development of consequence analysis of WMD counterproliferation programs.

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Maintained permanent (virtual) presence at the Joint Warfare Simulation Center (JWARS) and the Joint Simulation System (JSIMS), supporting WMD modeling within these critical programs.

Project AE - Weapon Safety and Operational Support (cont'd)

U.S./Allied Survivability & Operability in Nuclear/Designated Advanced Weapons

Environments (\$5,814K)

- Continued to conduct Balanced Survivability and Integrated Vulnerability Assessments on DoD facilities as tasked by CINCs, Joint Staff, and OSD.
- Continued to assist CINCs and intelligence community in target planning against hard and deeply buried facilities.
- Continued to conduct integrated vulnerability assessments of defense and critical national infrastructure facilities.
- Continued to apply sensor technology for target detection, target characterization and battle damage assessments.
- Began integration of infrastructure and event data into FBI Geographic Information System (GIS)-based tools.
- Began assessments and verification and validation of potential WMD scenarios and impacts.
- Began implementation and testing of approved WMD mitigation strategies, chemical, biological, and radiological (CBR) filtration, sensors, flow test, structural/window/heating, ventilation, and air conditioning (HVAC) system retrofit(s).

Weapon/Target Interaction (\$518K)

- Continued development of visualization tools for weapon effects models that are compatible with the HLA.

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Project AF - Weapon System Operability - Current and future warfighters and weapon systems, including the associated Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) 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 operability of U.S. and Allied Forces and systems to advanced conventional weapons, special weapons and limited nuclear attack. Military systems of interest include those that support military missions in the air, on land, at sea, or in space. The Smart Building program supports the building retrofit, software, modeling and technical support to enhance the WMD protection of the Olympic Operations Center(OCC)and Joint Operations Center(JOC)for the FBI. Efforts and products will be consistent with existing FBI, State and local geographic interface system (GIS)-based tools and incident reporting/management tools. The Smart Building effort will provide the portable WMD protection equipment, and will also provide for facilities inspections and retrofits.

This project constitutes the DoD's resident science and technology expertise in nuclear and related operability 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 testing 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. Specific programs in the project include: development and demonstration of the enabling technologies for ensuring the continued availability of special materials and radiation-hardened microelectronics and photonic devices; development and demonstration of affordable hardening and mitigation methods that protect against the adverse effects from electromagnetic, natural space and nuclear weapons engendered radiation (i.e., ionizing radiation and displacement damage), nuclear electromagnetic pulse (EMP), high power microwave (HPM) and nuclear atmospheric environments; direct support to warfighters by predicting and quantifying the operational impact/risk of nuclear, biological and chemical

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(NBC) and conventional battlefield environments on systems and personnel; development and demonstration of cost-effective system

Project AF - Weapon System Operability (cont'd)

design and test qualification certification techniques for testable hardware that do not require underground nuclear tests; methods for measuring and increasing soldier effectiveness on NBC battlefields; 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.

This project provides the testable system design rules and protocols for users of nuclear effects simulators that are funded in Project AB. It also supports the following JCS Joint Warfighting Capabilities: Information Superiority, Counterproliferation, Electronic Warfare, and Precision Force.

FY 2000 Accomplishments

Nuclear Weapons Effects Phenomenology (\$12,786K)

- Supported National Missile Defense (NMD) analyses and development and system operation in nuclear environments.
- Improved cell resolution for optical emission predictions.
- Updated early time Magnetohydrodynamic (MHD) Extended to Global Scale (MEGS) version for Collisionless MHD (CMHD) and Magnetic Containment Regime (MCR) replacement.
- Supported Space-Based Infrared Satellite (SBIRS) and NMD system analysis and operational development.
- Replicated Strategic Command (STRATCOM) C4 Assessment Tool (STRATCAT) tool set in non-DoD Emergency Operations Centers.
- Implemented STRATCAT: V.3 on STRATCOM Top Secret (TS) Local Area Network (LAN) and Global Command and Control System (GCCS).
- Updated High-altitude EMP (HEMP) and Source Region EMP (SREMP) Vulnerability Number (VN) model for long-line coupled targets (power & telecom systems).
- Implemented HEMP and SREMP TAPS for DIA-specified potential threat weapons.

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Integrated nuclear computational tools (INCA) to run ten lethality models covered by all of the nuclear effects covered in INCA.
Upgraded EMP-VN Model for specific WMD Targets.

Project AF - Weapon System Operability (cont'd)

Completed version 2000 of the Advanced Systems Survivability Integrated Toolkit (ASSIST) nuclear phenomenology distribution package.
Completed version 2000 for the Nuclear Optical & Radar System Effects (NORSE) nuclear operability distribution package, NORSEGUIDE.
Provided Source and operational modules for nuclear operability to Ballistic Missile Defense Office (BMDO)/National Missile Defense (NMD) System Simulations developers.
Upgraded and transfer SREMP TAPS smart system for WMD Target Planning.
Developed end-to-end targeting models of WMD for the simulated nuclear EMP stress on targets via the new initiative.
Completed the development of STRATCAT tool and transferred the tool to CINC Commands.
Developed Shock Acceleration Model for nuclear burst pumped Radiation Belts.

U.S./Allied Survivability & Operability in Nuclear/Special Weapon Environments (\$12,677K)

Characterized the response of visible sensor technologies to nuclear weapons radiation environments.
Continued the development of electronic controller chip technology to implement the testable hardware upset and recovery techniques on Air Force space systems and Ballistic Missile Defense (BMD) missile/interceptors.
Continued feasibility assessment of high-performance computing models to reduce design margins and test requirements.
Delivered to program offices and government contractors an electronic tool kit to automate testable hardware protocol design capability for sensors, spacecraft, and missile/interceptors.
Continued development of thermal structure response (TSR) design and test methods for use in the design of survivable sensors, missiles, interceptors and reentry vehicles/bodies.

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Initiated assessment of the performance of BMD Family of Systems (FoS) in nuclear-disturbed environments.
 Delivered a prototype nuclear weapons effects module/database for the Warfighter Electronic Battlebook for assessments of the Integrated Tactical Warning and Attack Assessment (ITW/AA) by US Space Command (USSPACECOM) and USSTRATCOM.

Project AF - Weapon System Operability (cont'd)

Conducted two non-ideal airblast experiments to measure damage to medium armored vehicles to support JCS updates to the Joint Nuclear Targeting Manual.
 Demonstrated feasibility of integrated circuits (IC) substrate conduction protection technology.
 Initiated EM Infrastructure 2010 (INFRA 2010) SMART Building assessment to radio frequency (RF) weapons effects.
 Initiated Mission Degradation Analysis (MIDAS) program for assessing impact of vulnerabilities to critical civilian infrastructures on selected Service/CINC missions and functions.
 Produced commercially available EMP/HPM hardened AC power cord.
 Developed Built-In Test Equipment (BITE) technology for unmanned hardness surveillance of NMD long-haul communications sites.
 Began assessment of Command, Control and Communications network equipment in development for future digital battlefield use.
 Modeled and laboratory tested the effectiveness of mesh structures for retrofit hardening of sensitive military receivers against RF attack.
 Continued assessment and testing of critical national security assets.
 Characterized the response of advanced detector technologies to radiation.
 Upgraded non-upsettable processor controller circuit for circumvention and recovery (C&R) for testable hardware protocol implementation.
 Continued the development of TSR test methodology for application to weapon systems operating in nuclear environments.
 Began development of Airborne Nuclear Survey system with Army using existing Army Radiation Detection Indication and Computation (RADIACs).

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Began development of internal and biodosimetry functions of fly-away dosimetry lab. Field-tested and evaluated fly-away dosimetry system in scheduled nuclear weapons exercises. Delivered product to Air Force Radiation Assessment Team. Assessed NMD/Theater Missile Defense (TMD) nuclear survivability testing and validation plans.

Project AF - Weapon System Operability (cont'd)

Continued development and evaluation of radiation protection standards and risk measures applicable to equipment for NATO review. Initiated conceptual development of battlefield radiological measurement system adapted to unmanned aerial vehicle (UAV) platform.

Smart Building (\$1,998K)

Completed Phase I of Smart Building (SB) infrastructure and event data into FBI GIS-based tools. Completed SB assessments and Verification and Validation (V&V) of potential WMD scenarios and impacts. Began SB retrofits of the OCC and JOC for enhanced WMD protection. Completed SB implementation and testing of approved WMD mitigation strategies, chemical, biological, radiological (CBR) filtration, sensors, flow test, structural/window/heating, ventilation, and air conditioning system retrofit(s). Established a SB operational counter-WMD consequence assessment center within the OCC and JOC for on-site and reach-back technical support. Initiated software training.

Radiation-Hardened (RH) Microelectronics, Materials, and Photonics (\$17,794K)

Demonstrated qualified RH 4 Million(M) Static Random Access Memory (SRAM) for USAF and BMDO. Demonstrated prototype 1M non-volatile memory technology. Demonstrated RH deep submicron (0.25 micron) technology for very-low-power, ultra-large-scale integrated circuit (ULSIC), e.g., 4M gate array, for USAF and BMDO. Tested and evaluated photonics signal processing technology for USAF. Published sampling and identification of radiological agents standards.

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Fielded a web-based version of consequence assessment tools for rapid assessment and initial detection teams.

Continued development of RH imager/star tracker.

Small Business Innovative Research (SBIR) (\$664K)

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

Executed Agency-approved SBIRs.

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Project AG—Scientific Computations & Information Systems - This project provides High Performance Computing (HPC), computational databases, and information products that enable the Agency's researchers to answer questions about Weapons of Mass Destruction (WMD) effects. Models, codes, and information products are developed to aid the design of experiments, predict types and levels of measurements required, establish system design requirements, assess performance, and provide system-specific predictions of weapons effects to DoD planners. Nuclear issues often require use of advanced computational resources, i.e., for investigation of the physics of weapon-target interactions, and for extrapolating test results into areas for which tests are no longer possible. This effort requires world-class high performance computing architecture with high bandwidth communications, which is provided via a hub at Los Alamos National Laboratory and the DoD HPC centers. The Data Archival and Retrieval Enhancement (DARE) information system (a digital archive and retrieval system tailored to the specific needs of the researcher, the system designer, and developer) is supported by this project. This project funds the "Graybeard" efforts for collection of unique and potentially perishable nuclear data with appropriate prioritization based on technical value. The principal thrusts respond to warfighter requirements for survivable systems and effective weapons in the Joint Warfighting Technology Areas of Discriminate Attack, Global Reach, and Counterproliferation.

FY 2000 Accomplishments

Scientific Computing (\$6,918K)

- Provided computational support for the Scientific Computing Communications Network; upgraded HPC equipment for the DTRA Telegraph Road Data Center and provided access to scalable DoD HPC Modernization Program (HPCMP) Systems and ensured DOE Accelerated Strategic Computing Initiative (ACSI) program.
- Provided sustainment and enhancement of classified access capabilities to the Scientific Computing Resources.
- Provided monitoring and assessment of circuit utilization and investigation of emerging communication technologies to support remote visualization and analysis of full physics, full fidelity, 3-dimensional calculations.
- Generated precision data to verify and validate Automatic Mesh Refinement (AMR).

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Project AG—Scientific Computations & Information Systems (cont'd)

Graybeard Project (\$5,517K)

Continued Graybeard work on High Altitude Nuclear Effects.

Continued review, commentary and archival of perishable nuclear electronics environmental test data, shock physics, test data, thermomechanical, biological and nuclear sources effects data.

Continued data review, commentary and archival of transient radiation effects on electronics, cratering, ejecta, dust and fallout, and thin-film optics.

DTRIAC (Defense Threat Reduction Information Analysis Center) (\$2,468K)

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 preparation of Nuclear Weapons Effects textbook.

Application of Nuclear Weapons Expertise (\$719K)

Continued to supply authoritative data and provide requested analysis of the effects of nuclear weapons testing, and other DTRA mission areas.

Continued efforts to ensure that Nuclear Weapons Effects test data and results are preserved as DoD downsizes and laboratories with nuclear test data close.

Validated the AMR code, using field atmospheric data.

DARE (\$6,121K)

Continued to expand archival of information and knowledge of nuclear weapons and other Weapons of Mass Destruction (WMD) and Agency mission areas for retrieval in DARE as outlined in DARE Master Plan.

Continued to develop and test computational tools and system enhancements, which provide greater search, retrieval, storage, and analysis capability to the DARE customer.

Continued development of video/text interrelationship with hyperlink and other innovative knowledge enhancement and preservation tools.

Continued legacy document population.

Began entry of nuclear simulation data.

Enhanced data visualization tools.

Expanded online access to DARE classified and unclassified resources.

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Project AG—Scientific Computations & Information Systems (cont'd)

Advanced Systems and Concepts Office (ASCO) (\$2,253K)

Stimulated, identified, and executed high-impact studies which encouraged new thinking, addressed technology gaps, and improved the operational capabilities of DoD, DTRA, and other Government Agencies for the management of, threat and use of, and response to WMD.

Began work to form the first end-to-end operational concepts and system-of-systems architectures for counterproliferation.

Required identification, assessment, and integration of operational, organizational, and technical approaches to protecting all types of military and domestic targets from attacks with WMD.

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Project AI - Hard Target/Tunnel Defeat & Nevada Test Site (NTS) Sustainment - 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 which house battle management facilities, command, control, and communications facilities, theater ballistic missiles and their transporter-erector-launchers (TELs), and biological/chemical/ nuclear weapons production or storage facilities. An objective of this program 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 priorities by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD(AT&L)), Hard and Deeply Buried Target Defeat Capability Initiative and warfighting CINCs. Efforts in this program provide part of the technology base needed for counterproliferation activities conducted in other DoD programs.

The Presidential Decision Directive (PDD) on Stockpile Stewardship implemented an indefinite moratorium on underground nuclear testing while requiring retention of the capability to resume testing at Presidential direction. DoD has complied with this policy by realigning the previously existing underground test program to emphasize non-nuclear weapons test technology and facility development, and to conduct a program for an orderly decommissioning and mothballing of the national underground nuclear test assets. The following major tasks will satisfy this requirement: (1) continue test complex shutdown, and tunnel stabilization and preservation; (2) continue environmental characterization; (3) document testbed design and construction methodology; (4) maintain underground test readiness through joint test organization activities at NTS including counterproliferation and hard target defeat testing; and (5) support SOCOM efforts to develop tactics and techniques for JCS Joint Warfighter Capabilities of Discriminate Attack and Counterproliferation. Project AI is linked to Project AB, through which its testing is conducted, and to Project AC which leverages its weapons work.

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Project AI - Hard Target/Tunnel Defeat & Nevada Test Site (NTS) Sustainment (cont'd)

FY 2000 Accomplishments

Functional Defeat Characterization (\$2,100K)

Continued development and validation of remote site geologic characterization technology.
 Conducted geologic material properties tests for tunnel defeat demonstration facility.
 Continued functional characterization and modeling of tunnel facilities.
 Identified mission critical equipment and vulnerabilities for functions modeled in second tunnel facility.
 Evaluated signatures for hard target defeat applications.

Defeat Technology (\$5,935K)

Continued to evaluate weapon/target interactions for new weapon concepts, enhanced payloads, and target fragility.
 Continued penetration testing on other tunnel geologies.
 Continued weapon/payload testing to identify/quantify defeat mechanisms and evaluate effectiveness for other tunnel functions.
 Developed improved new weapon/target interaction models to include in-tunnel equipment response, and reconstitution for different tunnel functions.
 Continued support for DoD and military service hard target defeat-related activities.
 Completed readiness testing of live weapons at NTS in preparation for the first series of tunnel defeat demonstrations.
 Conducted functional defeat demonstrations on the full-scale tunnel facility.
 Completed planning for construction of a second tunnel facility representing a different target function.

Planning Tool Development (\$950K)

Continued automated weaponing tool development by enhancing the Munitions Effects Assessment (MEA) tunnel module for structural and functional damage and battle damage assessment for different tunnel functions.

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Continued development of new planning tools to improve operations planning capabilities for hard target defeat.

Project AI - Hard Target/Tunnel Defeat & Nevada Test Site (NTS) Sustainment (cont'd)

NTS Sustainment (\$1,100K)

Maintained Agency activities at NTS in support of environmental remediation efforts. Provided on-site personnel to plan and supervise environmental remediation of Agency facilities.

Maintained one tunnel complex.

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Project AN - Thermionics - Meeting national objectives in both the military and civilian areas will require large capacity (40-100kW) nuclear space power systems having long lifetimes. Potential applications have been identified by the Air Force and NASA. The Air Force "New World Vistas" study, dated 15 December 1995, cites specific requirements for space nuclear power to accomplish force projection from space. NASA has identified requirements for power and propulsion for contemplated deep space missions and manned exploration. The objectives of the Advanced Thermionics Program are to advance the state of the art of thermionic power conversion in the United States, to develop high performance and highly reliable thermionic converters that provide high output power per unit of system mass, to demonstrate the capabilities of these thermionic converters, to show their feasibility for use in thermionic systems, and to develop corresponding system level conceptual designs. This effort supports the Defense Technology Area Plan for Space Platforms.

FY 2000 Accomplishments

In-Core Thermionic Development (\$2,000K)

Continued work on development of close-spaced multi-cell converter module. Continued development of appropriate solar power for thermionic applications. Awarded a contract for follow-on development of multi-cell converter module.

Microminiature Thermionic Converters (MTCs) (\$916K)

Completed testing of tricarbonite coatings on the emitter portion of the converters, and continued work on scandate coatings.

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Project AQ - Deep Digger - This project proposes to develop a "Deep Digger" design for attacking hard targets such as leadership or Command, Control, and Communications (C3) Bunkers, underground factories, or weapon storage facilities. Current weapons have only limited capability against these targets. A more effective penetrator capability such as that claimed by the inventor of "Deep Digger" is required.

The "Deep Digger" system would be delivered by a guided munitions airframe such as used by the Air Force and the Navy. This was a Congressionally funded program in FY 2000.

FY 2000 Accomplishments (\$3,888K)

Developed and demonstrated a Special Operations Forces (SOF) projectile that can be fired from a near standard 1" gun (or 25mm gun) for defeating concrete blast doors and other hardened concrete walls.

Evaluated and selected the best rapid firing methodology/gun for use in Deep Digger concept.

Initiated development of a Deep Digger prototype.

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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 Plans

Small Business Innovative Research (\$4,477K)

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

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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 Plans

Balanced Survivability Assessments (\$7,369K)

Conduct up to thirty balanced survivability assessments on DoD facilities as tasked by CINCs, the Joint Staff, and OSD Command, Control, Communications (C3I).
Continue integrated vulnerability assessment of defense and critical national infrastructure facilities.

Smart Building Program (\$4,349K)

Complete 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.
Complete 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.
Collaborate and conduct external and internal tracer gas tests.

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

Provide technical support to the Command Post and Field Training Exercises.
Initialize Operational Capability of integrated SB system
Complete an operational counter-WMD cell within Joint Operations Center (JOC) for on-site and reach-back technical support, and provide training as appropriate.
Complete assessment of the counter WMD integrity of the as-built JOC.

Thermionics Program (\$2,276K)

Continue thermionics research and development
Continue microminature thermionics convertor 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

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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

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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 funding to support development of a new subproject known as Zebra-Chip (aka Z-Chip). These funds will be used to accelerate the demonstration and fielding of a new system for detection and mitigation of the effects of a terrorist bioweapon attack on the U.S. 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 funded 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.

The FY 2002 program reflects additional resources provided as part of the Secretary of Defense's recent strategic review. These funds will be used 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 Plans

Munitions Effects Assessment Program (\$9,939K)

Release 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.

Release 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).

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Project BD - Weapon Effects Technologies (cont'd)

- Perform verification & validation testing and submit an accreditation support package to the Joint Technical Coordinating Group for Munitions Effects (JTTCG/ME) to obtain accreditation.
- Complete precision tests for validating Lethality/Vulnerability (L/V) models that are used in the Integrated Munitions Effects Assessment (IMEA).
- Complete tests on Former German Democratic Republic Command, Control, Communications, and Intelligence (C3I) equipment and develop functional defeat model.
- Conduct precision tests on reinforced concrete and masonry walls and steel deck slabs, and integrate engineering level models into MEA.
- Develop multiple shot wall damage algorithms for MEA 5.0.
- Integrate the initial set of weaponeering tools into the Integrated Target Planning Tool Set (ITPTS 1.0). Assure compatibility with the Defense Intelligence Agency (DIA) ATHENA database and the JCS/J2T Joint Targeting Toolbox.
- Upgrade structural response and ground-shock propagation methodologies for Ground-Shock Vulnerability Number (GVN) Improvement.

Phenomenology and Advanced Computing (\$18,090K)

- Complete non-ideal airblast phenomenology update in direct response to request of U.S. Army.
- Complete development of the EMP (Electromagnetic Pulse) targeting models for Strategic Command (STRATCOM).
- Complete development of the STRATCOM C4 Assessment Toolset (STRATCAT) and transfer the final version of the tool to STRATCOM. Complete upgrade of fallout casualty assessment tools with incorporation of scavenging.
- Begin the phase-out of the Graybeard nuclear test data review and archival on airblast, cratering & ejecta, dust & fallout, electronics interaction, and biological effects.
- Provide scientific and technical information services and products as the DOD-wide repository for test photos, films, data, test records, and other information products.

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Continue review and archival of perishable nuclear environmental radiation, thermo-mechanical, and electromagnetic test data.

Project BD - Weapon Effects Technologies (cont'd)

Continue 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. Provide classified access capabilities for the DTRA Telegraph Road Data Center. Support 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. Complete detailed first principle upgrade of EMP tools to include Source Region EMP (SREMP) Tool sets. Complete detailed benchmark calculations of delivery system impact on nuclear weapon output spectrum. Initiate upgrade of high/low altitude nuclear environment to assess nuclear effects on military system design. Upgrade ground shock prediction methodologies utilized by DIA and STRATCOM for the Ground Shock Vulnerability System used in Strategic Integrated Operational Plan (SIOP) planning. Publish and distribute Nuclear Weapon Effects textbooks.

Hazard Prediction and Assessment Capability (HPAC)/Consequence Assessment Tool Set (CATS) (\$12,680K)

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

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Deliver 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.

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

Project BD - Weapon Effects Technologies (cont'd)

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

Evaluate urban modeling capability at 2001 Presidential Inauguration using the HPAC and new urban sub-models in concert with Joint Forces Command (JFCOM). Provide counter-terrorism planning and urban transport and dispersion modeling capability for joint DoD/DoE support in preparation for Salt Lake City Winter Olympics.

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

Provide 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) (\$6,211K)

Stimulate, identify, and execute high-impact studies that encourage new thinking, address technology gaps, and improve the operational capabilities of DoD, DTRA, and other Government Agencies.

Further evolution of studies to protect target complexes from CB threats.

Spearhead project to field inexpensive, reliable, sensitive, rapid-acting, broad-spectrum BW sensor.

Develop and establish integrated national bio-forensics capability.

Accomplish broad spectrum WMD intelligence collection gaps and needs assessment.

Zebra-Chip (\$500K)

Define requirements & deliverables

Address legal, economic, logistical, regulatory, statistical, R&D, and technical issues

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Develop roadmap to successfully design, execute, implement, and maintain an end-to-end National Diagnostic Surveillance Program (NDSP)

Infrastructure (\$9,399K)

Provide for payment of civilian salaries.

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

Congressionally added funding.

Project BD - Weapon Effects Technologies (cont'd)

FY 2002 Plans

Munitions Effects Assessment (\$15,785K)

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 IPTS 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 and implement in joint Blast Effects Estimation Model.

Complete development of a high-fidelity, physics-based computer code 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.

Phenomenology and Advanced Computing (\$21,471K)

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

Provide support for the weapon effects Scientific Computing Communications Network and High Performance Computing (HPC) equipment.

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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 education seminars on the use of energy deposition.

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

Integrate nuclear weapon disturbed environments into space weather program.

Project BD - Weapon Effects Technologies (cont'd)

Complete hostile environment (nuclear interceptor output) definition for reentry body upgrade program.

Develop nuclear effects and output models and precision lethality tools for warfighter/CINC and service acquisition program office support.

Assess nuclear test readiness.

Hazard Prediction and Assessment Capability (HPAC)/Consequence Assessment Tool Set (CATS) (\$14,458K)

Deliver HPAC 5.0 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.

Exploit existing technologies and develop initial model for low-level hazard dispersion 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 Salt Lake City Winter Olympics.

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

Stimulate, identify, and execute high-impact studies that encourage new thinking, address technology gaps, and improve the operational capabilities of DoD, DTRA, and other Government Agencies.

Further evolution of studies to protect target complexes from CB threats.

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Spearhead project to field inexpensive, reliable, sensitive, rapid-acting, broad-spectrum BW sensor.

Develop and establish integrated national bio-forensics capability.

Accomplish broad spectrum WMD intelligence collection gaps and needs assessment.

Zebra-Chip (\$10,000K)

Conduct genomics & proteomics of threat agents

Conduct chip/reader technology assessment and next generation design

Project BD - Weapon Effects Technologies (cont'd)

Conduct preliminary assessment and design of bioinformatics and national infrastructure

Infrastructure (\$11,110K)

Provide for payment of civilian salaries.

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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 Plans

Test-Bed Operation and Support (\$7,023K)

Continue to provide unique test-bed capabilities for weapon-target interaction and WMD programs for DoD, the CINCS (USPACOM/USFK, USEUCOM, USSOCOM), the Services (USAF, USN, USA), other federal agencies (DOE, CIA, NSA, ATF), NATO, and friendly foreign nations.

Provide an inventory of unique targets, infrastructure support, and expertise for

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

conduct of major integrated test programs, including instrumentation maintenance, 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 include HTD and CP ACTD.

The number of tests supported varies from year to year due to customer requirements and funding constraints but typically is 1-2 large demonstration tests and 30-40 smaller tests to address demonstration of weapon or explosive effects and phenomenology in preparation for larger demonstrations or code validations for hard target defeat and CP ACTDs.

Field Support (\$1,439K)

Continue 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)

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

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

FY 2002 Plans

Test-Bed Operation and Support (\$8,721K)

Continue to provide unique national test-bed capabilities for weapon-target interaction and WMD programs.

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.

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

Field Support (\$2,101K)

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.

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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), Targeting Support and IC 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 commanders-in-chief (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 RDT&E priorities by the Office of the Under Secretary of Defense for

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

Acquisition, Technology and Logistics (OUSD(A,T&L)). Additional FY 2002 funds provided as part of the Secretary of Defense's recent strategic review are being used to develop technologies identified in the Hard and Deeply Buried Target Defeat S&T Plan (Report to Congress).

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 both an operational resource for information and analysis and a research and development facility to improve U.S. capabilities to defend against WMD threats and to mitigate consequences of nuclear, chemical, and biological weapons use or release of hazardous materials. It provides DoD and non-DoD customers with a centralized, comprehensive resource for WMD information and analysis. The WMDAAC objectives are to: (1) provide warfighters and first responders with ready access to mature computer models, computer databases, and expert information on WMD effects and countermeasures using reliable and proven operational equipment assets and communications networks; (2) operate a research and development facility for maturing and testing leading edge software, i.e., weapon effects models and next generation communications schemes; (3) ensure maximum utility of DTRA models in distributed interactive simulations through compliance with High Level Architecture (HLA) standards and protocols; (4) improve warfighter ability to counter WMD through field assistance, training, and information resources; and (5) provide a Modeling and Simulation Center of Expertise for DTRA program managers.

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This project provides research and development of advanced simulations to implement hardware and software services for WMDAAC next-generation communications connectivity to the user community, to include technical support. Advanced simulations are **Project BF - CP Operational Warfighter Support (cont'd)** developed from first-principles physics models produced in other CP projects (extensively Project BD). Daily center operation is supported from DTRA operation and maintenance funds.

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). This program provides methods to functionally kill selected facilities and predict and minimize resulting collateral effects. NITR supports attack planning and real-time attack, as well as post-attack assessment and follow-on actions. Reliable facility defeat seeks to accomplish two primary objectives. The first is to achieve adequate structural and equipment damage to the target that would prevent reuse of the facility for a specified period of time. The second objective is to reduce the possibility of unacceptable collateral effects and off-site release of hazardous chemical and radioactive materials. 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; unattended aerial vehicle (UAV) based remote chemical/radioisotope sensors for collateral effects assessment; tactical unattended ground sensors for battle damage assessment (BDA) and target characterization; improved hard target penetration; advanced fuzing; enhanced weapon guidance technologies or strategies to ensure structural damage to targeted components and mitigate damage to surrounding components; and an integrated sensor fusion strategy supporting attack planning, attack timing, and post-attack analysis. Additionally, this program will enhance our ability to predict the consequences of terrorist action against and accidents in nuclear facilities. The program depends on test planning and execution support from Project BE.

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

Targeting and IC Support - Targeting and IC Support 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 (Project BC). Details of specific individual assessments are classified.

FY 2001 Plans

Hard Target Defeat Demonstrations (\$9,475K)

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

Hard Target Defeat Technology (\$7,375K)

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

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

Continue 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)

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

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

Continue evaluation of signatures for hard target defeat applications.

WMD Assessment and Analysis Center (\$11,103K)

Transform 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.

Conduct Independent Verification, Validation, and Accreditation of DTRA-developed WMD simulations to include Weapons Analysis Lethality Toolset (WALTS) and Nuclear Chemical Biological Radiological Server (NCBR).

Produce an electronic/automated WMD Assistant that can automatically search available resources, find pertinent data, and select and run the appropriate models or simulation event to facilitate utilization and improve responsiveness.

Implement 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 (JSAF), etc.

Continue to design and implement redundant, fault-tolerant WMDAAC architecture to meet mission requirements and insure sustained operations during a WMD threat or incident.

Continue technical and advanced simulation support to CINC-sponsored exercises worldwide and consequence analysis support for exercises and wargames.

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Continue 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.

Continue 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.

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

NITR Collateral Effects (\$2,328K)

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

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

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

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

Develop nuclear component fragility modeling and testing plan.

Transfer nuclear aspects of collateral effects to Project BD.

NITR Systems Assessment/Weapons (\$1,494K)

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

Identify 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.

Document results and conclude systems assessments.

Targeting and IC Support (\$1,899K)

Continue assessments of hostile facilities based on JCS and CINC priorities. Details are classified.

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FY 2002 Plans

Hard Target Defeat Demonstrations (\$11,910K)

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

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

- 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 (\$40,501K)

- 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.

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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.

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

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

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

WMD Assessment and Analysis Center (\$11,534K)

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.

Establish a virtual test environment for the development of leading edge software, hardware, new and updated weapons effects models (e.g., WALTERS, MM5, OMEGA), weapon test support and emerging communications technologies to include advanced distributed learning.

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.

Continue exercise participation (CINC 21 ACTD, Fleet Battle Management Experiments), training, and development of WMD information resources.

Targeting and IC Support (\$1,994K)

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Continue assessments of hostile facilities based on JCS and CINC priorities. Details are classified.

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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 encompasses programs formerly contained in Project AE (Weapon Safety and Operational Support) and Project AL (Classified Program) which transitioned from the Defense Special Weapons Agency into DTRA (Nuclear Operations, Education and Training, and Nuclear Weapons Stockpile Support). Project BG (Nuclear Operations) has reorganized these legacy activities 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.

Safety: As tasked by the JSCP, the safety programs will provide CINCs, Services, and JCS with technical analysis, studies, research, and experimental data to identify and quantify risks and uncertainties of plutonium dispersal due to accidents, fires or natural causes during normal, peacetime operations of the nations nuclear weapon systems. Additionally, these studies quantify the probability of reduced safety assurance or Nuclear Detonation Safety Exceptions (NDSE) as identified by DOE Laboratories.

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.

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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 Plans

Nuclear Programs (\$17,653K)

Safety Program Thrusts:

Complete the B-2 Weapon Safety System Assessment (WSSA).

Complete the safety assessment for the dual capable fighter aircraft in Europe.

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Project BG - Nuclear Operations (cont'd)

- Complete the C-17 Aircraft Transportation Study.
- Continue Storage Vault Blast Effects Testing and Analysis.
- Analyze and quantify DOE Nuclear Detonation Safety Exceptions (NDSEs) for B-2 weapons.
- Conduct modeling and testing to respond to weapon and weapon system safety requirements and criteria.
- Continue the development and population of a weapon safety database to archive completed assessments, studies, and test programs.
- Begin Long Term Storage WSSA to ensure safety of weapons in post-Cold-War environment.
- Begin Phase II Small Business Innovative Research (SBIR) - Intentional Acts Project for Navy Strategic Systems Program.
- 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.
 - Provide personnel, as tasked by Assistant to the Secretary of Defense for Nuclear, Chemical and Biological (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 the W80 in support of the Air Force.
 - Prepare an annual performance report, as directed by Presidential Decision Directive (PDD), on the DoD stockpile sustainment accomplishments and future plans.
 - Continue development of the Advanced System Survivability Evaluation (ASSET) program, which will utilize a combination of codes, models, simulators, and legacy test data to evaluate weapon system survivability, in support of requirements to maintain a survivable nuclear stockpile.
- Stockpile Operations Thrusts:
 - Develop and implement Defense Integration and Management of Nuclear Data Services (DIAMONDS) capability package 1 which includes initial unsatisfactory reporting,

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Project BG - Nuclear Operations (cont'd)

electronic technical publication and maintenance bay data collection capabilities. Link CONUS nuclear storage sites and some higher level commands with secure communications to support DIAMONDS data transmission and access to stockpile tools and data.

CINC/Forces/Security Support (\$9,065K)

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

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

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

Provide 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.

Complete 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, initiate 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 is focus for FY01 program.

Complete 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.

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

Conduct 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.

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

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Project BG - Nuclear Operations (cont'd)

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.

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

WMD (Nuclear) Protection and Response (\$17,500K)

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

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

Develop 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.

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

Develop 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.

Conduct 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.

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

FY 2002 Plans

Nuclear Programs (\$20,485K)

Safety Program Thrusts:

Continue the Long-Term Storage WSSA.

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

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Project BG - Nuclear Operations (cont'd)

Continue the development and population of a weapon safety database to archive completed assessments, studies, and test programs.

Analyze and quantify DOE Nuclear Detonation Safety Exceptions (NDSEs) for B-2 weapons.

Complete Storage Vault Blast Effects Testing and Analysis.

Complete Phase II SBIR - Intentional Acts Project for Navy Strategic Systems Program.

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.

Provide personnel, as tasked by Assistant to the Secretary of Defense for Nuclear, Chemical and Biological (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 the W80 in support of the Air Force.

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

Continue development of ASSET program, which will utilize a combination of codes, models, simulators, and legacy test data to evaluate weapon system survivability, in support of requirements to maintain a survivable nuclear stockpile.

Stockpile Operations thrusts:

Develop and implement DIAMONDS capability package 2 which includes additional electronic technical publication enhancements, maintenance bay data collection and distribution enhancements and weapon tracking system migration and interfaces.

Link OCONUS nuclear storage sites and additional organizations with secure communications to support DIAMONDS data transmission and access to stockpile tools and data.

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Project BG - Nuclear Operations (cont'd)

CINC/Forces/Security Support (\$10,906K)

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

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Project BG - Nuclear Operations (cont'd)

WMD (Nuclear) Protection and Response (\$14,917K)

Develop 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 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 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 hostile and uncertain. 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 for radiological material detection devices to facilitate standoff operator detection of radioactive source 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

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enough scope to permit publication at classified and unclassified levels, and

Project BG - Nuclear Operations (cont'd)

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 radiological detection devices in order to determine relative efficiencies, capabilities, and technologies to further enhance 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.

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Project BH - System Survivability - 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 (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 encompasses programs formerly contained in Project AB (Test and Simulation Technology), Project AC (Weapons Systems Lethality), and Project AF (Weapon System Operability) which transitioned from the Defense Special Weapons Agency into the Defense Threat Reduction Agency. The new project is divided into the five business areas described below: Radiation Hardened Microelectronics, Simulator Technology, Operability Assessments, Balanced Electromagnetic Hardening, and Human Risk and Technology.

Additional funds have been provided in FY 2002 in response to Secretary of Defense guidance to develop advanced radiation hardened technology for providing affordable protection and to ensure the reliable operation of our military forces and systems in WMD environments.

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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 (RH) 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 (RH) microelectronics and photonic devices. DoD has unique needs for radiation hardened microelectronics that are met by leveraging commercial microelectronic products. Funds will be used for the science and technology portion to advance radiation hardened electronics to enhance protection of DoD's space and missile systems.

Simulator Technology. This program is being revised to conform with the Defense Science Board Task Force on Nuclear Effects Simulation which will aggressively 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,

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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

Project BH - System Survivability (cont'd)

reduction strategies for an affordable next-generation radiation simulator with substantially improved intensity and fidelity; based on user test requirements, support improvements to the two existing test centers, one at Maxwell Physics International (MPI) in San Leandro, California, and one at the Arnold Engineering Development Center (AEDC) in Tullahoma, Tennessee; 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, 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.

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Project BH - System Survivability (cont'd)

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 environments on systems and personnel; providing methods for measuring and increasing 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.

Project BH supports the following JCS Joint Warfighting Capabilities: Information Superiority, Counterproliferation, Electronic Warfare, and Precision Force.

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Project BH - System Survivability (cont'd)

FY 2001 Plans

Radiation Hardened Microelectronics (\$19,902K)

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

Simulator Technology (\$13,572K)

Operate and improve DTRA's radiation simulators to support nuclear weapons effects testing requirements.
 Continue user data acquisition system (UDAS) upgrade, integration and certification at the Decade Radiation Test Facility.
 Replace obsolete instrumentation at the Decade Radiation Test Facility.
 Demonstrate the cold x-ray testing requirements for the Decade Quad and optimize output to double the initial yield.
 Complete hardware modifications to the Decade Quad for the cold x-ray mode at AEDC.
 Demonstrate high-fidelity (>5 keV) cold x-ray source for advanced radiation simulators using a high-energy test facility ("Z") at Sandia National Laboratories.
 Demonstrate a large-area (>700cm²) debris shield system for cold x-ray testing on the Decade Quad.

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Project BH - System Survivability (cont'd)

Initiate the deployment of a monolithic plasma opening switch on the Decade Quad.
 Continue the development of technology to dramatically improve the capability of non-nuclear x-ray test facilities.
 Continue the development of improved-efficiency, long-implosion, cold x-ray sources in support of Decade and future x-ray simulators.
 Begin development of radiation magnetohydrodynamic modeling and simulation tool for use in cold x-ray source development.
 Continue development of pulsed power components for faster simulators.

Assessments and Protection Technology (\$7,331K)

Continue to modify the Electronic Battle Book (EBB) database to include multiple link assessment due to nuclear weapons detonation for USSPACECOM exercises and assessments.
 Complete Military Strategic and Tactical Relay (MILSTAR) transition operability assessment.
 Complete development of subsystem controller microcircuitry for fast circumvention and recovery (C&R) after radiation exposure.
 Complete the development of thermal structure response (TSR) test methodology for application to weapon systems operating in nuclear environments.
 Begin development of a Commercial-Off-The-Shelf (COTS) operability and survivability protocol for designing and testing systems containing COTS parts.
 Improve and refine testable hardware toolkit delivered to program offices and government contractors in FY00.
 Develop nuclear environment software modules for integration with Hardware-in-the-Loop (HWIL) facilities.
 Conduct testing of Early Warning Radars (UEWRs) in support of National Missile Defense (NMD) program upgrades. Develop radar disturbance mitigation techniques for NMD ground-based radar (GBR) and Upgraded EWRs (UEWRs).
 Provide infrared (IR) scene testing of National Missile Defense/Theater Missile Defense (NMD/TMD) sensors.

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Project BH - System Survivability (cont'd)

Support IR and communications testing of Space-Based Infrared Satellite (SBIRS).
 Continue communication/radar atmospheric effects participation in operational/warfighting exercises.
 Complete development of an advanced IR scene generator.
 Continue development of the Wideband Channel Simulator.
 Continue development of flexible network assessment tool for analyzing various nuclear weapons effects on system performance.

Balanced Electromagnetic Hardening (\$6,808K)

Develop a unified EM environmental effects protection design tool.
 Conduct integrated EMP high power microwave (HPM) test methods study.
 Conduct case study on EM effects on civilian infrastructures supporting key DoD missions.
 Perform High Altitude EMP (HEMP) test of National Military Command Center (NMCC).
 Continue Mission Degradation Analysis (MIDAS) case study on civilian infrastructure.
 Complete proven COTS hardware kit, which provides easy-to-install devices and simple techniques to harden COTS computers against RF threats.
 Perform susceptibility testing on at least one new class of foreign or U.S. asset.
 Complete 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 high power radio frequency effects on and how we can better protect them.
 Complete EM Infrastructure 2010 (EM INFRA 2010) and deliver an EM toolkit to determine the operational impact to specific infrastructure sectors supporting critical DOD missions.

Human Risk and Technology (\$788K)

Continue 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.

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Project BH - System Survivability (cont'd)

Implement "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. Adapt/develop operational radiological measurement and spectrographic systems to unmanned aerial vehicle (UAV) platforms. Evaluate a conceptual biological dosimetry capability during a field exercise. Investigate new methods/agents for decontaminating mission-essential equipment that is radiologically contaminated above military guidelines. Facilitate the adaptation and integration of human response and behavioral representations into the appropriate agency and outside agency programs.

FY 2002 Plans

Radiation Hardened Microelectronics (\$38,301K)

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. The program goal is to accelerate radiation hardened microelectronics performance to the 0.18/0.15 micron technology level to be within one generation of mainstream commercial devices, while maintaining two suppliers to meet DoD needs.
 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.

Simulator Technology (\$17,020K)

Support customer test requirements at DTRA test facilities.

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Project BH - System Survivability (cont'd)

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 pulsed power component development.
 Continue radiation magnetohydrodynamic modeling and simulation.

Assessments and Protection Technology (\$16,565K)

Initiate USSPACECOM operability assessment of tactical warning/attack assessment (TW/AA) system considering impacts of future NMD system integration.
 Complete development of subsystem controller microcircuitry for fast circumvention and recovery (C&R) after radiation exposure.
 Continue development of a COTS operability and survivability protocol for designing and testing systems containing COTS parts.
 Begin development of a microelectromechanical systems (MEMS) operability and survivability protocol for designing and testing systems containing MEMS parts.
 Begin development of an advanced modeling, simulation, and testing (MS&T) integrated design environment (IDE).
 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.

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Support CINC requests for operability and survivability assessments of battle management and command, control, and communications systems.

Project BH - System Survivability (cont'd)

Balanced Electromagnetic Hardening (\$8,322K)

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 NMCC.

Develop integrated EM protection measures/technologies for battlefield systems.

Continue pulsed power component development.

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.

Facilitate the adaptation and integration of human response and behavioral

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representations into appropriate agency and outside agency programs.

A. Mission Description and Budget Item Justification - The proliferation of nuclear, biological, and chemical weapons and their means of delivery (NBC/M) continues to pose a grave threat to national security. The U.S. requires counterproliferation (CP) counterforce capabilities to neutralize this threat. To accomplish this counterforce mission, the U.S. must be able to identify, characterize and defeat NBC/M research, production, storage, operations and support, and command and control facilities while mitigating collateral hazards resulting from release and expulsion of NBC agents. The potential target set includes fixed, aboveground and underground, hardened and unhardened facilities.

Programs funded through this program element develop, demonstrate, and transition CP counterforce technologies to combatant commands and the Services. The programs are structured to exploit ongoing DoD agency, Service laboratory, and Department of Energy laboratory technology programs wherever possible. The program emphasis is on functional kill as well as hard kill and on mitigating collateral effects. The goal is rapid development of enhanced counterforce mission capabilities to include, but not limited to, advanced conventional and non-conventional (non-nuclear) weapons, application of sensor technologies to provide weapons of mass destruction (WMD) combat assessment, and target-attack planning tools to optimize weapon and sensor employment.

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

Prototype or modified systems integrating these capabilities will then be evaluated in demonstrations, those having military utility transition to a Service for acquisition, and, in some cases, a residual operational capability is provided to combatant commanders.

These programs have been grouped into two projects, Special Operation Forces (SOF) Counterproliferation Support (Project BJ) and Counterforce (Project BK).

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

B. <u>Program Change Summary</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
Previous President's Budget	80.6	77.4	76.9
Current President's Budget	79.9	76.6	89.8

Change Summary Explanation:

The decrease in FY 2001 is due to general Congressional reductions. FY 2002 reflects an addition of \$15M, which resulted from the Secretary of Defense strategic review process. Essentially, all funds added to this Program Element since the previous budget submission are the result of the Secretary of Defense's strategic review and will be used to demonstrate technologies identified in the Hard and Deeply Buried Target Defeat Science & Technology Plan (Report to Congress). FY 2002 also reflects inflation adjustments.

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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 Plans

SBIR Total (\$1,703K)

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

FY 2002 Plans

SBIR Total (\$1,712K)

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

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Project BJ - Special Operations Forces (SOF) Counterproliferation Support - In 1995 the SecDef assigned the core task of countering the proliferation of weapons of mass destruction (WMD) to SOF. This project directly supports SOF contributions to the nation's effort to counter the spread of WMD. Efforts in this project include the defeat of hard and deeply buried targets (HDBT), explosive ordnance disposal (EOD), maritime efforts to prevent the spread of WMD technology, and a SOF sponsored Advanced Concept Technology Demonstration (ACTD). This project supports requirements that apply to all three of the efforts identified above.

Details of this program have been classified per CJCSM 5225-01 dated 23 Oct 96.

FY 2000 Accomplishments

SOF Projects (\$19,263K)
Specific details are classified.

FY 2001 Plans

SOF Projects (\$19,300K)
Specific details are classified.

FY 2002 Plans

SOF Projects (\$17,605K)
Specific details are classified.

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Project BK - Counterforce - The purpose of this project is to develop technologies, demonstrate prototype systems in an operationally realistic environment, support operators in the definition of the concept of operations, and provide combatant commanders with enhanced capabilities in response to potential adversaries who have the capability to develop and/or employ nuclear, biological and chemical (NBC) weapons of mass destruction (WMD) in future regional conflicts involving the U.S. or its allies. The U.S. requires the capability to attack and neutralize NBC research, production, storage, operations and support, and command and control facilities while mitigating collateral effects resulting from expulsion and release of NBC agents. The potential target sets include fixed, aboveground and underground, hardened and unhardened, and tunnel facilities. The project is structured to exploit ongoing technology programs wherever possible. The project emphasis is on functional kill as well as hard kill and on mitigating collateral effects through advanced weapon development and greatly enhanced target attack planning to optimize weapon employment. The goal is the development of an enhanced counterforce mission capability to include penetrating weapons, WMD combat assessment, and the supporting planning tools. Prototype or modified systems integrating these technologies will then be evaluated in demonstrations, and, in some cases, a residual operational capability is provided to combatant commanders.

This project emphasizes technology demonstrations to include Advanced Technology Demonstrations (ATD) and Advanced Concept Technology Demonstrations (ACTD). Three demonstrations are currently planned: the Second Counterproliferation (CP2) Counterforce ACTDs, the Hard Target Defeat (HTD) C3I Demonstration, and the Thermobaric Weapon Demonstration (a proposed ACTD). Funding was added to this Project in FY 2002 as part of the Secretary of Defense's strategic review and will be used to demonstrate technologies identified in the Hard and Deeply Buried Target Defeat Science & Technology Plan (Report to Congress).

The CP2 ACTD objective is to develop, demonstrate, and deliver enhanced standoff, counterforce capabilities in conjunction with operational concepts to combatant commanders
Project BK - Counterforce (cont'd)
for planning attacks and timely, reliable defeat of WMD related facilities while

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minimizing collateral hazards. The CP2 ACTD depends on the technology base and products in PE 0602715BR, Project BD for planning tools and on test planning and execution support in PE 0602715BR, Project BE for the operational demonstrations. The Navy and Air Force are both participating in weapons and WMD combat assessment system development for the ACTD. The CP2 ACTD has been approved by Deputy Under Secretary of Defense for Advanced Systems and Concepts DUSD(AS&C), and the management plan was signed April 21, 1999. USEUCOM is the operational sponsor with USJFCOM and USSTRATCOM participating. The CP2 ACTD started in FY98 and will be completed in FY03.

The HTD program objective is to develop and demonstrate end-to-end capabilities for the functional defeat of hard targets, particularly tunnels, and assess developing weapon and sensor concepts against such targets. The program does not develop new sensors; it assesses existing or emerging technologies being developed by others. The HTD program develops technologies under PE 0602715BR, Project BF and transitions them to this program for demonstration. The demonstrations require test planning and execution support from PE 0602715BR, Project BE. The currently planned HTD demonstration ends in FY03. HTD customers are USPACOM, USSTRATCOM, USSOCOM, and the Air Force's Air Combat Command.

The Thermobaric Weapon Demonstration will develop a weapon concept that is based on a new class of thermobarics. The weapon could be used against a certain type of tunnel targets for a maximum functional kill of the tunnels. Prototype weapons will be tested under operational conditions for their performance, and leave-behinds will be delivered to the customer.

The project milestones supporting the planned demonstrations and product delivery are broken into six major product areas or subprojects: chemical combat assessment, collateral

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Project BK - Counterforce (cont'd)

effects prediction, target response, CP Analysis and Planning System (CAPS), weapons, and operational demonstrations.

The Advanced Systems and Concepts Office (ASCO) project milestones support the analyses of emerging WMD threats as well as future technologies and operational concepts to deal with them.

WMD Combat Assessment. This subproject has evolved from the former (completed in FY98) Counterproliferation 1 (CP1) ACTD sensor subproject to provide WMD combat assessment capabilities. Subproject efforts will provide improved warfighting capabilities against the spectrum of WMD-related facilities. The subproject will leverage existing programs to (1) evaluate near-term technologies; (2) define concepts of operation and system architecture for chemical combat assessment; (3) produce data fusion and mission planning modules to meet user requirements on existing platforms; and (4) integrate chemical and biological combat assessment capabilities onto delivery systems, such as unmanned air vehicle (UAV) and expendable mini-UAV platforms. Further, the effort will demonstrate the ability to confirm, identify, and assess the release of biological/chemical agents in support of attacks on NBC facilities and assist in predicting transport patterns by updating pre-strike predictions of the potentially hazardous plume with real-time data. The combat assessment subproject will not develop its own sensors, but will leverage ongoing chemical sensor efforts within the chemical and biological defense community to minimize program risk for applying this technology to counterforce missions. In CP2 a Chemical Combat Assessment System (CCAS) will be demonstrated.

Collateral Effects Prediction. The collateral effects effort provides predictive tools for a variety of applications supporting Nuclear, Biological and Chemical (NBC) target attack planning to include NBC expulsion and dispersion resulting from attacks on

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WMD facilities as well as acts of terrorism and hostile use of WMD. Requirements include high-resolution weather models, weather measurement systems, and population databases. A key element in developing these collateral effects codes is chemical/biological expulsion tests and modeling. Modeling of chemical/biological expulsion sources will be based on theoretical models and empirical data. Codes will be validated from existing data, other predictive models and special collateral effects experiments. The collateral effects tools will provide pre-attack prediction and post-attack assessment.

The Hazard Prediction and Assessment Capability (HPAC) is a major product that predicts the release and transport of NBC materials and the subsequent collateral effects. The high-resolution weather prediction capability, another area of emphasis in the subproject, will provide timely wind, cloud, and precipitation data necessary for NBC collateral effects predictions. Weather data currently does not have the resolution or quality necessary. These tools will also be integrated into the target attack planning tools to assess the consequences of attacks on WMD facilities.

Target Response. This effort will provide a new target attack planning, combat assessment capability and a major upgrade for existing theater-level planning capabilities for defeating or denying NBC facilities and capabilities. This effort builds upon the Integrated Munitions Effects Assessment (IMEA) planning tool developed for CP1. IMEA provides a forward deployable, target planning capability for NBC targets. IMEA is an integration of the Munitions Effects Assessment (MEA) tool providing targeting solutions using conventional weapons for a variety of structures and equipment and the HPAC developed under the Collateral Effects Prediction subproject. The integrated capability supports the warfighters in the attack planning phase with target response and collateral effects prediction, and in the post-attack phase with combat assessment and re-strike decision support. Upgrades to IMEA for the CP2 ACTD include additional target types

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Project BK - Counterforce (cont'd)

(including complex facilities), additional weapons as developed in Item 5 below (including multiple weapon effects), additional platforms, more operator-friendly displays, more WMD material types, weather interfaces and sources, and more detailed weapon input parameters (such as angle of attack). The ultimate CP2 IMEA product will be able to run stand-alone or in a web-based client-server distributed architecture as it migrates into the Integrated Target Planning Tool Set (ITPTS) suite of tools, the second deliverable during CP2. The ITPTS will provide a spectrum of planning and assessment capabilities from deliberate to crisis. ITPTS provides the warfighter a standardized weaponeering framework that greatly increases weaponeering efficiency and fidelity while minimizing warfighter training requirements. It expedites cross service/coalition weaponeering and joint planning. The ITPTS architecture provides the warfighter with cross platform interoperability and a common look and feel, independent of weapon or target. In addition, it provides the warfighter critical decision support services for all target classes including those associated with weapons of mass destruction. ITPTS will also predict weapons performance and associated NBC collateral effects, develop targeting solutions that minimize collateral effects, and provide results through appropriate interfaces for a variety of targets including functionally and structurally complex facilities. ITPTS will provide an enhanced seamless interface to the Intelligence Community (IC) data sources. ITPTS will be the weaponeering segment in the Joint Targeting Toolbox (JTT) and provides the warfighter with targeting information in a JTT's "Electronic Target Folder" (ETF). This effort will execute a full verification and validation program, in accordance with the Joint Technical Coordinating Group for Munitions Effects (JTCG/ME) Procedures, for all delivered capabilities including extensive verification testing and operational and field testing at all functional levels.

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Project BK - Counterforce (cont'd)

CP Analysis and Planning System. The Counterproliferation Analysis and Planning System (CAPS) program responds to the need for a comprehensive and timely counterproliferation (CP) target planning tool to assist combatant commanders in the conduct of their CONPLAN 0400 targeting responsibilities. Products from CAPS include end-to-end descriptions of country specific Nuclear, Biological, Chemical, and Means of delivery (NBC/M) programs of proliferation concern. The analysis provides combatant commanders highly detailed assessments of a country's NBC/M programs, proliferation pathways, and identifies the critical nodes and key facilities that, if eliminated, would cause the greatest impact to that program. This information will directly support the combatant commanders in the planning and execution of their CP missions. These analyses are conducted in successive levels of detail, identified as Level 1-5 analysis, with Level 1 having the lowest analytical detail. As an output of the analyses, CAPS will provide CP target planners with the critical data elements needed to take effective action against the NBC/M programs of proliferating countries, and will also predict whether there will be environmental program. (1) The integration of intelligence and NBC/M production process analyses to create highly-detailed models of the proliferation efforts underway in selected countries, identifying the specific function and location of the major production sites, and developing detailed layouts of these sites within each country. (2) Element analyses of each country model will be conducted in order to select the critical nodes in the country's proliferation pathway. Critical nodes will include those facilities essential to research, production, weaponization, and storage, which if eliminated, would require extended time to replace and significantly degrade the NBC/M program being analyzed (Level 1-3 analysis). (3) Conduct highly detailed inside-the-building analysis necessary for the employment of precision-guided munitions or special operations forces (Level 4-5 analysis). (4) The execution of consequence analyses to determine and to quantify the level of damage that might occur as a result of potential interdiction/counterforce actions, to include:

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Project BK - Counterforce (cont'd)

possible casualties, economic losses, and other environmental issues. (5) The completed CAPS analyses will be provided via secure means to the user community in a logical, user-friendly format incorporating the latest advances in computer software development. The Counterproliferation Mission Support Senior Oversight Group Requirements Subcommittee and CINC J-2/3/5 representatives have identified 46 NBC/M programs in 16 different countries as the requirements basis for CAPS analysis.

Weapons. This subproject will develop, integrate and demonstrate advanced conventional weapons technologies to improve mission effectiveness against NBC facilities while mitigating collateral effects. The focus for CP2 ACTD is to provide combatant commanders with a demonstrated option to attack NBC facilities in a standoff mode. This effort will improve on existing standoff weapon platforms to provide enhanced penetration and advanced fuzing developed during CP1. Standoff weapons to be enhanced include the Tactical Tomahawk in a penetrator variant and the Conventional Air Launched Cruise Missile (CALCM). An enhanced payloads project explores alternate warhead options to conventional blast/fragmentation with the objective of mitigating collateral effects associated with dispersal of NBC. Hard Target Defeat (HTD) will demonstrate non-conventional (non-nuclear) weapons to functionally defeat tunnels.

Operational Demonstrations. This subproject will improve the operational capability for holding NBC targets at risk with minimum collateral effects. The objective is to integrate available or near-term technologies for WMD combat assessment, weapons, collateral effects prediction, and target planning tools, to evaluate the technologies in an operational context, and to transition improved capabilities rapidly to combatant commands. Specifically, this subproject will enhance and accelerate existing programs to provide integrated target planning, collateral effects prediction codes, a Chemical Combat

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Project BK - Counterforce (cont'd)

Assessment System (CCAS) and advanced weapons to meet NBC target defeat requirements. This subproject will also support demonstration operations to include system operational concept, demonstration planning, scenario development, execution of the demonstration, and post-demonstration analysis. Planning and execution of the demonstration uses a time phased approach to screen candidate technologies for maturity, develop prototype systems and demonstrate enhancements in military capability against a combatant command prioritized subset of all potential NBC target types. This approach results in a cycle of prototype development and testing followed by periods of operational demonstration. Three operational demonstration series are planned during CP2 ACTD over the period of FY2000-2003 to provide the operational sponsor, United States European Command, and participating commands with the opportunity to assess the utility of the selected technologies. The objective of the first demonstration series in CP2 ACTD, called Dipole Yukon (DY), is to demonstrate the capability to plan and execute chemical/biological (C/B) counterforce missions with the Joint Air-to-Surface Standoff Missile (JASSM) through operationally realistic attacks against a simulated biological weapons storage facility. The objective of the second demonstration, called Dipole Zodiac (DZ), is to assess the suitability of the CALCM with a penetrating warhead and a Predator unmanned air vehicle (UAV) based standoff collateral effects assessment system. The objective of the third demonstration series, called Divine Canberra (DC), is to evaluate the end-to-end set of products of the CP2 ACTD including the target planning tool, in its final operational context, the Tactical Tomahawk Penetrator Variant (TTPV), and remote combat assessment using a small expendable mini-UAV with a chemical point detector on-board (and deployed from the Predator UAV demonstrated in DZ) against a hard chemical production and storage facility.

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HTD will conduct a functional defeat demonstration on a Command, Control, Communications, and Intelligence (C3I) tunnel facility using improved target planning tools and new weapon concepts.

Thermobaric Weapon Demonstration will conduct an operational demonstration against a tunnel target using the newly developed thermobaric payload.

ASCO develops concepts and technologies, and provides end-to-end focus on assessments and plans for meeting emerging WMD threats. The office also analyzes emerging requirements, looking 5 to 20 years in the future and acts as the focal point for new, advanced systems and innovative technological concepts by formulating programs to meet those requirements.

For FY01, PE 0605160BR, Project P542 funding and activities are transferred to this project.

FY 2000 Accomplishments

WMD Combat Assessment (\$9,781K)

Initiated integration, fabrication, and demonstration of air platform modifications to provide the CCAS.

Continued integration and test of standoff (remote) chemical assessment subsystem.

Continued to configure, fabricate, and test components for chemical point (contact) detector.

Conducted FINDER mini-UAV flight test.

Designed agent sample capture approach.

Project BK - Counterforce (cont'd)

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Initiated CCAS development of concept of operations, communications, data fusion/display ground station, and interface requirements.
 Developed CCAS validation test plan.
 Conducted successful Tactical FLIR Pod Modification (TFPM) Nose-Section Critical Design Review (CDR).

Collateral Effects Prediction (\$5,932K)

Delivered a biological hazard source model and transport capability for soft facilities in HPAC 3.2 (and IMEA 3.9).
 Developed high-resolution databases for real populations and real land surfaces for customer determined locations.
 Developed human effects model for civilian populations to better predict WMD collateral effects (casualties).
 Delivered theater weather server with high fidelity weather model to an operational weather squadron in Sembach, Germany.

Target Response (\$5,085K)

Delivered IMEA 3.9 software that includes a full 3D visualization capability.
 Incorporated a multiple weapon capability in IMEA.
 Demonstrated IPTTS prototype with three integrated tools (MEA, HPAC, and the Joint Air Trajectory (JAT) while accessing an IC data source Athena on the classified SIPRNET.
 Delivered Joint Air-to-Surface Standoff Missile (JASSM) weapon effects/performance models for IMEA.
 Delivered a full 3D model generation and modeling capability for three (3) Joint Munition Effects Manual (JMEM) complex aboveground target classes.

Initiated Component Vulnerability and Agent Release/Agent Release Model (CVAR/ARM) validation test and analysis program.

Project BK - Counterforce (cont'd)

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Delivered preliminary weapons effects/performance models for the Tactical Tomahawk Penetrator Variant (TTPV) in IMEA for use in Fleet Battle Exercise Foxtrot. Performed sub-scale Bio-Storage experiments to develop weaponeering models for use in Dipole Yukon.

Initiated the Independent Verification and Validation (IV&V) process to obtain accreditation of IMEA 3.9/4.0 by the JTCG/ME.

CP Analysis and Planning System (\$10,631K)

Began CAPS analysis on top 16-18 combatant commanders' NBC/M country programs as defined by CP Mission Support Senior Oversight Group (CP MS SOG); analysis is to be completed to Level 3 which will include a detailed end-to-end assessment of each NBC/M program and the identification of the most critical nodes (facilities and buildings) within each program.

Installed CAPS Network (CAPSNET) terminals at major commands; planning CAPSNET installations for priority supporting commands and support agencies.

Conducted enhanced payloads static scaled tests against soft chemical/biological targets.

Conducted modeling and simulation support for enhanced payload development and scale testing.

Conducted design and effectiveness studies for HTD classified weapon concepts.

Operational Demonstrations (\$5,067K)

Completed target construction for Divine Umpire (CALCM Block I baseline test).

Completed planning exercises for Dipole Yukon 1 demonstration.

Completed target construction for Dipole Yukon 2.

Supported CP analysis for concept of operations development.

Advanced Systems and Concepts Office (ASCO) (\$3,613K).

Stimulated, identified, and executed high-impact studies which encouraged new thinking, addressed technology gaps, and improved the operational capabilities of DoD, DTRA, and other Government Agencies for the management of, threat and use of, and response to WMD.

Began work to form the first end-to-end operational concepts and system-of-systems architectures for counterproliferation.

Project BK - Counterforce (cont'd)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Counterproliferation Support; 0603160BR	

Required identification, assessment, and integration of operational, organizational, and technical approaches to protecting all types of military and domestic targets from attacks with WMD.

FY 2001 Plans

WMD Combat Assessment (\$8,800K)

- Integrate and test standoff subsystem on Predator UAV.
- Continue to configure, fabricate, and test components for chemical point detector.
- Implement agent sample capture design.
- Conduct simulant and agent tests for sampling, remote and point sensors in explosive chamber.
- Finalize CCAS concept of operations, communications, data fusion/display ground station, and interface control documents.
- Initiate Divine Invader test series.
- Integrate point detector/sampler on FINDER mini-UAV.
- Integrate FINDER mini-UAV on Predator and flight test.

Collateral Effects Prediction (\$5,900K)

- Deliver initial hazard source models for CP2 ACTD standoff weapons.
- Deliver initial urban collateral effects capability in coordination with the United Kingdom.
- Integrate Meteorological Data Server in ITPTS architecture.
- Provide weather model services to HPAC, IMEA and ITPTS.
- Validate weather models and wind field data for priority regional areas.
- Develop HPAC access to ITPTS.
- Deliver HPAC 4.0 to EUCOM, STRATCOM, JFCOM and other CINCs, utilizing a client-server architecture, incorporating wet biological source terms and enhanced chemical/biological warfare agent source terms.

Target Response (\$5,975K)

- Deliver IMEA 4.0 software to support Dipole Zodiac and Dipole Yukon 2 (JASSM).

Project BK - Counterforce (cont'd)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Counterproliferation Support; 0603160BR	

Complete the Independent Verification and Validation (IV&V) of MEA 4.0 and submit the Accreditation Support Package (ASP) to the JTCG/ME for accreditation.
Deliver CALCM weapon effects/performance models and support operational exercises for Divine Umpire.

Deliver IPTS 1.0 that includes four tools (MEA, HPAC, Joint Targeting Toolbox {JAT}), and the USAF Modular Effectiveness and Vulnerability Assessment (MEVA), access to IC data sources and use of a common data structure.

Begin the IV&V of IPTS 1.0 and submit the Accreditation Support Package (ASP) to the JTCG/ME for accreditation.

Begin the phased integration of the JTCG/ME weaponeering product Windows version of JMEM (WinJMEM) into IPTS.

Complete Component Vulnerability and Agent Release/Agent Release Model (CVAR/ARM) validation tests.

Initiate IMEA C3I facility model validation testing.

CP Analysis and Planning System (\$8,728K)

Complete Level 3 CAPS analysis on top 16-18 combatant commanders' NBC/M country programs.

Continue CAPS analytical effort by performing Level 4-5 (highly-detailed inside-the-building) analysis of specific facilities/buildings, needed for precision strike and SOF operations, within the above 16-18 NBC/M programs as determined by the CP MS SOG and combatant commands.

Potentially begin new Level 1-3 analysis on the second group of combatant commander's priorities as CAPS analysts are able following the completion of the above Level 4-5 analysis, or as determined by the CP MS SOG and combatant commands.

Continue CAPSNET terminal installations at major commands, priority supporting commands, and support agencies; installations planned for FY01 are NIMA, DTRA, and CIA's NPC; additional installations are possible for DIA, USSOCOM, USEUCOM, USSOUTHCOM, USCENTCOM, USPACOM, and the CMSA's.

Weapons (\$16,182K)

Conduct TTPV penetrator systems integration.

Project BK - Counterforce (cont'd)

Continue TTPV penetrator warhead design, fabrication, and test.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Counterproliferation Support; 0603160BR	

Complete TTPV penetrator command and control modifications.
 Continue TTPV penetrator payload system design.
 Continue TTPV penetrator missile systems design and engineering.
 Continue TTPV penetrator air-vehicle modification design and fabrication.
 Conduct TTPV CDR.
 Conduct TTPV penetrator system test and evaluation (8 sled track tests).
 Conduct CALCM CDR.
 Initiate system trade studies for enhanced payload concepts against chemical/biological targets.
 Continue modeling and simulation of selected enhanced payloads concept.
 Continue design and effectiveness studies for HTD classified weapon.

Operational Demonstrations (\$10,036K)

Conduct Divine Zorro static TTPV demonstration.
 Analyze Divine Zorro static demonstration results and report.
 Conduct Divine Umpire (CALCM Block I baseline).
 Analyze Divine Umpire demonstration results and report.
 Analyze demonstration results and report.
 Conduct Dipole Yukon 1 demonstration.
 Analyze Dipole Yukon 1 demonstration results and report.

FY 2002 Plans

WMD Combat Assessment (\$8,200K)

Test integrated CCAS on Predator UAV during Dipole Zodiac.
 Begin to configure, fabricate, and test components for biological point detector.
 Continue Divine Invader test series with integrated CCAS.
 Conduct simulat and agent tests for sampling, remote and point sensors in explosive chamber.
 Train operators on integrated CCAS.

Project BK - Counterforce (cont'd)

Collateral Effects Prediction (\$4,038K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Counterproliferation Support; 0603160BR	

Deliver final hazard source models for CP2 ACTD standoff weapons.
 Integrate initial ensemble weather forecasting and source models for CP2 ACTD weapons.
 Provide HPAC for ITPTS 2.0.
 Deliver and validate HPAC 5.0 for Dipole Zodiac 1 and 2 and Dipole Yukon 1.

Target Response (\$6,575K)

Validate IMEA 5.0 software to support Dipole Zodiac and Dipole Yukon 2 (JASSM).
 Deliver TTPV and CALCM weapon effects/performance models.
 Deliver ITPTS 2.0 that includes two (2) additional tools, access to additional IC data sources and interface to JTT and ETF.
 Complete the first phase of the integration of WinJMEM into ITPTS, begin integration of the JTCG/ME Air-to-Surface Weaponing System (JAWS) into ITPTS.
 Continue IMEA C3I facility model validation testing.
 Perform sub-scale validation tests to support the CP2 full-scale operational tests.
 Begin the IV&V of ITPTS 2.0 and submit the Accreditation Support Package (ASP) to the JTCG/ME for accreditation.
 Complete the integration of the JTCG/ME weaponing product WinJMEM into ITPTS.
 Complete the IV&V of MEA 5.0 and submit the Accreditation Support Package (ASP) to the JTCG/ME for accreditation.

CP Analysis and Planning System (\$8,935K)

Complete Level 4-5 analysis on first group of NBC/M country programs.
 Begin Level 3 CAPS analysis on second group of NBC/M country programs.
 Continue with additional Level 4-5 (highly-detailed inside-the-building) analysis of specific facilities/buildings, needed for precision strike and Special Operations Forces (SOF) operations, as determined by the CP Mission Support Senior Oversight Group (MS SOG) and combatant commands.
 Complete any remaining CAPSNET terminal installations.

Weapons (\$14,900K)

Complete TTPV penetrator systems integration.
 Complete TTPV penetrator warhead design, fabrication, and test.

Project BK - Counterforce (cont'd)

Complete TTPV penetrator command and control modifications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Counterproliferation Support; 0603160BR	

Complete TTPV penetrator payload system design.
 Complete TTPV penetrator missile systems design and engineering.
 Complete TTPV penetrator air-vehicle modification design and fabrication.
 Conduct TTPV penetrator system test and evaluation.
 Conduct TTPV Flight Event Demonstration.
 Initiate development of a biological agent defeat weapon concept using near-term technologies in preparation for a proposed ACTD.
 Complete design and effectiveness studies for HTD classified weapon concepts.

Operational Demonstrations (\$27,807K)

Conduct Dipole Zodiac (1 and 2) demonstrations.
 Conduct Midway Blue 1, 2 and 3 demonstrations for the Advanced Unitary Penetrator (AUP).
 Analyze Dipole Zodiac demonstration results and report.
 Conduct Dipole Yukon 2 demonstration.
 Analyze Dipole Yukon 2 demonstration results and report.
 Start target construction for Divine Canberra demonstration.
 Initiate C3I demonstration for HTD classified weapon concepts.
 Develop HTD testbed to provide necessary demonstration and validation capability for new hard and deeply buried target defeat technologies.
 Complete management plan for Thermobaric Weapon (TW) demonstration.
 Initiate integration of thermobaric payload material with weapon system and firing system.
 Validate thermobaric weapon functionally through full and sub-scale testing.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE June 2001				
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3				R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR				
COST (In Millions)	FY 2000	FY 2001	FY 2002					
Total 0603711BR Cost	73.9	67.4	52.5					
Project BB - Small Business Innovative Research (SBIR)		.8	.8					
Project BI - Arms Control Technology	73.9	66.6	51.7					

A. Mission Description and Budget Item Justification - This program element (PE) provides research, development, test, and evaluation (RDT&E) to meet technology requirements in support of implementation, compliance, monitoring and inspection for existing and emerging arms control treaties and agreements. The funded projects address requirements validated by the Office of the Under Secretary of Defense (Acquisition, & Technology, & Logistics (OUSD(AT&L))) to implement, comply with, and monitor the following treaties/agreements: The Treaty on the Reduction and Limitation of Strategic Offensive Arms (START); the Treaty on Further Reduction and Limitation of Strategic Offensive Arms (START II) (START follow-on treaties); the Anti-Ballistic Missile (ABM) Treaty; the Intermediate-Range Nuclear Forces (INF) Treaty; the Conventional Armed Forces in Europe (CFE) Treaty and CFE Adaptation; the Open Skies (OS) Treaty; the Convention on Certain Conventional Weapons (CCW); the Chemical Weapons Convention (CWC); Biological Weapons Convention (BWC); Comprehensive Nuclear Test Ban Treaty (CTBT); Safeguards, Transparency and Irreversibility (STI) agreement; Missile Technology Control Regime (MCTR); Nuclear Non-proliferation Treaty (NPT); Fissile Material Cut-off Treaty (FMCT); Organization for Security and Cooperation in Europe (OSCE) Confidence- and Security-Building Measures (CSBMs); United Nation's Transparency in

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE
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		June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

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

Armaments (TIA) Agreement; Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies; the Anti-Personnel landmine (APL) negotiation; and Presidential arms control initiatives.

This PE conforms to the Administration's research and development priorities as related to both conventional arms control and weapons of mass destruction arms control and disarmament. Arms control technologies are critical for enabling the U.S. to monitor, verify and implement international arms control treaties and other agreements whose purpose is to prevent the proliferation of and/or reduce nuclear, chemical, biological, and advanced conventional weapons. Technical assessments are made to provide the basis for sound project development, evaluate existing programs, and provide the data required to make compliance judgments and support U.S. policy and decision-makers and negotiating teams. Technology developments and system improvement projects are conducted to ensure that capabilities to monitor, comply with, and implement treaties and agreements are available when required.

The program includes development of equipment and procedures for data exchanges, on-site and aerial inspections and monitoring, off-site analysis and other confidence-building measures. In addition, assistance is provided to the Office of the Secretary of Defense by providing technical support in preparing for U.S. compliance with treaty obligations. Hardware and procedures developed are often transitioned to the appropriate inspectorate for use in conducting treaty mandated inspection and monitoring and for implementing transparency and confidence-building regimes. Where applicable, RDT&E to meet requirements in one treaty area is applied to fulfill requirements in other areas to eliminate duplication of efforts. The technologies and procedures developed in the arms control technology program provided an invaluable source of information on equipment and procedures that was extensively used by an Agency team to support an interagency assessment of Long Term Monitoring of Iraq. The results of the effort and equipment developed in this program are also being used to implement the provisions of United Nations Resolution 715. Arms control treaties require extensive exchanges of data

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE June 2001
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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR
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A. Mission Description and Budget Item Justification (cont'd)

concerning treaty accountable items, initial declarations, movements, etc., by signatory nations.

The Agency has developed a treaty information management system, the Compliance Monitoring and Tracking System (CMTS), to accommodate these data exchanges and monitor U.S. compliance with treaty data reporting provisions.

The CMTS provides treaty-required data exchanges for INF, START, CFE and Confidence- and Security-Building Measures. The Open Skies Notification System (OSNS) is being developed to support anticipated treaty entry-into-force (EIF). This PE also supports the JCS warfighting capability area of counterproliferation.

B. Program Change Summary

	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
Previous President's Budget	73.5	52.9	50.0
Current President's Budget	73.9	67.4	52.5

Change Summary Explanation:

Changes in FY 2001 are attributable to compliance with Congressional emphasis in the areas of nuclear detection analysis and basic and applied research to support nuclear testing.

As part of its internal budget review process, the Department of Defense (DoD) provided an initial funding increase to DTRA for the International Monitoring Stations (IMS) in the O&M, Defense-Wide appropriation. However, funding to support the IMS stations should have been spread across the O&M, Defense-Wide, RDTE, Defense-Wide, and Procurement, Defense-Wide accounts. As part of this budget submission, DTRA has realigned the IMS O&M, Defense-Wide funding to reflect the proper appropriation break for the IMS stations.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development -	R-1 ITEM NOMENCLATURE

BA3	Arms Control Technology; 0603711BR
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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 Plans

Small Business Innovative Research (\$813K)

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

FY 2002 Plans

Small Business Innovative Research (\$831K)

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

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

Project BI - Arms Control Technology - This project provides an integrated and comprehensive approach to meeting the technology requirements associated with achieving national defense arms control objectives. The major activities consist of the following:

Develop procedures and equipment that will enable the USG to effectively exercise treaty inspection rights, monitor compliance, and accomplish reporting associated with current and projected treaty requirements in the most non-intrusive and cost-effective manner. Objectives include achieving more effective methods of measuring characteristic Treaty-Accountable Item signatures (e.g. for non-deployed missiles and warheads in all life-cycle phases, to include conversion and/or elimination) utilizing technologies based on physical principles such as nuclear radiation detection, acoustics, or chemical identification and providing monitoring/inspection capabilities to reduce the overall cost and increase the flexibility of U.S. inspectors.

Develop technology to provide information collection, processing and dissemination capabilities required for compliance assessments and meet notification and reporting requirements associated with evolving treaties and agreements (e.g., new rules for counting strategic forces).

Develop technology to support revised implementation and compliance requirements resulting from the decisions of CFE's Joint Consultative Group; the OSCE's Forum for Security Cooperation; NATO's Verification Coordinating Committee and the High Level Task Force; the Conference on Disarmament; the Multilateral Working Group on Arms Control and Regional Security; the Wassenaar Arrangement; and the Open Skies Consultative Commission.

Perform technology assessments and provide technical input to support developing negotiating positions on APL and Small Arms/Light Weapons.

Perform technology assessments to support development of innovative agreements addressing arms control issues unique to a geographic region.

Develop and validate technologies that ensure on-site sampling and analysis is effective and that DoD equities are protected during the course of all inspections/visits conducted under the convention on the Prohibition of the Development, Production, Stockpiling, and use of

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

Project BI - Arms Control Technology (cont'd)

Chemical Weapons and on their Destruction (CWC), and the protocol under the Biological Weapons Convention (BWC).

Develop technologies to synergistically support international peacekeeping efforts, and other non-proliferation initiatives.

Perform technology assessments and provide technical expertise in areas relevant

to the production and detection of biological agents to support DoD and U.S. policy makers and negotiators in determining the impact of proposed BWC investigation/visit methodologies, declaration requirements and transparency measures on DoD equities, and in representing the U.S. during BWC Ad Hoc Group meetings.

Develop the nuclear test monitoring capability necessary to support current and emerging nuclear test ban treaty requirements as well as to independently monitor and detect nuclear test activities worldwide in support of national security objectives.

Develop the next generation nuclear test monitoring system with particular emphasis in the area of analysis automation to handle the vast amount of data with a resource-constrained analyst pool. In addition, leverage the tremendous pace of advances in information technologies to push the state-of-the-art in systems design.

Exploit nuclear test monitoring data center development activities for application to other treaty and nonproliferation areas.

Conduct basic research in geophysical and physical phenomena that must be understood in order to meet current limited nuclear testing agreements' standards at decreasing cost over time, to enhance monitoring capabilities to detect treaty violators, and to provide high-confidence independent monitoring of nuclear activities required to protect national defense interests.

FY 2000 Accomplishments

Technical Assessments (\$10,006K)

Initiated an effort to assess non-visual methods of verifying ballistic missiles.
 Evaluated requirements for upgrades to Votkinsk continuous monitoring system for START following INF monitoring conclusion in FY01.

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Project BI - Arms Control Technology (cont'd) -

Extracted lessons-learned from START and INF for use in negotiating and implementing technologies under future arms control regimes.

Initiated Space Arms Control Technology Assessment to support DoD analysis and evaluation of potential space arms control measures and their need for verification technology developments.

Initiated the analysis of the technological impact of multilateral strategic verification regimes.

Completed an analysis of options for modifications to the ABM treaty to accommodate Theater Missile Defense (TMD) and National Missile Defense (NMD) deployment. Assessed requirements for a follow-on START Treaty inventory, monitoring, and notification system as part of the Arms Control Information and Notification (ACIN) Program.

Completed a Regional Verification Technology Study on technologies suitable for monitoring strategic treaties in the Middle East.

Provided technical negotiation support for START, START II and START follow-on treaties.

Assessed various technology options to support the U.S. arms control delegations to NATO, Open Skies Consultative Committee (OSCC), the Joint Consultative Group, the Forum for Security Cooperation, and the APL, Small Arms/Light Weapons (SA/LW), and regional arms control negotiations.

Provided treaty compliance assessments and planning support to OUSD(AT&L).

Provided technical assessments for Open Skies, APL, CCW and SA/LW treaties/negotiations.

Continued Open Skies sensor performance evaluations and initiated optical camera upgrade replacement lifecycle assessment.

Completed the Asia/Pacific Rim Arms Control Technology Assessment providing Treaty Managers and USG decision makers with potential candidate confidence and security building regimes.

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Project BI - Arms Control Technology (cont'd) -

Initiated situational influence modeling support effort for Northeast Asia regional stability assessment.

Assessed new rapid gas chromatography (GC) technology and evaluated potential applications of new detectors and other alternative technologies to CWC-related sample analysis.

Assessed impact of CWC inspection/monitoring technologies and methodologies on DoD facilities and agencies.

Evaluated assets and vulnerabilities relative to potential challenge inspections

Updated BW History on-line database.

Participated in the Organization for the Prohibition of Chemical Weapons (OPCW) technical working group to validate spectra submitted for inclusion in the OPCW central analytical database.

Provided technical support to OSD(P) during BWC protocol negotiations and potential Preparatory Commission (PrepCom) activity.

Continued providing technical analysis and vulnerability assessments on implementing the BWC Protocol.

Conducted analyses and assessments of selected CTBT implementation and compliance issues.

Technology Development (\$63,900K)

Conducted a Joint DoD/DOE START III-related monitoring technology demonstration at DOE's Pantex Plant for the Interagency Working Group.

Participated in conducting a Joint DoD/DOE Fissile Material Transparency Technology Demonstration at Los Alamos National Laboratory for representatives of the Russian Federation.

Initiated a project to demonstrate and evaluate the operation impacts of monitoring nuclear warheads at DoD bases under a dismantlement regime.

Initiated adaptation projects for technologies identified by Alternate Technology

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Project BI - Arms Control Technology (cont'd) -

Working Group for non-radiation based alternatives for a potential START follow-on treaties transparency regime.

Explored possibilities of electromagnetic coil instruments to characterize Special Nuclear Material (SNM) in containers.

Developed technology for nuclear material detection, analysis, and forensics systems assessments.

Investigated potential for an infrared sensor to detect warheads by detecting the high explosives within the warhead.

Initiated effort to investigate applications of ultrasonic interferometry technique (originally developed for Chemical Weapons Convention use) to strategic arms

control monitoring.
 Initiated an effort to automate the presentation of Russian and U.S. nuclear weapon system life cycles in support of treaty negotiations.
 Initiated contracts with Russian laboratories to accomplish cooperative research in Russia on strategic arms control monitoring.
 Continued development of a portable gamma camera able to provide both spatial and energy resolution.
 Delivered Full Operational Capability (FOC) version of OSMAPS.
 Procured and delivered four 3rd generation Transportable Operational Planning Systems (TOPS) in support of Open Skies.
 Began proof-of-concept of follow-on technologies to support implementation and compliance with the future APL agreements.
 Completed development of the baseline Regional Inspection Simulation Tool (RIST) system and demonstrated Initial Operational Capability (IOC) system in Europe.
 Continued Open Skies Management and Planning System (OSMAPS) independent verification and validations (IV&V)
 Initiated development of CFE Treaty computer based training modules.

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Project BI - Arms Control Technology (cont'd) -

Integrated FOC of VERITY Mapping Tool (VMT) System to identify international sites and assets within a defined area.
 Developed enhanced time-efficient sample screening technologies and methods for on-site CWC inspections, including a prototype low power Gas Chromatograph(GC) and dual channel Pulsed Flame Photometric Detector and a prototype Photoionization Mass Spectrometer(MS).
 Developed an 8-port air sampler that can collect and divide air samples for later GC/MS analysis.
 Developed additional analytical methods for use in preparing chemical samples collected during CWC inspections for GC/MS analysis.
 Continued development of follow-on non-destructive evaluation (NDE) capabilities for standoff chemical munition classification, identification, and quantification.
 Conducted technology integration methods for on-site BWC-related analytical equipment

and methodologies.

Tested and evaluated procedures to assess operational performance, environmental durability, safety and overall effectiveness of BWC related analytical equipment.

Initiated the development of a negotiator's database to provide reference tools and technical data to support U.S. decision making.

Developed a distributed DoD data management system for compiling and submitting information as part of US participation in BWC confidence building measures (CBMs).

Continued upgrade, test and evaluation of IMS primary seismic stations.

Completed test and evaluation of prototype data acquisition system for IMS auxiliary seismic stations.

Initiated prototype development of IMS radionuclide sensor.

Upgraded particulate radionuclide sampler at Charlottesville, VA IMS radionuclide station and began operational testing.

Upgraded particulate sensors in Ashland, KS and Melbourne, FL.

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Project BI - Arms Control Technology (cont'd) -

Completed equipment installation and laboratory setup for the US CTBT radionuclide laboratory at the Environmental Measurements Laboratory in New York, NY.

Certified IMS primary seismic monitoring stations at Mina, NV.

Continued transition of the prototype IDC systems with delivery of version 3 software to the International CTBT Organization.

Validated operational test and evaluation results for IDC of software releases.

Developed upgrades to increase the prototype IDC capability to support on-going R&D.

Continued research and development efforts in support of the CTBT National Authority and National Data Center and integrated enhanced tools.

Initiated location calibration research for IMS seismic stations.

Continued development of cost-effective computerized, rapidly executing techniques and algorithms to detect, locate, and identify seismic, acoustic and radionuclide signals from operational sensor systems.

Continued research and development to improve understanding of source phenomenology and propagation for nuclear treaty-related events near detection threshold and

enhance detection, location, screening and identification of underground, oceanic, and atmospheric events through a peer-reviewed program of basic research.
 Expanded the basic and applied research in support of nuclear test detection in compliance with Congressional emphasis.
 Continued the industry-based development of nuclear detection sensors and analysis technology in compliance with Congressional emphasis.

FY 2001 Plans

Technical Assessment (\$8,232K)

Complete an effort to assess non-visual methods of verifying ballistic missiles.

Continue a Space Arms Control Technology Assessment to support DoD analysis and evaluation of potential space arms control measures and their need for verification technology developments.

Continue the analysis of the technological impact of multilateral strategic regimes.

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Project BI - Arms Control Technology (cont'd) -

Initiate an adversarial analysis of the technical options for modifications to the ABM treaty to accommodate Theater Missile Defense (TMD) and National Missile Defense (NMD) deployment.

Initiate a study of the impacts on DoD operations of verification of an ABM Treaty modified to allow a NMD deployment.

Provide technical negotiation support for START, START II and START follow-on treaties.

Initiate Open Skies Mission Area Planning System (OSMAPS) life-cycle upgrade assessment.

Initiate assessment of technology requirements of potential regional arms control initiatives in the Middle East with an emphasis on Aerial overhead monitoring.

Assess various technology options to support the U.S. arms control delegations to NATO, OSCC, the Joint Consultative Group, the Forum for Security Cooperation, the APL, Small Arms/Light Weapons (SA/LW), and regional arms control negotiations.

Initiate assessment of a Middle East Arms Control Technology Assessment that addresses Aerial/Overhead monitoring as key contribution to current and future

regional confidence building measures.
 Continue performance evaluation of Open Skies sensors and recommend enhancements.
 Assess Synthetic Aperature Radar (SAR) system performance and provide lifecycle upgrade/replacement recommendations.
 Provide acquisition RDT&E support for upgrade/replacement of the Open Skies aircraft optical cameras, video camera and Infrared Lens Scanner (IRLS), as required.
 Assess sensor technology for stand off APL detection and mapping.
 Conduct OSMAPS life-cycle upgrade assessment.
 Complete Latin America Regional Area Technical Assessment.
 Conduct market survey and state-of-the-art assessment of micro engineered machinery and detection technologies.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

**Project BI - Arms Control Technology (cont'd) -
 Technology Development (\$58,469K)**

Continue situational influence modeling support for regional security assessment and workshops.
 Define user and system software requirements for next generation of CWC-related analytical equipment.
 Evaluate advanced Mass Spectrometry technology for CWC-related applications.
 Evaluate implications and consequences for DoD of potential changes to the CWC resulting from the Review Conference.
 Provide technical support to OSD(P) in preparation for BWC Review Conference (REVCON).
 Conduct market surveys and assessments on BW detection and related technologies to include immunological and genetic assays, polymerase chain reaction (PCR) analysis, MS, and genomic sequencing.
 Conduct a scoping study on information technology requirements for potential mandatory declarations under the BWC.
 Conduct analyses and assessments of selected nuclear test detection implementation

and compliance issues including on-site inspection. Plan and execute a START follow-on treaties monitoring regime demonstration at the Pantex Plant for representatives from the Russian Federation.

Plan, execute, and evaluate a demonstration at a DoD base to evaluate the operational impact of nuclear warhead monitoring at that location.

Initiate a follow-on effort for the cooperative development of strategic arms control technologies with the Russian Federation.

Complete effort to investigate applications of ultrasonic interferometry technique (originally developed for Chemical Weapons convention use) to strategic arms control monitoring.

Initiate development of the next generation of treaty support information management

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

Project BI - Arms Control Technology (cont'd) -

capabilities under the Arms Control Information and Notification Program, using state-of-the-art technologies and adhering to DoD international standards.

Complete development of VERITY Treaty Limited Equipment (TLE) Search System and deliver final documentation and source code.

Initiate development of GC/MS follow-on technology for advanced screening and determinative analysis of chemical samples.

Test and evaluate the low power GC/Pulsed Flame Photometric Detector (PFPD), Photoionization MS and 8-Port Air Sampler for chemical agent detection.

Develop GC/MS sample preparation methods for samples of bio-medical origin.

Complete proof-of-concept on Fourier Transform Microwave Spectroscopy screening technique for CW and populate related spectral database.

Initiate development of CW arms control technology compendium.

Continue development of Advanced Non-Destructive Evaluation (ANDE) system to include addition of physics-based.

Update a distributed DoD data management system for compiling and submitting inputs under BWC CBMs.

Initiate development of an unclassified database for Polymerase Chain Reaction (PCR)

probes and primers for BW Arms Control. Investigate alternative sample preparation methods for DNA analysis to increase speed and accuracy.
 Continue work on adaptation of a diagnostic hand-held assay for BW arms control applications.
 Continue PCR probes and primers development and validation process.
 Develop integrated techniques for confirmatory analysis
 Continue epidemiological studies for use in validating screening and confirmatory analysis methods.
 Test and evaluate on-site BW screening methods, biodetectors and confirmatory assays.
 Complete test and evaluation of the Hawaii prototype digital infrasound station.
 Complete installation of digital infrasound stations at Windless Bight, ANT; Pinon Flat, CA; and Newport, WA.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

Project BI - Arms Control Technology (cont'd) -

Begin installation of Wake Island and Eielson, AK nuclear test detection digital infrasound stations.
 Complete development and begin operational testing of the U.S. radionuclide laboratory at the Environmental Measurements Laboratory in New York, NY.
 Complete prototype and initial operational testing of nuclear test detection particulate and aerosol radionuclide sensors at Charlottesville, VA.
 Continue upgrade of particulate radionuclide samplers at nuclear test detection stations in Melbourne, FL; Ashland, KS; and Sacramento, CA.
 Complete certification of two nuclear test detection seismic monitoring stations at Pinedale, WY and Lajitas, TX.
 Continue communications upgrades and testing at all nuclear test detection stations for connection to the Global Communications Infrastructure via CD-1.0 protocols to be used in US national systems.
 Complete development of the prototype nuclear test detection data center systems software (Release 3).
 Develop upgrades to increase the capability of the Center for Monitoring Research to support U.S. national monitoring systems and on-going R&D and its application

across all treaty and nonproliferation areas. Continue research on world-wide location calibration for seismic events.

Continue development of cost effective computerized, rapidly executing techniques and algorithms & detect, locate, and identify seismic, hydroacoustic, infrasound, and radionclide signals from operational sensor systems and development systems to enhance US capability.

Continue research and development to improve understanding of source phenomenology and propagation for nuclear treaty-related events near detection threshold and enhance detection, location, screening, and identification of underground, oceanic, and atmospheric events through a peer-reviewed program of basic research.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

Project BI - Arms Control Technology (cont'd) -

Develop more cost-effective techniques for arms control related databases, information management, data processing, and reporting.

FY 2002 Plans

Technical Assessments (\$9,102K)

Assess CFE treaty technical needs based on historical performance of inspections to support CFE Review Conference (REVCON).

Begin an assessment of information processing needs for an APL ban.

Complete the OSMAPS Life Cycle Upgrade Assessment.

Continue a Space Arms Control Technology Assessment to support DoD analysis and evaluation of potential space arms control measures and their need for verification technology developments.

Complete the analysis of technologies options for the modification of the ABM treaty to accommodate Theater Missile Defense (TMD) and/or National Missile Defense (NMD) deployment.

Complete a study of the impacts of verification of an ABM Treaty modified to allow a NMD deployment on DoD operations.

Provide technical negotiation support for START, START I and START follow-on

treaties.

Provide technical support (to include quick turn around and longer term analyses) to the U.S. arms control delegations to the NATO, OSCC, the Joint Consultative Group, the Forum for Security Cooperation, the APL negotiation, and regional arms control negotiation.

Continue Open Skies sensor performance evaluations and provide acquisition RDT&E support for SAR, optical and video cameras, and IRLS.

Continue assessment of the Middle East Aerial/Overhead verification and confidence

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

Project BI - Arms Control Technology (cont'd) -

building for use in multiple arms control treaty verification regimes.

Conduct assessments of technologies to support current and emerging conventional arms control negotiations.

Initiate assessment of APL ban data reporting requirements.

Initiate assessment of CCW data reporting requirements.

Conduct CWC system modernization assessments.

Conduct DoD compliance analyses and declaration system assessment for BWC
Technology Development (\$42,541K)

Evaluate results of 2001 BWC REVCON for potential impact on DoD.

Initiate advanced screening technology evaluations for CWC and BWC related samples.

Continue multi-center validation program for bio detection methods & complete initial PCR database.

Initiate prototype development of selected non-visual methods of verifying ballistic missiles.

Plan and execute advanced monitoring regime demonstrations at a potential inspection site for Russian representatives as necessary for support of strategic Arms Control negotiations.

Plan, execute, and evaluate a second-generation demonstration at a DoD base to evaluate the operational impact of nuclear warhead monitoring.

Continue follow-on efforts for the cooperative development of strategic arms control

technologies with the Russian Federation. Initiate the development of an extended digital processor to process foreign digital sensor data to ensure treaty-required resolution of foreign sensors used in overflights of the U.S. Initiate APL Ban data system development to satisfy potential U.S. reporting requirements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Arms Control Technology; 0603711BR	

Project BI - Arms Control Technology (cont'd) -

Continue development of the next generation of treaty support information management capabilities under the Arms Control Information and Notification Program, using state-of-the-art technologies and adhering to DoD international standards. Initiate development of OSMAPS life-cycle upgrades and conduct required Independent Verification & Validation (IV&V) tests.

Continue IV&V tests of information processing systems.

Initiate development of a verification system for regional applications.

Initiate tech transfer of 8-port air sampler for chemical agent detection.

Complete addition of thermal value parameter to ANDE system.

Complete prototype polymerized foam detection system.

Continue ANDE development to include addition of liquids and solids to the library database and integration of electro-magnetic methodologies.

Test and evaluate mini-neutron spectroscopy using neutron generator.

Complete upgrade of particulate radionuclide samplers at nuclear test detection stations in Guam; Palmer Station, ANT; Sand Point, AK; Salchaket, AK; Wake and Midway Islands; and Oahu, HI.

Begin installation of aerosol radionuclide samplers at radionuclide stations.

Continue development and testing of seismic, hydroacoustic, infrasound and radionuclide sensor systems, processing and operations in support of US national systems and associated RDT&E activities.

Conduct research and engage in advanced sensor RDT&E to meet US next-generation requirements for WMD monitoring and treaty verification.

Continue research and development to improve understanding of source phenomenology

and propagation for nuclear treaty-related events near detection threshold and enhance detection, location, screening, and identification of underground, oceanic, and atmospheric events through a peer-reviewed program of basic research. Continue development and operation of the Center for Monitoring Research for application to all nonproliferation and arms control requirements, including developing enhanced automated processing for multiple, disparate data streams and databases for WMD applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE June 2001				
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/RDT&E Management Support - BA6				R-1 ITEM NOMENCLATURE Critical Technology Support; 0605110BR				
	FY 2000	FY 2001	FY 2002					
Total 0605110BR Cost	2.5	3.9	3.3					
Project BB - Small Business Innovative Research (SBIR)		.1	.1					
Project BL - Militarily Critical Technology Program	2.5	3.8	3.2					

A. Mission Description and Budget Item Justification:

This program element supports the following efforts:

- 1) The Military Critical Technology Program (MCTP) provides a flexible basis to pull together experts from government, industry, and academia in various technology areas for several purposes: (1) filling critical gaps in DTRA understanding of what technologies are militarily important and why; (2) identifying foreign militarily significant technological capabilities and how they relate to those of the U.S.; (3) providing technical support for foreign investment reviews and Congressional reports; (4) identifying technical parameters for use in defining and reviewing export control lists and regulations (includes providing critical support to the President's Defense Trade Security Initiative which requires DoD to conduct a review of the United States Munitions List on a rolling basis with 25 percent of the list reviewed each year).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE June 2001				
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A. Mission Description and Budget Item Justification (cont'd):

Several of the activities performed by the MCTP include: (1) Developing and publishing in both hard copy and electronic form various lists that describe the military and proliferation significance of various technologies; (2) Monitoring and assessing dual-use and military technologies worldwide; (3) Assisting in the Agency's development of proposals for negotiation in various multilateral export control regimes; (4) Providing technical support for the review/revision of the U.S. Munitions List under the Defense Trade Security Initiative; and (5) Providing analytical support for various Congressional reports, primarily the annual cumulative assessment of export licenses to various high-risk countries under Section 1402 of the FY 00 National Defense Authorization Act.

2) Automating the patent secrecy review process conducted by DoD and managed by DTRA with the military departments for the U.S. Patent and Trademark Office (PTO). This will be accomplished principally through development and implementation of the Patent Application Review System (PARS).

PTO currently scans patents into an in-house system and prints these patents for review. When a patent may pose a national security risk and merits review by DTRA and possibly military field commands, a hard copy is delivered to these sites for review. If a secrecy order is required, it is documented, labeled, and stored accordingly. To provide an efficient and effective review process of these patents, an automated system needs to be developed.

3) The Technology Security Assessment System (TSAS) which is being designed and developed to provide the analytical tools necessary for policy analysts, case analysts, and technical/intelligence analysts within DTRA to glean trends and relationships from a variety of data resources to assist in policy development and in case review processes. This system is intended to be an analytical complement to the case processing system being developed under USXPORTS.

APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/RDT&E Management Support - BA6	R-1 ITEM NOMENCLATURE Critical Technology Support; 0605110BR
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B. Program Change Summary

	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
Previous President's Budget	2.2	3.9	2.2
Current President's Budget	2.5	3.9	3.3

Change Summary Explanation:

Increased funding in FY 2002 supports the phasing approach for the development of analytical tools to aid in evaluation and assessment of technology and goods for national security.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/RDT&E Management Support - BA6	R-1 ITEM NOMENCLATURE Critical Technology Support; 0605110BR

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 Plans

Small Business Innovative Research (SBIR) (\$44K):

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

FY 2002 Plans

Small Business Innovative Research (SBIR) (\$56K):

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

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/RDT&E Management Support - BA6	R-1 ITEM NOMENCLATURE Critical Technology Support; 0605110BR	

Project BL - Militarily Critical Technologies Program: This project provides critical data required to support the ongoing update of lists of various military critical and

proliferation technologies; technical support for review/revision for the U.S. Munitions List under the Defense Trade Security Initiative; assessment of dual-use and military technology worldwide to support national security actions; proposals for negotiations in various multinational export control regimes, and analytical support for various Congressional reports.

FY 2000 Accomplishments

Military Critical Technology Program (MCTP) (\$2,174K):

Developed and published in both hard copy and electronic form various lists that described

the military and proliferation significance of various technologies.

Monitored and assessed dual use and military technologies worldwide and developed technology assessments.

Assisted with the Agency's development of proposals for negotiations in multilateral export control regimes.

Patent Application Review System (PARS) (\$325K):

Developed and designed an automated system to assist in the management control and assessment of the Department of Defense Patent applications for national security.

FY 2001 Plans

Military Critical Technology Program (MCTP) (\$2,049K):

Develop and publish in both hard copy and electronic form various lists that describe the military and proliferation significance of various technologies.

Monitor and assess dual use and military technologies worldwide and develop technology assessments.

Assist the Agency's development of proposals for negotiations in multilateral export control regimes.

Provide technical support for the review/revision of the U.S. Munitions Lists under the Defense Trade Security Initiative #17.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE June 2001
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/RDT&E Management Support - BA6	R-1 ITEM NOMENCLATURE Critical Technology Support; 0605110BR	

Project BL - Militarily Critical Technologies Program (cont'd):

Provide analytical support for various Congressional reports, primarily the annual cumulative assessment of export licenses to various high-risk countries under Section 1402 of the FY 00 National Defense Authorization Act.

Technology Security Assessment System (TSAS) (\$1,800K):

Provide analytical tools necessary to glean trends and relationships from a variety of data resources to assist in policy development and in case review process.

FY 2002 Plans

Military Critical Technology Program (MCTP) (\$1,966K):

Develop and publish in both hard copy and electronic form various lists that describe the military and proliferation significance of various technologies.

Monitor and assess dual use and military technologies worldwide and develop technology assessments.

Assist the Agency's development of proposals for negotiations in multilateral export control regimes.

Provide technical support for the review/revision of the U.S. Munitions Lists under the Defense Trade Security Initiative #17.

Provide analytical support for various Congressional reports, primarily the annual cumulative assessment of export licenses to various high-risk countries under Section 1402 of the FY 00 National Defense Authorization Act.

Technology Security Assessment System (TSAS) (\$1,300K):

Provide analytical tools necessary to glean trends and relationships from a variety of data resources to assist in policy development and in case review process.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE	
APPROPRIATION/BUDGET ACTIVITY								R-1 ITEM NOMENCLATURE	
RDT&E, Defense-Wide/RDT&E Management Support - BA6								Counterproliferation Support; 0605160BR	
Cost (In Millions)	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	Cost to Complete
Total 0605160BR Cost	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Realigned
Project P542 CP Architecture Studies and Management Oversight	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Realigned

Mission Description and Budget Item Justification - The proliferation of nuclear, biological, and chemical weapons and their means of delivery (NBC/M) continues to pose a grave threat to national security. The U.S. requires counterproliferation (CP) counterforce capabilities to neutralize this threat. To accomplish this counterforce mission, the U.S. must be able to identify, characterize and defeat NBC/M research, production, storage, operations and support, and command and control facilities while mitigating collateral hazards resulting from release and expulsion of NBC agents. The potential target set includes fixed, aboveground and underground, hardened and unhardened facilities.

Activities funded through this program element support programs that develop, demonstrate, and transition CP counterforce technologies to combatant commands and the Services. The programs are structured to exploit ongoing DoD agency, Service laboratory, and Department of Energy laboratory technology programs wherever possible. The program emphasis is on functional kill as well as hard kill and on mitigating collateral effects. The goal is rapid development of enhanced counterforce mission capabilities to include, but not limited to, advanced conventional and non-conventional (non-nuclear) weapons, application of sensor technologies to provide weapons of mass destruction (WMD) combat assessment, and target-attack planning tools to optimize weapon and sensor employment. Prototype or modified systems integrating these capabilities will then be evaluated in demonstrations, those having military utility transition to a Service for acquisition, and, in some cases, a residual operational capability is provided to combatant commanders.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE June 2001	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/RDT&E Management Support - BA6					R-1 ITEM NOMENCLATURE Counterproliferation Support; 0605160BR				
Cost (In Millions)	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	Cost to Complete
Total 0605160BR Cost	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Realigned
Project P542 CP Architecture Studies and Management Oversight	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Realigned

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

CP is the activity in DoD to combat the spread of NBC/M. Activities include arms and export control, intelligence collection and analysis, counterforce, active defense, passive defense, and consequence management. DTRA is responsible for all the counterproliferation activities except active defense and intelligence. Focusing counterproliferation activities in DTRA will improve integration and further leverage warfighter capabilities. The funds in this program element support requirement identification; monitoring the technology base for exploitation; studies and technical analyses to determine the best combination of technologies; systems engineering and integration; acquisition programs; development of doctrine and concepts of operation for combatant commanders' required capabilities; and CP investment strategy development.

To better support the DTRA program and resource structure, a new program element (PE) code construct was designed and approved. After FY 2000, Project 542, CP Architecture Studies and Management Oversight, is realigned to Project BK in PE 0603160BR.

B. Program Change Summary

	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
Previous President's Budget	5.3	0.0	0.0
Current President's Budget	5.3	0.0	0.0

Change Summary Explanation: As part of DTRA's efforts to better focus the Agency organization and resources to the threat reduction mission, funds for Project P542, CP Architecture Studies and Management Oversight, were realigned to PE 0603160BR in FY 2001.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE	
APPROPRIATION/BUDGET ACTIVITY								R-1 ITEM NOMENCLATURE	
RDT&E, Defense-Wide/RDT&E Management Support - BA6								Counterproliferation Support; 0605160BR	
Cost (In Millions)	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	Cost to Complete
Total 0605160BR Cost	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Realigned
Project P542 CP Architecture Studies	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Realigned

~~Project P542 CP Architecture Studies and Management/Oversight~~ - DTRA has been designated by the Secretary of Defense as the focal point for CP activities. The CP Program provides this focus of activities within the DoD. This project provides essential technical, architectural and integration support to the CP Program. The project will (1) conduct analyses and planning activities necessary for program development, project prioritization and management oversight; (2) prepare required program deliverables such as the annual CP Report to Congress and internal DoD and interagency documents; and (3) provide technical and analytical support to the established CP review groups, including the Congressionally mandated Counterproliferation Program Review Committee (CPRC). This project provides critical support to the DTRA for conducting the day-to-day operations of the CP Program and in providing necessary management oversight.

FY 2000 Accomplishments

Warfighters' CP requirements (\$2,622K)

- Maintained a CP master plan.
- Supported CP technical analyses and provided technical program oversight.
- Coordinated CP interagency program and integrated activities (CPRC, Nonproliferation and Arms Control Technology Working Group).
- Delivered the CPRC Annual Report to Congress.
- Participated in Commander-in-Chief (CINC) exercises to demonstrate value added from new CP capabilities.

CP architectural studies and technical assessments (\$2,636K)

- Conducted trade-off analyses of contributions of selected DoD acquisition efforts to DoD counterproliferation capabilities.
 - Assessed new Service technology areas to support CP activities.
 - Assessed CP technologies for exploitation and inclusion in the CP master plan.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE June 2001	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/RDT&E Management Support - BA6					R-1 ITEM NOMENCLATURE Counterproliferation Support; 0605160BR				
Cost (In Millions)	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	Cost to Complete
Project P542 Counterproliferation Architecture Studies and Management/Oversight (cont'd) -									
Total 0605160BR Cost	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Realigned
Monitored the technology base for exploitation. Supported the warfighter by identifying non-material solutions and delivering material Project P542 CP Architecture Studies to required CP capabilities. and Managed and planned for new advanced concept technology demonstrations to meet CINC Oversight needs.									

Continued CP Capabilities Working Group.

FY 2001 Plans

Funding and activities realigned to Project BK in PE 0603160BR.