Defense Threat Reduction Agency
FY 2000/2001 RDT&E PROGRAM

EXHIBIT R-1

APPROPRIATION: 0400D Research Development Test & Eval, Defwide

Date: FEB 1999

Line No	Program Element Number	Item	Act	Thousands of Dollars FY 1998	FY 1999	FY 2000	FY 2001	S E C
19	0602715BR	WMD Related Technology	2	203,785	211,363	203,512	206,467	U
	Applied Research			**203,785**	**211,363**	**203,512**	**206,467**	
27	0603160BR	Counterproliferation Support - Adv Dev	3	80,209	52,951	81,245	75,841	U
35	0603711BR	Verification Technology Demonstration	3		57,347	58,455	55,325	U
	Advanced Technology Development			**80,209**	**110,298**	**139,700**	**131,166**	
100	0605110BR	USD(A&T)--Critical Technology Support	6			2,215	2,103	U
107	0605128BR	Classified Programs	6		13,706			U
109	0605160BR	Counterproliferation Support	6		9,307	5,315	4,629	U
	RDT&E Management Support				**23,013**	**7,530**	**6,732**	
	Total Defense Threat Reduction Agency			**283,994**	**344,674**	**350,742**	**344,365**	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)					DATE February 1999				
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2					R-1 ITEM NOMENCLATURE WMD Related Technologies; 0602715BR				
COST (In Millions)	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete
Total 0602715BR Cost	203.8	211.4	203.5	206.5	209.1	212.0	217.3	222.8	Continuing
Project AB Test & Simulation Technology	54.5	57.7	52.8	49.6	48.8	49.4	50.5	51.7	Continuing
Project AC Weapon Systems Lethality	41.1	39.4	35.8	36.3	36.8	38.9	40.3	41.1	Continuing
Project AE Weapon Safety & Operational Support	28.3	30.2	31.7	33.9	34.8	36.0	36.7	37.7	Continuing
Project AF Weapon System Operability	43.3	44.5	47.8	51.2	51.8	52.8	53.9	55.3	Continuing
Project AG Scientific Computations & Information Systems	19.1	22.0	21.5	21.6	22.2	21.8	22.5	23.2	Continuing
Project AI Hard Target Tunnel Defeat and NTS Sustainment	9.9	10.2	12.1	12.3	12.6	13.1	13.4	13.8	Continuing
Project AL Classified Program	2.6	2.4	1.8	1.6	2.1	0.0	0.0	0.0	Terminated
Project AN Thermionics	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	Completed
Project AQ Deep Digger	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	Completed
Project AY Bioenvironmental Hazards Research	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Completed

A. Mission Description and Budget Item Justification

This program develops the technology base needed to support national security issues relevant to nuclear and other advanced weapons and force application technologies. Program initiatives include the development, upgrade, and maintenance of advanced nuclear weapons effects simulators to address weapon systems operability issues; conventional weapon

targeting and strike planning tools for regional contingencies; battle damage prediction/assessment of conventional strikes against fixed hardened facilities; and

Mission Description and Budget Item Justification (cont'd)

predictive models for dispersion and transport of hazardous particles generated by attacks sustainment of a core nuclear competence in the national industrial base. Efforts encompass:

- -Support for national security policy implementation.
- -Support to CINCs in nuclear force structure, logistics, operations and stockpile programs.
- -Quantitative assessments of nuclear weapons systems with development and maintenance of nuclear weapons system safety databases.
- -Development, upgrade, and operation of simulators (radiation, blast, thermal, radio frequency propagation and optical/infrared background effects) to characterize operability of military systems during and after exposure to nuclear disturbed environments.
- -Physical and functional characterization of hardened underground structure designs and associated vulnerabilities.
- -Determination of nuclear and conventional weapons effectiveness against fixed targets. Emphasis is on targeting technical support, hard target kill criteria, and damage assessment methodologies.
- -Utilization of weapons effects information to support development of adaptive targeting methodologies.
- -Support of high-performance computing capability to maintain and upgrade the Agency's predictive codes in radiation hydrodynamics, structural dynamics, and electromagnetic propagation supporting nuclear and conventional weapon system lethality, operability, and safety assessments.

Mission Description and Budget Item Justification (cont'd) - The 6.2 programs under this Program Element (0602715BR) are divided into ten projects. It should be noted that information concerning Project AL is classified per DoD Directive 0-5205.7, Para B.2.f.

The November 1997 Defense Reform Initiative (DRI) directed the establishment of a Defense Threat Reduction Agency (DTRA) effective 1 October 1998. As a result of the DRI, resources for FY 1999 and out which were previously addressed in Defense Special Weapons Agency Program Element (PE) 0602715H have been transferred to this PE.

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, 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 simulator 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/DOE, 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

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

(LB/TS) at White Sands Missile Range (WSMR), including the demonstration of a non-ideal airblast simulation capability. 4) Operation and maintenance of the ARES electromagnetic pulse (EMP) facility at Kirtland AFB. 5) Target defeat assessments for precision-guided and special weapons against Weapons of Mass Destruction (WMD) related targets.

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 ACOM.

FY 1998 Accomplishments

Test & Simulation ($19,613K)

- Continued to provide high explosive (HE) simulation infrastructure and test support, and to maintain Permanent High Explosives Test Site (PHETS) facility at White Sands Missile Range (WSMR) and Chestnut Site at Kirtland AFB.
- Continued Radar Nuclear Effects Corruption Simulators (RNECS) development for National Missile Defense (NMD); completed Advanced Channel Simulator (ACS) development and began initial operational test planning; evaluated advanced SATCOM Simulation Test Support to assess NMD architecture communications link operability; continued communication/radar atmospheric effects simulator participation in operability

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

assessment/warfighting exercises; and evaluated NMD Ground-Based Radar (GBR) operability.

Evaluated off-the-shelf technology for improvements in thermal and pressure diagnostics capabilities of LB/TS. Tested three Navy ship deckings and one United Kingdom communications shelter, and continued testing of Israeli subscale structure.

Supported test requirements by providing utilities and maintaining the construction capability infrastructure needed for the Counterproliferation (CP), Hard Target Defeat (HTD) and Hard and Deeply Buried Target (HDBT) programs.

Completed Phase 1 Advanced Concept Technology Demonstration (ACTD) for the CP program with infrastructure support and rehab capabilities at PHETS.

Completed over 80 individual high explosive tests supporting HTD Program, Counterterrorism Program, Service Support of F-117 attack methodologies, and penetration abilities of weapons.

Developed specialized airblast testing methodologies in LB/TS for large window safety testing in support of Counterterrorism.

Developed critical data supporting Non-ideal Airblast (NIAB) simulations in the LB/TS.

Completed ARES commercial pulse injection testing, DoD testing of electronic safe locks, GPS survivability and general upkeep of the facility.

Weapon/Target Interaction ($7,144K)

Awarded contract to develop and validate end-to-end targeting capability for conventional and nuclear weapons against tunnels.

Continued to construct and rehab test target facilities, provided utilities, maintained construction infrastructure, and executed tests needed for the CP, HTD, and HDBT programs.

Initiated construction of a full scale tunnel facility.

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

- Continued to develop signature requirements and munitions effectiveness assessment for hard target defeat.
- Continued construction of industrial targets for the assessment of WMD component damage, target response, and collateral effects for conventional weapons and enhanced payloads.

Radiation Simulators ($27,753K)

- Initiated an integrated modeling program for opening switches, power flow, and soft x-ray sources.
- Developed active debris mitigation valves for debris-free exposures greater than $100cm^2$.
- Demonstrated long-implosion soft x-ray sources on SATURN at Sandia National Labs in support of Decade source development.
- Developed improved fidelity source for NWE testing on the Decade simulator, plasma imaging and current diagnostics, and high-current, long-time implosion soft x-ray sources.
- Continued advanced, high-fluence, soft x-ray and high-dose and dose-rate hot x-ray development for the Decade Quad.
- Initiated Decade improvement program for power flow technologies to support high-fluence, soft x-ray sources.
- Assembled back-end power source for a Decade Quad at AEDC, and finalized front-end MITL-diode design.
- Completed very large ($410cm^2$) passive debris shields for cold x-ray testing.
- Began closure of the High Power Microwave Simulator.
- Continued development of a portable, compact, high-fidelity x-ray simulator.
- Partially replaced aging and obsolete instrumentation and diagnostics at test and R&D centers.
- Procured and integrated new diagnostics and instrumentation to enhance user test support.

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

Completed demonstration of high-fidelity, hot x-ray source for strategic system component testing.
Demonstrated high-fidelity, cold x-ray source and improved passive debris shield technology for solar array testing.
Demonstrated prototype remote access data system to save customer testing funds.
Demonstrated efficient laser-produced cold x-ray sources.

FY 1999 Plans

Test & Simulation ($20,325K)

Continue to respond to emerging user testing needs through R&D upgrades.
Continue to provide high-explosive simulation infrastructure and test support, and maintain PHETS facility at WSMR and Chestnut Site at Kirtland AFB.
Complete RNECS development for National Missile Defense (NMD) and begin initial operational tests.
Develop mitigation techniques for NMD GBR in a nuclear-disturbed environment and provide advanced SATCOM/User Early Warning Radar (UEWR) Simulation Test Support to assess NMD architecture operability.
Continue communication/radar atmospheric effects simulator participation in operability assessment/warfighting exercises.
Evaluate NMD UEWRs for operability and continue advanced Simulation Test Support to MILSTAR, IFICS, and Global Positioning System (GPS).
Develop advanced optical scene generator techniques and capabilities to support testing of NMD infrared (IR) sensors.
Complete evaluation of Anti Radiation Missile Systems using the improved 512 x 512 Nuclear Optical Dynamic Display System (NODDS) scene generator.
Complete modifications to LB/TS for blast and thermal diagnostics. Test one Navy ship decking and six Israeli tactical systems.

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

- Continue to provide HE simulation infrastructure and test support, and maintain PHETS facility at WSMR and Chestnut Site at Kirtland AFB.
- Complete large scale high explosive test in hard rock.
- Continue to rehab test target facilities at WSMR.
- Continue to support LB/TS maturing NIAB technology, window testing capabilities, and testing of vehicles against ideal nuclear airblast and thermal effects.
- Begin HE infrastructure support of Phase 2 ACTD, Counterterrorism and Hard Target Defeat Testing.
- Begin phenomenology testing of penetration of weapons into rocks and into damaged concrete. Complete penetration testing into granite. Initiate testing into limestone.
- Initiate Joint Attack Stand-Off Missile (JASM) infrastructure test support of three out of five fundamental target types. JASM program also supports the CP and HTD program.
- Begin ARES support of small operation testing and the TRW, Inc., Army tent tests.

Weapon/Target Interaction ($7,111K)

- Develop and validate tunnel targeting capability for system component level.
- Continue to construct and rehab test target facilities, provide utilities, maintain the construction capability infrastructure, and execute tests for CP, HTD, and HDBT programs.
- Complete tunnel testbed facility outfitting.
- Continue to develop signature requirements and munitions effectiveness assessment for hard target defeat.
- Collect operational signatures for tunnel testbed facility.
- Begin rehab of industrial targets for the assessment of WMD component damage, target response, and collateral effects for conventional weapons and enhanced payloads.

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

Radiation Simulators ($30,260K)

- Develop source capabilities for NWE testing with Nova laser.
- Continue development of large survivable passive debris shields for cold x-ray testing on Double-EAGLE simulator.
- Continue development of active debris mitigation valves for debris-free exposures greater than 300cm^2.
- Demonstrate long-implosion soft x-ray sources in support of Decade source development.
- Develop current, density-imaging, PRS diagnostics with demonstration of a Plasma Opening Switch (POS) diagnostic.
- Continue Decade improvement program for power flow technologies to support improved fidelity and intensity x-ray sources.
- Complete assembly of Decade Quad at AEDC.
- Optimize Decade Quad hot x-ray source and operation for user testing.
- Continue to support ongoing NWE test programs by maintaining DTRA's suite of ionizing radiation simulators.
- Complete closure of HPM facility at Maxwell Physics International.
- Demonstrate and deploy quick-turnaround, cold x-ray diagnostic system.
- Demonstrate high-spectral fidelity hot x-ray source on PITHON simulator.
- Continue development of a portable, compact, high-fidelity simulator.
- Begin augmented pulsed power concept development for advanced simulators for strategic component testing.
- Begin fast discharge energy storage technology development.
- Begin process of transferring MBS Calorimetry technology and design to AEDC.

FY 2000 Plans

Test & Simulation ($18,374K)

- Conduct testing of UEWRs in support of NMD program upgrades. Develop radar mitigation techniques for NMD GBR and UEWR.

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

Support IR scene testing of NMD TMD seekers. Support IR and communications testing of Space-Based Infrared Satellite (SBIRS).
Continue communication/radar atmospheric effects participation in operational/ warfighting exercises.
Continue support of testing of MILSTAR, IFICS, and GPS.
Continue to provide HE simulation infrastructure and test support, and maintain PHETS facility at WSMR and Chestnut Site at Kirtland AFB.
Continue to rehab test target facilities at WSMR.
Complete LB/TS NIAB development and tests, improve window testing capabilities, and continue testing of vehicles against nuclear airblast and thermal effects.
Continue HE infrastructure support of Phase 2 ACTD, Counterterrorism and Hard Target Defeat Testing.
Continue phenomenology testing of penetration of weapons into rocks and into damaged concrete. Continue penetration into limestone and complete testing into damaged concrete.
Continue infrastructure support of JASSM test support of three fundamental target types.
Begin ARES testing of Army All Source Analysis System (distributed battlefieldintel system).

Weapon/Target Interaction ($7,068K)

Conduct operational tunnel defeat demonstrations using existing and developmental weapons.
Demonstrate reconstitution times and costs after each demonstration.
Collect signatures of the tunnel facility for characterization before, during, and after each weapon application.
Exercise target planning tools through each of the participating CINCs.
Initiate construction of tunnel facility #2 of a different functional type in a different geology.

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

Conduct weapon lethality experiments to evaluate new weapons for functional defeat of tunnel facilities.

Radiation Simulators ($27,358K)

Demonstrate high-fluence, soft x-ray source on Decade Quad.
Demonstrate >500cm^2 debris shields for the Decade Quad.
Make large-area, hot x-ray source available for user testing on Decade Quad.
Initiate hardware development to support high-dose and high-dose-rate bremsstrahlung sources on Decade Quad.
Continue to support NWE test and R&D customers on DTRA's suite of ionizing radiation simulators.
Demonstrate and characterize high-fidelity wire array plasma radiation source on Double-EAGLE.
Demonstrate and characterize high-fluence ion beam capability on Pithon.
Upgrade control systems on radiation simulators at Maxwell Physics International for improved reliability.
Enhance Remote On-Line Simuator Access data encryption and access control capabilities.
Complete conversion of high-density plasma models to high-performance computers.
Demonstrate 20krads(Si) hot x-ray operation on Decade Quad.
First operation of Decade Quad cold x-ray capability.
Complete compact x-ray pulser.
Demonstrate distributed laser-produced x-ray source technology.

FY 2001 Plans

Test & Simulation ($19,170K)

Develop and test radar mitigation techniques for NMD GBRs. Support NMD UEWR mitigation upgrades.

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

Complete development of advanced IR scene generation simulator.
Continue development of the WCS.
Continue communication/radar atmospheric effects participation in operational/warfighting exercises.
Continue support of testing of IFICS and SBIRS.
Continue to provide HE simulation infrastructure and test support, and maintain PHETS facility at WSMR and Chestnut Site at Kirtland AFB.
Continue to rehab test target facilities at WSMR.
Continue HE infrastructure support of Phase 2 ACTD, Counterterrorism and Hard Target Defeat Testing.
Complete penetration testing into limestone and damaged concrete.
Complete JASSM test support of three fundamental target types.
Continue to support LBTS operations and infrastructure supporting vehicle and window testing.
Initiate ARES testing in SBIRS and THAAD (missile model/engineering representation) testing.

Weapon/Target Interaction ($6,890K)

Complete construction and outfitting of tunnel facility #2.
Conduct strike planning for operational attacks against the tunnel facility.
Collect signatures for target characterization during operational, strike, and post-strike phases of each attack.
Demonstrate improved tunnel target planning tools for both physical and functional defeat of tunnel facilities.
Conduct weapon-target interaction tests against tunnels.
Conduct reconstruction of the tunnel facility after each strike.

Radiation Simulators ($23,496K)

Soft x-ray source capability to Decade Quad.

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

- Initiate demonstration of high-fidelity, low-end-point energy bremsstrahlung source on Decade Quad.
- Continue to operate and improve DTRA's suite of ionizing radiation simulators in support of NWE testing and R&D customers.
- Transfer test technologies from Maxwell Physics International to Decade Radiation Test Facility, and characterize/correlate new test environments.
- Complete engineering enhancements to active, large-area debris shieldsysstems to provide user-friendly and reliable, debris-free, cold x-ray test environments on both Double-EAGLE and Decade.
- Demonstrate critical technologies for an advanced radiation simulator.
- Complete enhanced opening switch performance verification.
- Demonstrate >500cm^2 debris shields on Decade Quad soft x-ray source.
- Begin high energy demonstration of laser x-ray sources for NWE testing.

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. 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 program 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

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 source technology for warfighting applications and hardening technologies for emerging radiofrequency (RF) threats. This project also includes electrothermal chemical (ETC) gun advanced technology and projectile lifting body programs per memorandum of agreement (MOA) with the Navy; ETC gun technologies for direct-fire (tank) applications, per MOA with the Army; and initiates development of ETC gun technologies for future indirect fire (artillery) Army applications.

FY 1998 Accomplishments

Weapons Effects Phenomenology ($3,716K)

- Developed concepts for demonstrating nuclear weapons effects on underground storage facilities, and other very hard and very deep targets.
- Developed a weapons output report on nuclear weapons effects from potential proliferants' weapons.
- Completed energy coupling analysis and effective yield models for cratering and ground motion.
- Accomplished ground motion predictions and experiment for Degelen-98 100 ton underground high explosive event.
- Developed prototype Integrated Munitions Effects Assessment (Nuclear) (IMEA-N) model to allow collateral consequence assessment of targeting weapons of mass destruction (WMD) materials. Model designated interim NATO standard.
- Completed nuclear targeting analysis for Air Force Milestone 0 study.

Project AC - Weapons Systems Lethality (cont'd)

- Delivered fire vulnerability assessment tool to USSTRATCOM.
- Reviewed Russian EMP Test Data and developed a framework for an EMP vulnerability Number (EMPVN) Model and a SREMPTAPS "Smart System" for WMD Target Planning database.
- Completed the development of STRATCAT Version 2 as a top level, quick C3I Assessment Tool and installed on STRATCOM's Top Secret LAN system.

Technical Information ($1,528K)

- Began development of integrated CD ROM nuclear weapons effects computational aid.
- Beta tested and distributed battlefield nuclear targeting CD ROM.
- Disseminated electronic version of Effects Manual-1 (EM-1) Technical Handbook.

Application of Nuclear Weapons Expertise ($16,346K)

- Defined the vulnerabilities of nuclear reactors to conventional weapon effects. Developed a prototype of a Munitions Effects Assessment (MEA) module for nuclear reactors.
- Demonstrated radiofrequency (RF) hardening technology of commercial off-the-shelf (COTS) equipment during an OSD sponsored Advanced Technology Demonstration.
- Completed field test of long-pulse sub-megawatt-class RF power source.
- Tested High Power Microwave (HPM) hardening countermeasures on tactical systems.
- Developed an innovative device to detect RF sources, the "Witness Chip", which can be used to warn of existing electronic attack.

Weapon/Target Interaction ($15,706K)

- Executed initial phase of a test program to define the vulnerability of C3I components and subsystems found in former Soviet Block high-value fixed targets.
- Developed fragility models for components found in high value fixed targets.
- Delivered electronic version of Design and Analysis of Hardened Structures (DAHS) and the electronic version of Protective Structures Analysis and Design System (PSADS).

Project AC - Weapons Systems Lethality (cont'd)

- Executed tests and performed analyses to develop vulnerability models for nuclear power plants attacked by advanced weapons.
- Performed precision scale tests to fill the data gaps in DAHS methodologies.
- Completed a precision test program to define penetration limits for advanced penetrator concepts for three rock types and impact velocity up to 1.5 Km/Sec.
- Completed an Independent Verification and Validation (IV&V) of the second generation weapon effect models in MEA 3.0.
- Provided technical support and hardware/software to integrate weapons effects and target response codes into distributive environment.
- Completed World-Wide Research Reactor Isotopic Inventories.
- Integrated Research Reactors into the Hazard Prediction and Assessment Capability (HPAC).
- Demonstrated a Comprehensive Weaponeering Environment that links diverse weaponeering tools on a computer network.
- Applied advanced weapon effect codes to current terrorist events to support civil authorities.
- Developed/delivered a prototype Force Protection Tool. Used the tool to support special State Department embassy surveys.
- Developed an initial tunnel defeat module for MEA to support Korean (USFK/PACOM) targets.
- Developed IMEA tunnel portal module for hard target defeat office.
- Provided structural engineering/weaponeering support of Persian Gulf operations.
- Provided weaponeering support for UFL (ROK).
- Conducted vulnerability assessments of U.S. Government facilities in the National Capital area.
- Conducted vulnerability assessments of U.S. embassies abroad for the State Department.

Project AC - Weapons Systems Lethality (cont'd)

- Provided conventional weapons effects tests and analysis support for FBI anti-terrorism programs.
- Began vulnerability reassessment of Russian silos for STRATCOM.
- Developed initial anti-terrorism planning software for force protection assessments.
- Provided technical support for the bilateral MOU between the USAF and the German Ministry of Defense (MoD).
- Provided engineering support to DIA and J2T (Target) Office (J2T) for BDA analysis during contingencies.
- Applied analytical tools to vulnerability assessments of deployed forces' sites and high priority CONUS sites.
- Conducted joint tests and foreign bunker exploitation visits with German MoD to gather data on potential foe's storage and control of Weapons of Mass Destruction.
- Demonstrated a robust capability to analyze complex fluid/structure interaction found in weapons effects environments using newly developed coupled code capability.
- Successfully completed 5-inch, Navy ETC gun-launched, horizontal range (700 feet) testing of two each full-up steel and composite projectile flight bodies that validated rear fin deployment, rear obturator performance, and rocket motor ignition. Both projectile designs survived 18MJ muzzel energy gun launch and performed as designed.
- Successfully designed, developed and evaluated two different ETC ignitor assemblies to meet ETC tank requirements.
- Successfully developed and produced an advanced, colayered, gun propellant that will meet energetic requirements for the 120mm ETC tank gun cartridge performance criteria.
- Successfully tested gun propellant candidates in subscale gun firings (60mm) to validate performance characteristics prior to manufacturing full-scale gun propellants.

Project AC - Weapons Systems Lethality (cont'd)

- Successfully initiated full-scale gun testing (120mm M256 tank gun) of the first delivery of advanced propellants using the ETC ignitor system. Preliminary firings (unoptimized) demonstrated a 23% increase in performance over the fielded 120mm M256 tank gun.
- Completed development of the explosive charge preparation and handling facility and initiated its operation at the Green Farm Electric Gun R&D Facility.
- Completed 20 ETC ignitor and charge development phenomenology experiments, ten 120mm ETC gun tests, and seven 90mm electromagnetic (EM) gun firings to evaluate EM, UK-designed, anti-tank projectiles at the Green Farm Facility.

US/Allied Survivability and Operability in Nuclear/Special Weapon Environments ($370K)

- Add graphics to analysis tools for STRATCOM to assess B-2 aircraft dust survivability for planned SIOP routes.

Test and Simulation ($1,182K)

- Performed validation testing for particle formulation models for nuclear fallout prediction in urban areas.
- Executed nuclear energy-coupling simulation utilizing NRL PHAROS laser system.

Technical Information ($1,528K)

- Began development of integrated CD ROM nuclear weapons effects computational aid.
- Beta tested and distributed battlefield nuclear targeting CD ROM.
- Disseminated electronic version of Effects Manual-1 (EM-1) Technical Handbook.

FY 1999 Plans

Weapons Effects Phenomenology ($7,742K)

- Distribute interim Threat Volume 2 of Nuclear Weapons Manual & Output Handbook.
- Begin work on advanced nuclear threat volume.
- Start development of computational capabilities to obtain 3-D radioactive output for strategic weapons.

Project AC - Weapons Systems Lethality (cont'd)

- Continue work on very deep hard target kill methodologies that will address assessments of weapons systems.
- Complete the geological analysis of two additional foreign sites.
- Finish material properties definition of a third foreign target site.
- Provide nuclear MEA capability to NATO/SHAPE in the MEA 4.0 release.
- Execute scaled nuclear target simulation test.
- Complete nuclear terrorist incident analysis and consequence assessment.
- Proof-of-concept demonstration of EMPVN Model for Lon lines connected Power and Telecommunications system of the Military.
- Develop simulation & modeling of EMP targeting of WMD using coherent pulsed power and nuclear EMP Simulator Sources based on air, land, and sea mobile platforms- a new initiative.
- Upgrade STRATCAT tool set for STRATCOM and for Regional Commands specific C3I assessment mission requirements.
- Upgrade the source region EMP target assessment and planning system (SREMPTAPS) to include new and war planners required weapon designs parameters.
- Develop 3-D Simulation of new Nuclear Weapon Effects (NWE) and Asymmetric Threat via SHYPS code suing the DoD high power computing (HPC) capability and in collaboration with LLNL.

Technical Information ($1,247K)

- Complete and demonstrate integrated NWE computational aids.
- Update 2 chapters of Effects Manual-1 (EM-1).

Application of Nuclear Weapons Expertise ($16,341K)

- Construct brassboard compact power sources.
- Conduct high-level testing of compact power distribution source prototype.
- Define the vulnerability of nuclear reactors and nuclear reprocessing facilities to advanced conventional weapons effects.
- Complete development of substrate conduction, an innovative protection technology effective against all EM threat frequencies.

Project AC - Weapons Systems Lethality (cont'd)

- Apply High Power Microwave (HPM)/EM hardening technology to a warfighter system.
- In partnership with the U.S. Telecommunications industry, apply HPM/EM hardening technology to critical, disaster recovery, communications hub.
- Complete key technologies for an advanced long pulse HPM solid-state source.
- Continue development of Witness Chip RF detector, increasing its sensitivity, improving computer interfaces, increasing its dynamic range, and adding frequency selectivity, for final product.
- To support a DIA request, review the lethality models for Soviet missile silos in light of current technical information. Support revision of VN/TK.
- Provide HPM source to allow OSD and Joint Services to conduct HPM experiments.

Weapon/Target Interaction ($12,456K)

- Develop detailed analysis of blast effects on First and Third Generation Aircraft Shelters to include the effects on stored assets and protection viability.
- Develop vulnerability/collateral effects tools for uranium mining/milling facilities module and transport model including effects of rainout/washout.
- Provide technical support, hardware/software to integrate weapons effects, target response codes in distributive interactive environment.
- Develop 3-dimensional, real-time visualization of targets with variable damage levels from physics-based weapon effects.
- Develop and implement joint service component vulnerability model into the MEA.
- Conduct functional defeat tests on systems.
- Produce an initial CD-ROM revision of the DAHS manual and begin work on an update to DAHS based on state-of-the-art technology.
- Execute field scale and full scale testing to reduce the uncertainty of penetration tests into rock, weathered rock, and hardened targets using advanced weapon concepts.
- Initiate the Integrated Comprehensive Weaponeering Capability (ICWC) that provides the warfighter a standardized weaponeering framework for a full spectrum of weapons and targets.

Project AC - Weapons Systems Lethality (cont'd)

- Develop an optimized dual delivery capability and implement it into MEA 4.0.
- Deliver a fully operational Force Protection tool and support Force Protection site surveys.
- Begin work on an Expert Design Advisor to guide the designer through the design of a complex protective structure.
- Transfer weapon effects data and models and develop a prototype forensic tool for civil applications that includes improvised and terrorist bombs.
- Develop models for optimized dual delivery of weapons for incorporation into IMEA.
- Develop IMEA module to support SOCOM requirements.
- Extend IMEA to meet the requirements of the Counterproliferation 2 Advanced Concepts Technology Demonstration (CP2 ACTD) and the hard target defeat demonstration.
- Extend IMEA nuclear weapons module to include ground shock kill of ultra-hard targets.
- Develop and update weapons effects and fragility models for incorporation into IMEA.
- Complete development of anti-terrorism planning software for force protection assessments.
- Provide technical support for the bilateral MOU between the U.S. and the German Ministry of Defense.
- Provide engineering support to DIA and J2T for BDA analysis during contingencies.
- Provide conventional weapons effects tests and analysis support for FBI anti-terrorism programs.
- Conduct vulnerability assessments of U.S. Government facilities in the National Capital area.
- Conduct vulnerability assessments of U.S. embassies abroad for the State department as requested.
- Assist in development of comprehensive IMEA training program.
- Complete validation verification and accreditation of IMEA through Joint Technical Coordination Group for Munitions Effectiveness (JTCG/ME).

Project AC - Weapons Systems Lethality (cont'd)

- Continue joint tests with German MoD to quantify WMD control and storage equipment lethality.
- Provide high-fidelity vulnerability assessments for deployed sites and high priority CONUS sites.
- Demonstrate new capability to more accurately predict target response using meshless numerical analysis.
- Complete ballistic range validation testing of 5-inch Navy gun-fired steel and composite projectile flight bodies at Wallops Island NASA Facility. Tests will evaluate projectile performance at ranges exceeding 25nmi.
- Complete repeatability testing of the 120mm ETC tank gun cartridge with advanced colayered propellants to achieve 14MJ muzzle energy performance in the M256 tank gun. Complete assessment and evaluation of the selected ETC tank cartridge to understand the impacts of operational temperature (-25°F to 125°F) extremes on gun performance. Investigate mitigation techniques, potentially available using ETC plasma ignitors, to overcome temperature-induced performance degradations.
- Complete 120mm ETC cartridge program.
- Initiate ETC 155mm Artillery charge development program to adapt ETC ignitor designs to the 155mm Modular Artillery Charge (MAC) propulsion system to evaluate theorized significant operational performance enhancements. This phase will evaluate the ability to use ETC ignition for both a single as well as multiple MAC cartridge components.
- Initiate relocation of the Green Farm Electric Gun R&D Facility so as to vacate Marine Corps Air Station Miramar (due to BRAC realignment) by 30 Sep 99. Maintain EM gun firing operations until Dec 98 in support of the US/UK program and ETC phenomenology and gun testing operations until Jun 99. Determine destination and begin preparation for the new site location.
- Complete isotopic inventories for reprocessing facilities.

Project AC - Weapons Systems Lethality (cont'd)

Integrate reprocessing facility into HPAC to assess hazards from these facilities due to attack, accident or incident.

Deliver radiological weapon operational module to HPAC.

US/Allied Survivability and Operability in Nuclear/Special Weapon Environments ($270K)

Update analysis tool for STRATCOM to assess aircraft dust survivability for planned SIOP routes.

Test and Simulation ($1,354K)

Validate height-of-burst airblast environments for models used in the STRATCOM PDCALC tool using advanced Adaptive Mesh Refinement (AMR) computational code.

Execute laboratory scale fireball-in-tunnel nuclear simulation with PHAROS laser system.

FY 2000 Plans

Nuclear Weapons Effects Phenomenology ($8,143K)

Distribute completed Volume 2 of Nuclear Weapon Manual & Output Handbook. Complete advanced technical threat volume.

Deliver SHAPE/NATO integrated nuclear Munitions Effects Assessment (MEA)/Hazard Prediction Assessment Capability, version 3.0.

Deliver STRATCOM microphysics based fall out model.

Complete analysis of the geology of three additional sites.

Upgrade EMPVN Model for specific WMD Targets.

Upgrade and transfer SREMPTAPS Smart System for WMD Target Planning

Develop end-to-end Targeting Models of WMD for the simulated nuclear EMP stress on Targets via the new initiative.

Complete the development of STRATCAT Tool and transfer the tool to CINC commands.

Develop Shock Acceleration Model for nuclear burst pumped Radiation Belts.

Technical Information ($1,263K)

Update 2 chapters of Effects Manual-1 (EM-1).

Convert 5 new chapters in EM-1 Manual to be electronically interactive.

Project AC - Weapons Systems Lethality (cont'd)

Applications of Nuclear Weapons Expertise ($16,375K)

- Develop and integrate MEA for application of nuclear weapons to defeat WMD targets, agents and material.
- Develop both physical/functional defeat models for enhanced warhead concepts such as high temperature incendiary.
- Integrate RF detection device ("Witness Chip") into existing Commercial Off-the-Shelf (COTS) and MILSPEC equipment.
- Develop advanced solid state techniques for microwave production.
- Develop advanced cathode and power supply technologies for microwave production.

Weapon Target Interaction ($8,634K)

- Produce a final CD-ROM revision of the DAHS manual and complete work on an update to PSADS based on state-of-the-art technology.
- Execute validation tests for complex blast and blast/fragment damage models within MEA to support DTO WE 57.
- Exploiting computing advances, develop an Advanced Lethality Tool (ALT) which brings advanced numerical techniques for end-to-end solutions of WMD related attack/planning scenarios.
- Deliver ICWC 1.0 to the warfighter that integrates the first set of weaponeering tools. Demonstrate the use in an operational exercise. Initiate ICWC 2.0 to add additional tools.
- Develop/deliver a MEA tunnel module to support the Tunnel Defeat Demonstration.
- Complete final phase of the testing and analysis to define the vulnerability of C3I components and sub-systems found in former Soviet Block high value fixed targets.
- Upgrade IMEA module to support SOCOM requirements.
- Extend IMEA to meet the requirements of the CP2 ACTD and the hard target defeat demonstration.
- Update IMEA nuclear weapons module.
- Develop and update weapons effects and fragility models for incorporation into IMEA.

Project AC - Weapons Systems Lethality (cont'd)

- Develop models for the Conventional Air Launched Cruise Missle (CALCM) warheads for incorporation into IMEA.
- Update anti-terrorism planning software for force protection assessments.
- Provide technical support for the bilateral MOU between the U.S. and the German Ministry of Defense.
- Provide engineering support to DIA and the J2T for BDA analysis during contingencies.
- Provide conventional weapons effects tests and analysis support for FBI anti-terrorism programs.
- Conduct vulnerability assessments of U.S. Government facilities in the National Capital area.
- Conduct vulnerability assessments of U.S. embassies abroad for the State department as requested.
- Assist in update of IMEA training program.
- Maintain validation verification and accreditation of IMEA through JTCG/ME.
- Develop version 2.0 of PSADS.
- Develop version 2.0 of DAHS CWE.
- Apply meshless methods to target response problems.
- Provide high-fidelity vulnerability assessments for deployed sites and high priority CONUS sites.
- Deliver combined lethality and hazard prediction module for nuclear power reactors in HPAC.
- Deliver a nuclear weapon accident hazard module for HPAC.

Test and Simulation ($1,365K)

- Demonstrate HE charge design for tunnel airblast simulation.
- Execute proof-of-principle nuclear airblast in tunnel simulation at the Army Waterways Experiment Station.
- Begin second in a series of three tunnel complexes to be used in the Hard Target Defeat Program.

Project AC - Weapons Systems Lethality (cont'd)

FY 2001 Plans

Weapons Effects Phenomenology ($8,302K)

- Complete Full Consequences Assessment of Nuclear Terrorism Urban Scenario.
- Update Geological and Material Properties Characterization Capabilities based on First Model Target Data.
- Update assessment of 2 and 3 Dimensional weapons output estimates for critical weapons capabilities.

Technical Information ($1,286K)

- Update 2 chapters of Effects Manual-1 (EM-1).
- Convert 5 new chapters in EM-1 manual to be electronically interactive.

Application of Nuclear Weapons Expertise ($16,799K)

- Develop an enhanced warhead module for MEA that incorporates both physical/functional damage to targets, components, and WMD material.
- Transfer proven COTS hardware kit, which provides easy-to-install devices and simple techniques to harden COTS computers against RF threats.
- Integrate advanced cross field amplifier tube design and improved subsystems into HPM technology demonstrator.

Weapon Target Interaction ($8,758K)

- Build an MEA module for the vulnerability of former Soviet Block C3I components.
- Complete validation database for synergistic weapon effects. Develop appropriate lethality models and implement into MEA.
- Demonstrate ICWC 2.0 during a mini-exercise that supports the CP2 ACTD which has integrated additional tools and enhanced functionality.
- Execute system level validation test that includes realistic WMD components to validate MEA modules.
- Validate the Advanced Lethality Tool (ALT) using precision small scale tests for end-to-end solutions of WMD related attack/planning scenarios.
- Update models for optimized dual delivery of weapons for incorporation into IMEA.

Project AC - Weapons Systems Lethality (cont'd)

- Upgrade IMEA module to support SOCOM requirements.
- Extend IMEA to meet the requirements of the CP2 ACTD and the hard target defeat demonstration.
- Update IMEA nuclear weapons module to include tunnel defeat.
- Develop and update weapons effects and fragility models for incorporation into IMEA.
- Develop models for High Temperature Incendiary weapons for incorporation into IMEA.
- Update anti-terrorism planning software for force protection assessments.
- Provide technical support for the bilateral MOU between the USAF and the German Ministry of Defense.
- Provide engineering support to DIA and J2T for BDA analysis during contingencies.
- Provide conventional weapons effects tests and analysis support for FBI anti-terrorism programs.
- Conduct vulnerability assessments of U.S. Government facilities in the National Capital area.
- Conduct vulnerability assessments of U.S. embassies abroad for the State department as requested.
- Assist in update of IMEA training program.
- Maintain validation verification and accreditation of IMEA through JTCG/ME.
- Deliver a combined lethality and hazard prediction model for nuclear fuel production reactors.
- Deliver a radiological accident and hazard module for HPAC.
- Publish version 2.0 of PSADS. Publish version 2.0 DAHS CWE.

Test and Simulation ($1,186K)

- Complete initial assessment of predictions and data for full-scale nuclear simulation tests at NTS.
- Complete second tunnel complex in support of the Hard Target Defeat Program.

Project AE - Weapon Safety and Operational Support - This project is critical to the maintenance of a safe, secure and reliable nuclear deterrent, given that the enduring stockpile will retain weapons far beyond their designed life. Stockpile support efforts in this project include nuclear weapons stockpile technology for weapon systemsustainment, 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 the Modeling and Simulation Center, which provides integration of weapons effects, downwind hazard prediction models and force effectiveness models to users in acquisition, training, exercises, operations other than war, and warfighting. Oversight, technical support and curriculum review 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 andtaskings 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 Bureauof Investigation. The thrust of this project supports the JCS Joint Vision 2010 Warfighting Capabilities of Dominant Maneuver, Precision Engagement, and Full-Dimensional Protection.

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

FY 1998 Accomplishments

Nuclear Operations ($16,313K)

- Completed the analysis of monomethylhydrazine (hypergolic) propellant for Minuteman III.
- Continued the safety assessment of the B-52H aircraft.
- Continued the safety assessment of the Minuteman III missile system.
- Continued safety assessment for dual capable fighter aircraft to define operational risk management inputs and ensure USAFE nuclear capable weapon systems availability.
- Provided safety assessment support to the Nuclear Weapons Council (NWC), ATSD(NCB), STRATCOM, Services, and Project Officer's Group.
- Continued experimental testing to develop a technology base for mechanical impacts of fuel fire, energetic materials and electrical/lightning.
- Completed the study on the development of an interface between the Air Vehicle Planning System (APS) and service planning systems such as Tactical Aircraft Mission Planning System (TAMPS), NATO Nuclear Planning System (NNPS), and US/NATO intelligence systems.
- Continued an adaptive planning system software program to develop a deployable strategic planning capability for STRATCOM and initiated a modernized software interface between data collection sources and the Nuclear Planning and Execution System (NPES).
- Completed the development of a replacement message/data handling spooler for the NPES. Cooperative effort with STRATCOM, JCS J38, and DISA.
- Completed development of prototype computer-based training capability for nuclear staff planners, emphasizing adaptive nuclear planning.

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

- Continued development of the nuclear planning system target data feed which provides intelligence planning data in support of NATO.
- Completed the development of a methodology for STRATCOM, which includes the impact of fallout effects in achieving effective denial or delay of enemy access to key installations as a result of a nuclear strike.
- Continued to provide analytical support to assess STRATCOM's capability to effectively meet national objectives involving the SIOP while reducing its complexity.
- Utilized an analytical framework that facilitates alternative WMD deterrence approaches to the needs of multi-regional scenarios.
- Continued to provide quick turn analysis on WMD consequence issues for OSD, Services, and Joint Staff and provided weapons effects analysis to Project Officer's Groups and weapons modifications program as required.
- Began development of an integrated reporting system for automated reporting of Nuclear, Biological and Chemical (NBC) activity and hazard predictions.
- Provided support to the CINC planning staffs on NBC capability and impacts on warfighting capability.
- Developed mission and consequence analysis for HQ Air Combat Commands (ACC's) Agent Defeat Weapon phase studies and Analysis of Alternatives (AOAs).
- Trained and provided analysis support teams for each CINC in support of their counterproliferation development missions.

Education/Training to Maintain Core Competencies ($1,038K)

- Provided nuclear operational training support to CINCs, Services, and OSD.
- Continued development of general interest DoD nuclear training program.
- Continued development, improvement, and integration of course materials for the Defense Nuclear Weapons School (DNWS).
- Supported DoD and CINC exercises and wargames with WMD/target response analysis.

Nuclear Weapons Stockpile Programs ($379K)

- In support of stockpile stewardship and reliability, continued Agency participation in, and support to, the Dual Revalidation program with research, technical analysis, and assessment reports.

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

- Provided technical support, progress reports and recommendations to ATSD(NCB), Joint Staff, Services, STRATCOM and other Combatant Commanders as required related to weapons safety, reliability and performance.
- Provided support to the Annual Certification program and to the service weapons life-extension programs.
- Developed a collection of historical development documents on CD-ROM related to sustainment of DoD nuclear weapon delivery platforms.

Modeling and Simulation ($2,479K)

- Increased Agency Modeling and Simulation (M&S) Center capability with a broadband (DS-3) global networking circuit and an operational INTEL-S node.
- Continued integration of WMD modules into campaign level analytical and assessment models.
- Provided technical and operational consequence analysis support for exercises and wargames.
- Continued Analysis and Assessments Phase II contract to provide real-time support to Services through enhanced infrastructure, deployment teams, integrated models, and technical support.
- Updated and refined support database per CINCs, Services and Joint Staff guidance and continued development of consequence analysis of WMD counterproliferation programs.
- Continued development of Extended Air Defense Simulation (EADSIM) based scenarios for additional studies to support STRATCOM requests.
- Integrated Agency weapons effects codes into Common Operational Modeling, Planning and Simulation Strategy (COMPASS) program.
- Published classified and unclassified M&S Center web page.
- Continued support of Director of Military Support (DOMS) and USMC/Chemical Biological Incident Response Force with hazard prediction and consequence assessments regarding military/domestic threats involving WMD.

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

Nuclear Weapons Effects Phenomenology ($1,333K)

- Delivered an operational, automated, adaptive, user-friendly, high resolution 36-hour weather forecast capability in-theater for the CINCs and Services, for hazard prediction, specifically Hazard Prediction and Assessment Capability (HPAC) users.

US/Allied Survivability & Operability in Nuclear/Designated Advanced Weapons Environments ($5,093K)

- Delivered subsystem vulnerabilities guide to support CINCs and intelligence community in functionally defeating hard and deeply buried targets.
- Conducted Balanced Survivability and Integrated Vulnerability Assessments as tasked by CINCs and DoD Agencies.
- Developed and applied sensor technology for target characterization and battle damage assessments.
- Developed functional defeat effectiveness computation tool.

Weapon/Target Interaction ($1,665K)

- Integrated additional Agency peculiar weapon effects and target response models into High Level Architecture (HLA) and CINC planning tools.
- Integrated weapons effects and target response models in a live virtual and constructive environment which can be visualized for training, exercises and Bomb Damage Assessment using weapons effects Federates to satisfy customer requirements.

FY 1999 Plans

Nuclear Operations ($16,843K)

- Complete the safety assessment for the dual capable fighter aircraft in Europe.
- Complete the safety assessment of the B–52H aircraft.
- Begin B-2 ongoing Weapon System Safety Assessment (WSSA) at the request of the Air Force Safety Center.
- Analyze and quantify DoE Nuclear Detonation Safety Exceptions (NDSEs).
- Conduct Fuel Fire Modeling and Testing to support ongoing WSSAs.
- Begin Weapon Storage Vault Blast Testing.

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

- Develop a WSSA data base to archive completed WSSAs.
- Begin storage vault blast effects testing and analysis at the request of the Air Force Safety Center.
- Conduct Forces Support nuclear and WMD technical analyses as required by OSD, Services, Joint Staff, and NWC on force structure, weapons safety and security, theater missile defense, counterproliferation, planning, and international military and political security issues.
- 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.
- Complete an adaptive planning system software program to develop a deployable strategic planning capability for STRATCOM and initiate a modernized software interface between data collection sources and NPES. Accept and test the first incremental delivery of the NPES.
- Complete and transition the nuclear planning system target data feed which provides intelligence planning data in support of NATO.
- Complete analytical support assessing STRATCOM's capability to effectively meet national objectives involving the Single Integrated Operations Plan (SIOP) while reducing its complexity.
- Continue utilization of the analytical framework that facilitates alternative WMD deterrence approaches to the needs of multi-regional scenarios.
- Conduct an annual force-on-force exercise to evaluate and validate policy standards as designated by the Security Policy Verification Committee (SPVC).
- Continue to provide quick turn analysis on WMD consequence issues for OSD, Services, and Joint Staff and provide weapons effects analysis to weapons Project Officer's Groups and weapons modification programs as required.
- Continue development of an integrated reporting system for automated reporting of NBC activity and hazard predictions.

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

- Provide support to the CINC planning staffs on NBC capability and impacts on warfighting capability.
- Develop mission and consequence analysis for HQ ACC's Agent Defeat Weapon phase studies and Analysis of Alternatives (AOAs).

Education/Training to Maintain Core Competencies ($1,038K)

- Provide nuclear operational training support to CINCs, Services, and OSD.
- Continue development of general interest DoD nuclear training program.
- Continue development, improvement, and integration of course materials for the DNWS.
- Support DoD and CINC exercises and wargames with WMD/target response analysis.
- Expand expertise outreach program to OSD and War Colleges.
- Initiate a nuclear/WMD "train-the-trainer" program for the DNWS.
- Provide vulnerability assessment training to critical infrastructure components.

Nuclear Weapons Stockpile Programs ($537K)

- In support of stockpile stewardship and reliability, continue participation in, and support to, the Dual Revalidation program with research, technical analysis, and assessment reports.
- Provide technical support and recommendations to OSD, Joint Staff, Services, STRATCOM and other Combatant Commanders related to weapons safety, reliability, and performance.
- Continue support to the Annual Certification program and support to the service weapons life-extension programs.
- Provide management and technical support to DoD programs for sustainment of the nuclear deterrent, to include development of a DoD-wide Nuclear Mission Management Plan (NMMP).

Modeling and Simulation ($3,464K)

- Upgrade and refine operations of the M&S Center.
- Continue integration of the lethality tool set with weather modules, underground target data, and the effects of enhanced payloads.

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

- Continue technical and advanced M&S support to CINC sponsored exercises world-wide.
- Provide an integrated program for analysis and testing of alternate strategies, force employment options and technologies.
- Continue to provide technical and operational consequence analysis support for exercises and wargames.
- Include WMD use and effects in a joint theater-level simulation.
- Implement the Analysis and Assessments program to provide real-time support to Services through enhanced infrastructure, deployment teams, integrated models, and technical support.
- Update and refine support database per CINCs, Services, and Joint Staff guidance and continue development of consequence analysis of WMD counterproliferation programs.
- Establish permanent (virtual) presence at the Joint Warfare Simulation Center (JWARS) and Joint Simulation System (JSIMS).
- Continue to develop EADSIM based scenarios for additional studies to support STRATCOM requests.

Nuclear Weapons Effects Phenomenology ($1,171K)

- Transition 36-hour weather forecast modeling capability to the CINCs and Services for use in WMD consequence predictions.
- Integrate the services global and regional scale models with in-theater high resolution capability to provide seamless weather input for hazard prediction assessment from continental to local scale.

US/Allied Survivability & Operability in Nuclear/Designated Advanced Weapons Environments ($5,754K)

- Conduct Balanced Survivability and Integrated Vulnerability Assessments on DoD facilities as tasked by CINCs, Joint Staff, and OSD.
- Assist CINCs and Intelligence community in target planning against hard and deeply buried facilities.

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

- Conduct integrated vulnerability assessments of defense and critical national infrastructure facilities.
- Apply sensor technology for target detection, target characterization and battle damage assessments.

Weapon/Target Interaction ($1,364K)

- Develop visualization tools for weapon effects models that are compatible with the High Level Architecture (HLA).
- For a particular legacy model or simulation, continue to define a Simulation Object Model (SOM), integrate the Runtime Infrastructure (RTI) and HLA functionality into that model, and transform the model's data structure into the SOM data representation.
- Establish a Weapons Effects Federation Object Model to allow interaction between SOMs and to effect the passing of weapons effects data between simulations.

FY 2000 Plans

Nuclear Operations ($17,105K)

- Continue B-2 WSSA.
- Analyze and Quantify DOE NDSEs.
- Conduct Fuel Fire Modeling and Testing to support ongoing WSSAs.
- Continue the development and population of the WSSA data base to archive completed WSSAs.
- Transition Aircraft Crash into Structures (ACCIS) risk analysis code to fast running format.
- Complete Storage Vault Blast Effects Testing and Analysis.
- Conduct Forces Support nuclear and WMD technical analyses as required by OSD, Services, Joint Staff, and NWC on force structure, weapons safety and security, theater missile defense, counterproliferation, planning and international military and political security issues.

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

- 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.
- Continue utilization and refinement of the analytical framework that facilitates alternative WMD deterrence approaches to the needs of multi-regional scenarios.
- Provide 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.
- Conduct an annual force-on-force exercise to evaluate and validate policy standards as designated by the SPVC.
- Continue to provide quick turn analysis on WMD consequences issues for OSD, Services, and Joint Staff and provide weapons effects analysis to weapons Project Officer's Groups and weapons modification programs as required.
- Continue development of an integrated reporting system for automated reporting of NBC activity and hazard predictions.
- Provide support to the CINC planning staffs on NBC capability and impacts on warfighting capability.
- Develop mission and consequence analysis for HQ ACC Agent Defeat Weapon phase studies and AOA's.
- Continue to provide analysis to the CINCs in support of their counterproliferation development missions.

Education/Training to Maintain Core Competencies ($1,046K)

- Provide nuclear operational training support to CINCs, Services, and OSD.

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

Continue development of general interest DoD nuclear training program.
Continue development, improvement, and integration of course materials for the DNWS.
Support DoD and CINC exercises and wargames with WMD/target response analysis.
Continue expanding expertise outreach program to OSD and War Colleges.
Continue the nuclear/WMD "train-the-trainer" program for the DNWS.

Nuclear Weapons Stockpile Programs ($1,000K)

In support of stockpile stewardship and reliability, continue participation in, and support to, the Dual Revalidation program with research, technical analysis, and assessment reports.
Provide technical support and recommendations to OSD, Joint Staff, Services, STRATCOM and other Combatant Commanders related to weapons safety, reliability, and performance.
Continue support to the Annual Certification program and support to the service weapons life-extension programs.
Provide management and technical support to DoD programs for sustainment of the nuclear deterrent update NMMP as directed.

Modeling and Simulation ($4,570K)

Upgrade and refine operations of the M&S Center.
Continue integration of the lethality tool set with weather modules, underground target data, and the effects of enhanced payloads.
Continue technical and advanced M&S support to CINC sponsored exercises world-wide.
Provide an integrated program for analysis and testing of alternate strategies, force employment options and technologies.
Continue to provide technical and operational consequence analysis support for exercises and wargames.
Include WMD use and effects in a joint theater-level simulation.

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

- Implement the Analysis and Assessments program to provide real-time support to Services through enhanced infrastructure, deployment teams, integrated models, and technical support.
- Update and refine support database per CINCs, Services, and Joint Staff guidance and continue development of consequence analysis of WMD counterproliferation programs.
- Maintain permanent (virtual) presence at the JWARS and JSIMS.
- Continue to develop EADSIM based scenarios for additional studies to support STRATCOM requests.

Nuclear Weapons Effects Phenomenology ($1,030K)

- Complete uncertainty information for weather models to HPAC to provide best estimate hazard and how good they are to the warfighter.

US/Allied Survivability & Operability in Nuclear/Designated Advanced Weapons Environments ($5,643K)

- Conduct Balanced Survivability and Integrated Vulnerability Assessments on DoD facilities as tasked by CINCs, Joint Staff, and OSD.
- Assist CINCs and Intelligence community in target planning against hard and deeply buried facilities.
- Conduct integrated vulnerability assessments of defense and critical national infrastructure facilities.
- Apply sensor technology for target detection, target characterization and battle damage assessments.

Weapon/Target Interaction ($1,309K)

- Develop visualization tools for weapon effects models that are compatible with the HLA.
- For a particular legacy model or simulation, continue to define a Simulation Object Model (SOM), integrate the Runtime Infrastructure (RTI) and HLA functionality into that model, and transform the model's data structure into the SOM data representation.

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

FY 2001 Plans

Nuclear Operations ($17,676K)

- Complete B-2 at request of the Air Force Safety Center.
- Continue Fuel Fire Modeling and Testing to support ongoing WSSAs.
- Continue population of WSSA data base to archive completed WSSAs.
- Analyze and quantify DoE NDSEs.
- Conduct Forces Support nuclear and WMD technical analyses as required by OSD, Services, Joint Staff, and NWC on force structure, weapons safety and security, theater missile defense, counterproliferation, planning and international military and political security issues.
- 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.
- Continue utilization of the analytical framework that facilitates alternative WMD deterrence approaches to the needs of multi-regional scenarios.
- Provide analytical support in assessing STRATCOMs capability to effectively meet national objectives involving the SIOP based on potential changes to the threat, national policy, and force structure.
- Initiate study for requirements development to integrate the Air Vehicle Planning System, as the aircraft and cruise missile nuclear planning system, with the NPES.
- Conduct an annual force-on-force exercise to evaluate and validate policy standards as designated by the SPVC.
- Continue to provide quick turn analysis on WMD consequences issues for OSD, Services, and Joint Staff and provide weapons effects analysis to weapons Project Officer's Groups and weapons modification programs as required.

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

- Continue development of an integrated reporting system for automated reporting of NBC activity and hazard predictions.
- Provide support to the CINC planning staffs on NBC capability and impacts on warfighting capability.
- Develop mission and consequence analysis for HQ ACC Agent Defeat Weapon phase studies and AOA's.
- Continue to provide analysis to the CINCs in support of their counterproliferation development missions.

Education/Training to Maintain Core Competencies ($1,150K)

- Provide nuclear operational training support to CINCs, Services, and OSD.
- Continue development of general interest DoD nuclear training program.
- Continue development, improvement, and integration of course materials for the DNWS.
- Support DoD and CINC exercises and wargames with WMD/target response analysis.
- Continue expanding expertise outreach program to OSD and War Colleges.
- Continue the nuclear/WMD "train-the-trainer" program for the DNWS.

Nuclear Weapons Stockpile Programs ($1,000K)

- In support of stockpile stewardship and reliability, continue participation in, and support to, the Dual Revalidation program with research, technical analysis, and assessment reports.
- Provide technical support and recommendations to OSD, Joint Staff, Services, STRATCOM and other Combatant Commanders related to weapons safety, reliability, and performance.
- Continue support to the Annual Certification program and support to the service weapons life-extension programs.
- Provide management and technical support to DoD programs for sustainment of the nuclear deterrent update NMMP as directed.

Modeling and Simulation ($5,054K)

- Upgrade and refine operations of the M&S Center.

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

- Continue integration of the lethality tool set with weather modules, underground target data, and the effects of enhanced payloads.
- Continue technical and advanced M&S support to CINC sponsored exercises world-wide.
- Provide an integrated program for analysis and testing of alternate strategies, force employment options and technologies.
- Continue to provide technical and operational consequence analysis support for exercises and wargames.
- Include WMD use and effects in a joint theater-level simulation.
- Implement the Analysis and Assessments program to provide real-time support to Services through enhanced infrastructure, deployment teams, integrated models, and technical support.
- Update and refine support database per CINCs, Services, and Joint Staff guidance and continue development of consequence analysis of WMD counterproliferation programs.
- Maintain permanent (virtual) presence at the JWARS and JSIMS.
- Continue to develop EADSIM based scenarios for additional studies to support STRATCOM requests.

Nuclear Weapons Effects Phenomenology ($1,061K)

- Provide weather models, capable of producing 36-hour forecasts, for high-resolution hazard prediction (1 km) in 4 hours to meet required operational tempo.

US/Allied Survivability & Operability in Nuclear/Designated Advanced Weapons Environments ($6,797K)

- Conduct Balanced Survivability and Integrated Vulnerability Assessments on DoD facilities as tasked by CINCs, Joint Staff, and OSD.
- Assist CINCs and Intelligence community in target planning against hard and deeply buried facilities.
- Conduct integrated vulnerability assessments of defense national and critical infrastructure facilities.

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

Apply sensor technology for target detection, target characterization and battle damage assessments.

Weapon/Target Interaction ($1,191K)

Develop visualization tools for weapon effects models that are compatible with the HLA.

For a particular legacy model or simulation, continue to define a Simulation Object Model (SOM), integrate the Runtime Infrastructure and HLA functionality into that model, and transform the model's data structure into the SOM data representation.

Project AF - Weapon System Operability - Current and future warfighters and weapon systems, including the associated Command, Control, Communications, Computers and Intelligence (C4I) and support systems/equipment, must be able to tolerate 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. The military systems of interest include those that support military missions in the air, on land, at sea, or in space.

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 toacquisition 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. Specific programs in the project include: development and demonstration of the enabling technologies for ensuring the continued availability of special materials and radiation tolerant microelectronics and photonic devices; development and demonstration of affordable hardening and mitigation methods that treat 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 of nuclear, biological and chemical (NBC) and conventional battlefield environments on systems and personnel; development and demonstration of cost effective system design and test 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.

Project AF - Weapon System Operability (cont'd)

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 1998 Accomplishments

Nuclear Weapons Effects Phenomenology ($11,778K)

- Supported Air Force Office of Testing and Evaluation Center (AFOTEC) Space Based Infrared Satellite (SBIRS) Low Earth Orbit (LEO) COMM link evaluation (continuing into 1999).
- Developed and integrated fast running detailed radar model into System Planning Intercept Evaluation Tool-DSWA (SPIET-D).
- Included Jammer model into Communication Link testing Code (COMLNK) simulations of satellite communications systems.
- Continued Optical Environment Support to SBIRS Program.
- Distributed new releases of Nuclear Optical Radar Simulation Environment (NORSE97) and Advanced Systems Survivability Integrated Simulation Tool Set (NORSE/ASSIST) and initial development of Nuclear Simulation (NUCSIM) Nuclear Weapons Effects (NWE) codes.
- Reviewed Russian EMP test data and developed a framework for an EMP Vulnerability Number (EMPVN) model and Source Region EMP Targeting & Planning System (SREMPTAPS) "smart system" for target planning design.
- Developed an initial NWE Human Response Simulation.
- Completed development of a new browser-based software tool Integrated Nuclear Computational Tools (INCA) to be used to calculate six different direct nuclear effects including EMP.

Project AF - Weapon System Operability (cont'd)

- Completed the development of Strategic C4 Assessment Tool (STRATCAT) Version 2 as a top level, quick C3I Assessment Tool and installed on STRATCOM's Top Secret LAN System.

US/Allied Survivability & Operability in Nuclear/Special Weapon Environments ($16,694K)

- Initiated capture of Underground Test (UGT) and Aboveground Test (AGT) structural response data for missiles and reentry vehicles.
- Upgraded testable hardware protocols based on validation testing of sensor subsystems in nuclear environments.
- Tested radiation- and laser- hardened rugate rejection filters.
- Upgraded spacecraft missile design and test protocols.
- Continued testing for validation of sensor design and test protocols.
- Continued development and evaluation of low-level radiation standards and equipment for NATO review.
- Completed new standards for operations in low-level radiation environments.
- Continued development and evaluation of low-level radiological instrumentation support for warfighters/peacekeepers operating in post-Cold-War settings (i.e., <70 rem scenarios).
- Began development of first ever fly-away dosimetry lab.
- Initiated evaluation of the end-to-end operability of National Missile Defense (NMD)/Theater Missile Defense (TMD) architectures/elements in a nuclear-disturbed environment.
- Demonstrated ability to validate nuclear hardness of satellite/interceptor systems by testing at less than system threat levels.
- Completed operability assessment of the North American Air Defense (NORAD)/U.S. Space Command (USSPACECOM) Tactical Warning/Attack Assessments (TW/AA) System as it transitions to MILSTAR and SBIRS.
- Completed optical rugate filter radiation and laser testing to develop a first pass material response model.

Project AF - Weapon System Operability (cont'd)

- Demonstrated affordable EMP/HPM design and test technologies, developed system hardening technology against advanced HPM techniques, and continued assessment and testing of critical fixed-ground-based C4I facilities.
- Updated High Altitude Electromagnetic Pulse (HEMP) protection/test standards.
- Updated software depicting HEMP field contours.
- Performed initial demonstration of radiation-tolerant, 16-megabit Static Random Access Memory (SRAM) integrated circuit technology required by USAF and Ballistic Missile Defense Organization (BMDO).

Radiation-Hardened Microelectronics, Materials, and Photonics ($14,791K)

- Completed test and evaluation of radiation-hardened analog and digital microelectronics.
- Demonstrated radiation-hardened 4M SRAM prototype.
- Evaluated advanced photonics and compound semiconductor technology for DoD space-based applications.
- Demonstrated radiation-hardened, ultra-low-power Silicon-on-Insulator (SOI) microelectronics technology in support of USN, USAF and BMDO requirements.

FY 1999 Plans

Nuclear Weapons Effects Phenomenology ($10,662K)

- Support AFOTEC SBIRS LEO COMM link evaluation.
- Continue Optical Environment Support to SBIRS Program.
- Upgrade SPIET-D version to include trapped radiation and HEMP effects.
- Support NMD analyses and development of System Requirement Document (SRD) and system operation in nuclear environments.
- Update ASSIST PC shell for phenomenology codes.
- Develop advanced versions of COMLNK, Radio Wave Propagation in a Structured Ionized Medium (PRPSIM) & Performance Simulation (PERSIM).
- Improve models for Short Wave Infrared Radiation (SWIR) optical emission predictions.

Project AF - Weapon System Operability (cont'd)

- Revise U.S.-NATO standard Radiation Transport Code to include distributed hazards.
- Upgrade INCA to include Source Region EMP and five other new nuclear weapons effects.
- Complete beta testing in the first quarter of FY 1999.
- Proof-of-concept Demonstration of EMPVN Model for Long lines connected Power and Telecommunications System of the Military.
- Develop Simulation & Modeling of EMP Targeting of WMD using coherent pulsed power and nuclear EMP Simulator Source based on air, land, and sea mobile platforms.
- Upgrade STRATCAT tool set for STRATCOM and for Regional Commands specific C3I assessment mission requirements.
- Upgrade the source region EMP target assessment and planning system (SREMPTAPS) to include new and war planners required weapon designs parameters.
- Develop 3-D Simulation of new Nuclear Weapon Effects (NEW) and Asymmetric Threat via SHYPS code using the DoD high performance computing (HPC) capability and in collaboration with Lawrence Livermore National Laboratory (LLNL).

US/Allied Survivability & Operability in Nuclear/Special Weapon Environments ($17,297K)

- Finalize configuration control electronics database for qualification testing.
- Begin development of protection technologies for sensor system hardening.
- Initiate development of circumvention and recovery implementations technology for hardened systems based on testable hardware protocols.
- Continue radiation response characterizations methodology for materials used in strategic systems.
- Complete AGT/UGT data search for missile and reentry vehicle materials/structures for strategic systems.
- Finalize sensor design and test protocols.
- Complete development and nuclear weapons exercise evaluation of first ever fly-away dosimetry lab.
- Initiate development of an end-to-end operability assessment tool for evaluation of families of systems in nuclear-disturbed environments.

Project AF - Weapon System Operability (cont'd)

- Continue development and evaluation of low-level radiological instrumentation support for war fighters/peacekeepers operating in post-Cold-War settings (i.e., <70 rem scenarios).
- Begin the evaluation of complex modeling and vulnerability testing results to reduce design margins in survivable systems.
- Complete HEMP test of Mobile Consolidated Command Center (MCCC).
- Circulate draft sampling identification of radiological agent standards for comment.
- Continue to assess the nuclear survivability of the NORAD/USSPACECOM Warfighting Support System (N/UWSS) architecture operability.
- Continue application of innovative, low-cost EMP/HPM hardening technology and propose candidate Electromagnetic standards and guidelines in accordance with the new technology.
- Continue assessment and testing of critical, fixed-ground-based and mobile C4I facilities.
- Evaluate the effects of non-ideal airblast on Army armored vehicles.

Radiation-Hardened Microelectronics, Materials, and Photonics ($16,562K)

- Demonstrate, test and evaluate a radiation-hardened, low-power 400K gate array for USAF.
- Demonstrate, test and evaluate radiation-hardened, 16M SRAM integrated circuit technology (e.g., $\leq$ 0.25 micron critical feature size) for USAF and BMDO.
- Demonstrate, test and evaluate a radiation-hardened 1m non-volatile memory using Giant Magneto Resistive (GMR) material for USAF and BMDO.
- Investigate and characterize single event effects in photonic devices and deep-submicron microelectronics for USAF and BMDO.
- Demonstrate radiation-hardened digital Electronic Design Automation (EDA) System for USAF and BMDO.
- Evaluate defects as a limiter to material response model.
- Complete assessment of NMD/TMD nuclear environment/survivability requirements.

Project AF - Weapon System Operability (cont'd)

Deliver nuclear, optical, and electronics analysis tool and guidelines for systems evaluation.

FY 2000 Plans

Nuclear Weapons Effects Phenomenology ($10,860K)

Support NMD analyses and development and system operation in nuclear environments.
Improve cell resolution for optical emission predictions.
Update early time Magnetohydrodynamic (MHD) Extended to Global Scale (MEGS) version for Collisionless MHD (CMHD) and Magnetic Containment Regime (MCR) replacement.
Support SBIRS and NMD system analysis and operational development.
Replicate Consequence Assessment Tool Set in non-DoD Emergency Operations Centers.
Implement STRATCAT: v.3 on STRATCOM TS LAN and Global Command and Control System (GCCS).
Update HEMP and Source Region EMP (SREMP) Vulnerability Number (VN) model for long-line coupled targets (Power & Telecom systems).
Implement HEMP and SREMPTAPS for DIA-specified potential threat weapons.
Integrate Nuclear Computational Tools (INCA) to run ten lethality models covered by all of the nuclear effects covered in INCA.
Upgrade EMPVN Model for specific WMD Targets.
Upgrade and transfer SREMPTAPS Smart system for WMD Target Planning.
Develop end-to-end Targeting Models of WMD for the simulated nuclear EMP stress on targets via the new initiative.
Complete the Development of STRATCAT Tool and transfer the tool to CINC Commands.
Develop Shock Acceleration Model for nuclear burst pumped Radiation Belts.

Project AF - Weapon System Operability (cont'd)

US/Allied Survivability & Operability in Nuclear/Special Weapon Environments ($17,854K)

- Continue to assess the nuclear survivability of the NORAD/USSPACECOM Warfighting Support System (N/UWSS) architecture operability, and evaluate its performance in nuclear-disturbed environments.
- Demonstrate integrated EMP/HPM test methods, techniques, and technologies that produce improvements over existing electromagnetic protection methodologies.
- Continue assessment and testing of critical national security assets.
- Upgrade non-upsettable processor controller for circumvention and recovery (C&R) for testable hardware protocol complementation.
- Develop Thermal Structural Response (TSR) test methodology for strategic systems.
- Begin development of Airborne Nuclear Survey system with Army using existing Army Radiation Detection Indication and Computation (RADIACs).
- Begin development of internal and biodosimetry functions of fly-away dosimetry lab.
- Assess NMD/TMD nuclear survivability testing and validation plans.
- Complete the evaluation of the combination of computer modeling and verification and validation to reduce design margins required for survivable systems.

Radiation-Hardened (RH) Microelectronics, Materials, and Photonics ($19,124K)

- Demonstrate qualified RH 4M SRAM for USAF and BMDO.
- Demonstrate RH deep submicron (0.18 micron) technology for very-low-power, ultra-large-scale integrated circuits (ULSIC), e.g., 4M gate array, etc., for USAF and BMDO.
- Test and evaluate photonics signal processing technology for USAF.
- Publish sampling and identification of radiological agents standards.
- Field a web-based version of consequence assessment tools for rapid assessment and initial detection teams.
- Demonstrate RH star tracker/visible imager.

Project AF - Weapon System Operability (cont'd)

FY 2001 Plans

Nuclear Weapons Effects Phenomenology ($11,061K)

- Provide support for future SPACECOM, STRATCOM and BMDO operational and developmental analyses.
- Develop advanced version of Antenna/Channel Impulse Response Function (ACIRF) and Communications Standards.
- Begin development of new, fast-running, all-altitude phenomenology for engagement modeling.
- Complete expanded/integrated human response algorithms for other than war effects/applications.
- Begin development of detailed Electron Injection Model for trapped radiation modeling.
- Upgrade STRATCAT: v.3 according to STRATCOM/J6 specified operational Final Operational Capability (FOC).
- Develop and test HEMP and SREMP VN models for STRATCOM hard target defeat program.
- Incorporate new targeting tool into INCA.

US/Allied Survivability & Operability in Nuclear/Special Weapon Environments ($18,314K)

- Continue to assess and evaluate the vulnerability of C4I systems exposed to nuclear disturbed environments.
- Transfer proven EMP/HPM hardware and software technologies and test techniques.
- Continue assessment and testing of critical national security assets.
- Complete development of airborne Nuclear Survey System with Army.
- Continue development of internal and biodosimetry functions of fly-away dosimetry lab.
- Develop nuclear environment injection software modules for integration with the hardware-in-loop (HWIL) facilities.

Project AF - Weapon System Operability (cont'd)

Radiation-Hardened Microelectronics, Materials, and Photonics ($21,847K)

Demonstrate RH 4M gate array for USAF and BMDO.
Demonstrate RH systems-on-a-chip (SOC) technology for USAF and BMDO.
Demonstrate prototype RH 16M SRAM Standard Evaluation Circuit for USAF.
Test and evaluate photonics wideband data transfer technology for USAF.
Provide model for thermal structural response of reentry vehicles.

Project AG—Scientific Computations & Information Systems. This project provides High Performance Computing (HPC), computational databases, information products, and advanced numerical models that enable the Agency's customers, researchers, and RDT&E contractors to answer questions about nuclear and advanced special weapons 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, e.g., for investigation of the physics of weapon-target interactions, and for extrapolating test results into areas for which tests are no longer possible. This has required the development of a world-class high performance computing architecture with high bandwidth communications. This capability, currently with a hub at Los Alamos National Laboratory, is scheduled to transition to the new DoE and DoD HPC architecture over the FYDP. 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.

FY1998 Accomplishments

Nuclear Weapons Effects Phenomenology ($5,986K)

- Completed master plan for ionization and electromagnetic (EM) effects areas of Graybeard knowledge capture program. Initiated archival of electronics/environmental interaction test data.
- Provided scientific and technical information services and products as the DoD-wide repository for test photos, films, data, test records and other information products.

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

- Continued revision of Glasstone's book, The Effects of Nuclear Weapons, the standard reference for nuclear weapons effects.
- Disseminated Science and Technology Digest.
- Reviewed, approved, and archived nuclear test data.
- Continued operation of web site providing radiation response of electronic parts.
- Hosted workshops on groundshock, thermal damage, structures damage to identify data locations, extent, and breakout of data commentary and workshop on vulnerability assessment methods.
- Completed compendium of nuclear weapon effect event objects.
- Continued development of master plan for thermo structural data review/commentary/archival.
- Continued development of master plan for biological data review/commentary/archival.

Infrastructure ($9,924K)

- Provided computer operations support through centralized CRAY resources. Provided continuous technical assistance for users of CRAY and other DoD High Performance Computing (HPC) platforms and high performance networks to supply display of supercomputer results.
- Continued DATACOM computational support by providing annual support for Wide Area Network.
- Provided broad-based science and technology Information Analysis Center research support.
- Continued computational support by providing annual support for the communication network and upgrade/acquire the network management equipment for the Agency hubsite.
- Integrated the Agency's network with the DoD's HPC Defense Research and Engineering Network (DREN) network.

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

Applications of Nuclear Weapons Expertise ($692K)

- Provided Advanced Computational Methods support to the International Shockwave Congress and demonstrated the Agency's advanced modeling techniques.
- Concluded development of integrated nuclear weapons effects computational aids.
- Continued to develop and upgrade computational aids of nuclear weapons effects on various electronic media.
- Disseminated individual nuclear weapons effects computational aids.
- Concluded development and data inclusion to nuclear effects data management assessment system. Installed system on DARE and at the United Kingdom's Atomic Weapons Establishment.
- Provided Advanced Computational Methods support by validating code work on explicit radiation modeling.
- Continued combustion/afterburning modeling for incendiary devices.
- Validated advanced numerical models for complex flow/chemistry.
- Performed a numerical study for the Advanced Radio Frequency Payload concept in support of DoD programs.
- Provided Advanced Computational Support by hosting the International Shockwave Conference.
- Added a reactive turbulent premixed combustion model to the Adaptive Mesh Refinement (AMR) code and validated against precision experimental data.

Data Archival and Retrieval Enhancement (DARE) ($2,482K)

- Expanded archival of information and knowledge of nuclear weapons, other Weapons of Mass Destruction (WMD) and Agency mission areas for retrieval in DARE as outlined in DARE Master Plan.
- Developed and tested 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

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

FY1999 Plans

Nuclear Weapons Effects Phenomenology ($7,999K)

- Continue review/commentary/archival of electronics/environmental test data.
- Initiate Graybeard knowledge capture efforts for thermomechanical 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, through operation of the Information Analysis Center.
- Continue computer operations support by providing centralized CRAY resources to researchers, Agency customers and RDT&E contractors.
- Continue operation of web site providing radiation response of electronic parts.
- Complete high-altitude nuclear effects data commentary/archival.
- Initiate transient radiation effects on electronics data review/commentary/archival.
- Continue review/commentary/archival of cratering, ejecta, dust and fallout test data.
- Initiate review/commentary/archival of nuclear effects test data for thin-film optics.
- Initiate review/commentary/archival of biological nuclear weapon effects test data.
- Continue DATACOM computational support by providing wide area connections.
- Disseminate Science and Technology Digest.
- Review, approve, and archive perishable nuclear test data.
- Coordinate draft update The Effects of Nuclear Weapons prior to distribution.
- Review draft Nuclear Weapon Effects textbook.
- Establish new Graybeard domain for nuclear devices.
- Accelerate Graybeard document review activities on ionization and electromagnetic (EM) effects.
- Complete graybeard free field airblast data commentary.
- Begin preparation of DARE guide to blast effects on structures.

Infrastructure ($9,770K)

- Continue to provide broad-based science and technology Information Analysis Center research support.

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

- Continue computational support by providing annual support for the Scientific Computing Communications Network and by acquisition and upgrade of HPC equipment for the Data Center.
- Provide annual support for existing DTRA owned computing equipment located at Los Alamos National Laboratory.
- Provide for increased processor speed and disk I/O for Data Center HPC equipment.
- Provide for classified access capabilities for the Data Center.
- Continue monitoring and assessment of circuit utilization and investigation of new communication technologies.

Data Archival and Retrieval Enhancement (DARE) ($3,707K)

- 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.
- Develop and test computational tools and system enhancements, which provide greater search, retrieval, storage and analysis capability to the DARE customer.
- Initiate development of video/text interrelationship with hyperlink and other innovative knowledge enhancement and preservation tools.
- Continue legacy document population.
- Continue incorporation of atmospheric and underground nuclear test data.
- Establish an intrinsic radiation transition repository.

Application of Nuclear Weapons Expertise ($517K)

- Complete validation of Advanced Numerical Methods. Compare results to precision test data.
- Develop a 3D atmospheric code with column physics based on the AMR code.

FY2000 Plans

Nuclear Weapons Effects Phenomenology ($7,399K)

- Complete Graybeard work on High Altitude Nuclear Effects.
- Initiate Graybeard mentoring program.

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

- Provide scientific and technical information services and products as the DoD-wide repository for test photos, films, data, test records, and other information products.
- Disseminate Science Technology Digest.
- Operate web site providing radiation response of electronic parts.
- Continue review, commentary, approval, and archival of nuclear weapon effects test data.
- Publish and distribute The Effects of Nuclear Weapons.
- Publish and distribute Nuclear Weapons Effects textbook.

Infrastructure ($9,257K)

- Provide computational support for the Scientific Computing Communications Network; upgrade HPC equipment for the Data Center and access to scalable DoD HPCMP Systems and systems compatibility with DoE ACSI program.
- Provide sustainment and enhancement of classified access capabilities to the Scientific Computing Resources.
- Provide monitoring and assessment of circuit utilization and investigation of new communication technologies to support remote visualization and analysis of full physics, full fidelity, 3-dimensional calculations.
- Provide broad-based science and technology Information Analysis Center research support.

Data Archival and Retrieval Enhancement (DARE) ($4,112K)

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

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

- Continue development of video/text interrelationship with hyperlink and other innovative knowledge enhancement and preservation tools.
- Continue legacy document population.
- Begin entry of nuclear simulation data.
- Enhance data visualization tools.
- Expand online access to DARE classified and unclassified resources.
- Integrate automated test data recorder interface into DARE archive.

Application of Nuclear Weapons Expertise ($719K)

- Continue to supply authoritative data and provide requested analysis of the effects of nuclear weapons testing, and other DTRA mission areas.
- Continue efforts to ensure that Nuclear Weapons Effects test data and results are preserved as DoD downsizes and laboratories with nuclear test data close.
- Validate the AMR code using field atmospheric data.

FY2001 Plans

Nuclear Weapons Effects Phenomenology ($7,164K)

- Complete Graybeard work on Biological Effects.
- Complete Graybeard work on Airblast, Cratering & Ejecta, and Dust/Fallout areas.
- Provide scientific and technical information services and products as the DoD-wide repository for test photos, films, data, test records, and other information products.
- Disseminate Science and Technology Digest.
- Operate web site providing radiation response of electronic parts.
- Continue review, commentary, approval, and archival of nuclear weapon effects test data.

Infrastructure ($9,498K)

- Continue computational support by providing annual support for the Scientific Computing Communications Network and by acquisition and upgrade of High Performance

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

Computing equipment for the Data Center, such as increased memory and additional PCU's to extend the life of existing systems and enable them to accommodate additional workload from decommissioning of the Cray M98.

Provide sustainment and enhancement of classified access capabilities for the Data Center. Deploy new communications technologies to support remote visualization and analysis of full physics, full fidelity, 3-dimensional calculations.

Continue to provide broad-based science and technology Information Analysis Center research support.

Data Archival and Retrieval Enhancement (DARE) ($4,013K)

Continue 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.

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

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

Complete incorporation of reviewed nuclear testing data.

Develop initial DARE interface to external data archives, including search/retrieve capability (e.g. DTIC, DoE, etc.).

Applications of Nuclear Weapons Expertise ($866K)

Perform validation of combined combustion atmospheric model with field data.

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

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

Validate the scalable AMR code with precision combustion data.

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 and Technology (OUSD(A&T)), 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.

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

FY 1998 Accomplishments

Functional Defeat Characterization ($2,100K)

- Developed geological database for tunnel facilities.
- Continued compiling a database of Balanced Survivability Assessments and began applying the data to identify vulnerable nodes in underground facilities.

Defeat Technology ($4,735K)

- Conducted a scale model multi-burst experiment to evaluate the effects of simultaneous detonations.
- Completed penetration studies in granite and weathered granite.
- Initiated live weapon testing of hardened tunnels at the Nevada Test Site (NTS).
- Continued testing of methods to defeat tunnels with penetrators and other conventional weapons.
- Continued support for USD(A&T)'s Hard Target Defeat Capability program.
- Evaluated weapon/target interactions for new weapon concepts, enhanced payloads, and target fragility.
- Initiated construction of a full scale tunnel facility.

Planning Tool Development ($500K)

- Continued development of an automated weaponeering tool for structural and functional damage to tunnels.

NTS Sustainment ($2,534K)

- Maintained Agency activities at NTS in support of environmental remediation activities.
- Provided on-site personnel to plan and supervise environmental remediation of Agency facilities.
- Maintained one tunnel complex in support of the stockpile stewardship program.

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

FY 1999 Plans

Functional Defeat Characterization ($1,454K)

- Continue development and validation of remote site geologic characterization technology.
- Initiate functional characterization and modeling of tunnel facilities.
- Identify mission critical equipment and vulnerabilities for functions modeled.

Defeat Technology ($5,804K)

- Continue to evaluate weapon/target interactions for new weapon concepts, enhanced payloads, and target fragility.
- Initiate penetration testing on other tunnel geologies.
- Conduct weapon/payload testing to identify/quantify defeat mechanisms and evaluate effectiveness.
- Develop improved/new weapon/target interaction models to include penetration, portal damage, in-tunnel airblast and fragments, in-tunnel equipment response, and reconstitution.
- Continue support for USD(A&T)'s Hard Target Defeat Capability program.
- Begin readiness testing of live weapons at NTS in preparation for tunnel defeat demonstrations.
- Complete construction and outfitting of the full-scale tunnel facility and initiate demonstrations.
- Initiate planning for and construction of a second tunnel facility representing a different target function.

Planning Tool Development ($1,000K)

- Continue automated weaponeering tool development by enhancing the Munitions Effects Assessment (MEA) tunnel module for structural and functional damage and battle damage assessment.
- Initiate development of new planning tools to improve deliberate planning capabilities for hard target defeat.

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

NTS Sustainment ($1,925K)

- Maintain Agency activities at NTS in support of environmental remediation efforts.
- Provide on-site personnel to plan and supervise environmental remediation of Agency facilities.
- Maintain one tunnel complex.

FY 2000 Plans

Functional Defeat Characterization ($2,100K)

- Continue development and validation of remote site geologic characterization technology.
- Continue functional characterization and modeling of tunnel facilities.
- Identify mission critical equipment and vulnerabilities for functions modeled.

Defeat Technology ($6,207K)

- Continue to evaluate weapon/target interactions for new weapon concepts, enhanced payloads, and target fragility.
- Continue penetration testing on other tunnel geologies.
- Continue weapon/payload testing to identify/quantify defeat mechanisms and evaluate effectiveness for other tunnel functions.
- Develop improved/new weapon/target interaction models to include in-tunnel equipment response, and reconstitution for different tunnel functions.
- Continue support for USD(A&T)'s Hard Target Defeat Capability program.
- Continue readiness testing of live weapons at NTS in preparation for tunnel defeat demonstrations.
- Conduct functional defeat demonstrations on the full-scale tunnel facility.
- Complete construction of a second tunnel facility representing a different target function.

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

Planning Tool Development ($1,100K)

- Continue automated weaponeering tool development by enhancing the MEA tunnel module for structural and functional damage and battle damage assessment for different tunnel functions.
- Continue development of new planning tools to improve deliberate planning capabilities for hard target defeat.

NTS Sustainment ($2,732K)

- Maintain Agency activities at NTS in support of environmental remediation activities.
- Provide on-site personnel to plan and supervise environmental remediation of Agency facilities.
- Maintain one tunnel complex.

FY 2001 Plans

Functional Defeat Characterization ($2,250K)

- Continue development and validation of remote site geologic characterization technology.
- Continue functional characterization and modeling of tunnel facilities.
- Identify mission critical equipment and vulnerabilities for functions modeled.

Defeat Technology ($6,148K)

- Continue to evaluate weapon/target interactions for new weapon concepts, enhanced payloads, and target fragility.
- Continue penetration testing on other tunnel geologies.
- Continue weapon/payload testing to identify/quantify defeat mechanisms and evaluate effectiveness for other tunnel functions.
- Continue to develop improved/new weapon/target interaction models to include in-tunnel equipment response, and reconstitution for different tunnel functions.
- Continue support for USD(A&T)'s Hard Target Defeat Capability program.

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

Continue readiness testing of live weapons at NTS in preparation for tunnel defeat demonstrations.

Conduct functional defeat demonstrations on the second full-scale tunnel facility.

Initiate planning for and construction of a third tunnel facility representing a different target function.

Planning Tool Development ($1,120K)

Continue automated weaponeering tool development by enhancing the MEA tunnel module for structural and functional damage and battle damage assessment for different tunnel functions.

Continue development of new planning tools to improve deliberate planning capabilities for hard target defeat.

NTS Sustainment ($2,733K)

Maintain Agency activities at NTS in support of environmental remediation efforts.

Provide on-site personnel to plan and supervise environmental remediation of Agency facilities.

Maintain one tunnel complex.

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 1999 Plans

In-core thermionic development ($1,800K)

Continue work on test of high-performance and high-reliability converters for in-core thermionic fuel elements. Award a contract for development of close-spaced multi-cell converter module.

Microminiature Thermionic Converters (MTCs) ($1,200K)

Continue to apply trial tricarbonate coatings on the emitter portion of the converters, and continue work on scandate coatings.

Project AQ - Deep Digger - This project proposes to develop a "Deep Digger" design for attacking hard targets such as leadership or C3 Bunkers, underground factories, or weapon storage facilities. The U.S. Services have identified a need to defeat such hard and buried targets. 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.

This effort is responsive to Special Operations Forces interests as well as the consolidated Mission Need Statement of the U.S. Air Force Combat Command and the U.S. Strategic Command. The deep digger system would be delivered by a guided munition airframe such as used by the Air Force and the Navy. As an integrated weapon, this concept has application as a breeching tool.

FY 1999 Plans ($2,000K)

Design and build a system that will penetrate rock, explosively fracture, and remove muck.

Construct a prototype for FY 2000 testing.

Field and test the prototype at Nevada Test Site.

Project AY - Bioenvironmental Hazards Research - This is a Congressionally mandated project that provides for research on bioenvironmental hazards of specific DoD concern. Areas of research include human health effects and risk evaluation, pollution preventions, waste stream treatment, remediation, and impact assessment of atmospheric emissions. Funds were provided as a Congressional addition in FY 1994, FY 1995, FY 1997 and FY 1998 and were intended to continue efforts begun by a grant in FY 1989 to Tulane and Xavier Universities. Additional funding was made available from existing Agency resources to comply with Congressional direction to continue this effort through FY 1996.

FY 1998 Accomplishments ($5,000K)

Awarded two research grants to study and understand mechanisms involving synergism between contaminants and their effect on the human and ecological systems based on biosensors and biomarkers to assist in risk-based DoD evaluations.

Collected and analyzed information and data on current remediation efforts, such as bioremediation, to ensure their effectiveness.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	R-1 ITEM NOMENCLATURE WMD Related Technologies; 0602715BR

B. Program Change Summary

	FY98	FY99	FY00	FY01
Previous President's Budget	203.7	203.6	206.6	209.7
Current Budget Submit/President's Budget	203.8	211.4	203.5	206.5

Change Summary Explanation:

In accordance with the November 1997 Defense Reform Initiative, resources for FY 1999 and out which were previously addressed in PE 0602715H have been transferred to this PE. The budget request represents a highly leveraged science and technology program, consistent with departmental strategic objectives. Significant adjustments are associated with congressional ads FY 1999 for Deep Digger, Thermionics, and Nuclear Weapons Efforts and technology efforts. Outyear adjustments are primarily associated with the termination of RDT&E efforts supporting the Electro-Thermal Chemical Gun program.

C. Other Program Funding Summary

	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
0602715H Defense Special Weapons Agency	203.8	0.0	0.0	0.0	0.0	0.0

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)					DATE **February 1999**				
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/Advanced Technology Development – BA3**					R-1 ITEM NOMENCLATURE **Counterproliferation Support-Advanced Development; 0603160BR**				
Cost *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete
Total 0603160BR Cost	0	53.0	81.2	75.8	74.7	75.9	77.7	79.3	Continuing
Project P535 SOF Counterproliferation Support	0	12.8	20.9	20.8	18.8	18.9	19.4	19.9	Continuing
Project P539 Counterforce	0	40.2	60.3	55.0	55.9	57.0	58.3	59.4	Continuing

A. Mission Description and Budget Item Justification - In August 1994, DoD established the Counterproliferation Support Program specifically to address the DoD shortfalls in counterproliferation operational capabilities documented in the May 1994 Report to Congress titled ***Report on Nonproliferation and Counterproliferation Activities and Programs***. Counterproliferation Support Program funds are used to leverage DoD acquisition programs to meet the counterproliferation priorities of the Commanders-in-Chief (CINCs) of the Combatant Commands and accelerate the deployment of enhanced capabilities to the field. Specifically, the goal of the Counterproliferation Support Program is to improve specific military counterproliferation capabilities by (1) building on ongoing programs in the Services, DoD agencies, Department of Energy and US Intelligence; (2) focusing on the most critical counterproliferation shortfalls to address major gaps in deployed capabilities (as reflected in the CINCs' priorities and the Counterproliferation Review Committee's (CPRC) prioritized list of counterproliferation Areas for Capability Enhancements); (3) leveraging existing program funding to more rapidly field capabilities by accelerating the deliverables of DoD programs; (4) identifying and enhancing the development of high payoff technologies to accelerate capabilities to the warfighter; (5) identifying and promoting key non-material initiatives that complement technological advances; (6) transitioning Counterproliferation Support Program projects to the Services as soon as practicable; and (7) procuring counterproliferation unique development products for CINCs.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE **February 1999**
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/Advanced Technology Development – BA3**	R-1 ITEM NOMENCLATURE **Counterproliferation Support-Advanced Development; 0603160BR**

Project P535 – SOF Counterproliferation Support - In 1995 the SECDEF assigned the core task of countering the proliferation of weapons of mass destruction (WMD) to SOF. Within SOF, Project P535 develops and demonstrates SOF unique devices that enable SOF and special mission units to detect, disable, and neutralize WMD and their associated facilities under the direction of a geographic CINC in support of CONPLAN 0400. This project is employed by SOF units with direct application to the nation's effort to counter the spread of WMD (CP-WMD). Efforts in this project include the defeat of hard and deeply buried targets (HDBT), explosive ordinance disposal (EOD), and maritime efforts to prevent the spread of WMD technology or systems using the sea-lanes. HDBT is focused on breaching tools, improved communications, life support equipment, detection and defeat sensors, underground navigation systems, and target defeat capabilities. The EOD focus is on detection, characterization, extraction, and emergency destruction of nuclear, biological, and chemical (NBC) agents and devices. Efforts seek to improve these capabilities by providing greater standoff range and utilizing non-intrusive technologies. Maritime CP operations concentrate on defeating and neutralizing WMD or WMD material being transported or concealed on maritime platforms. Also included are efforts to enhance our existing capability in support of the domestic response to the WMD threat on U.S. soil. The CP-WMD effort also addresses support requirements that apply to all three of the previously identified efforts.

FY 1998 Accomplishments
Funding and activities accomplished under PE 0603160D8Z.

FY 1999 Plans
SOF Projects ($12,763K)
Specific details are classified.

Project P535 – SOF Counterproliferation Support (cont'd) -

FY 2000 Plans

SOF Projects ($20,928K)

Specific details are classified.

FY 2001 Plans

SOF Projects ($20,763K)

Specific details are classified.

Project P539 – Counterforce - The purpose of this project is to develop technologies, demonstrate prototype systems in an operationally realistic environment and provide the warfighter with enhanced capabilities in response to current threat projections for potential adversaries who have the capability to develop and/or employ nuclear, biological and chemical (NBC) weapons in future regional conflicts involving the U.S. or its allies. The U.S. requires the capability to identify and characterize NBC research, production, storage and operational support facilities and be prepared to attack and neutralize them while mitigating collateral effects resulting from expulsion and release of NBC agents. The potential target set includes fixed, aboveground and underground hardened and unhardened facilities. The project started in FY95 and was structured to exploit ongoing technology programs wherever possible. Early project emphasis was applied to efforts to predict and measure target response and dispersion of agents associated with attacks against NBC facilities using existing conventional weapons. Project emphasis evolved to mitigation of collateral effects through advanced weapon development and greatly enhanced deliberate target planning leading to optimized weapon employment. The focus through FY98 was the demonstration of target planning tools, weapons and sensors supporting direct attacks on an expanded set of NBC targets. In the near-term (FY99-03), the project emphasis will change to standoff penetrating weapons, collateral effects assessment and the supporting planning tools. Prototype or modified systems integrating these technologies will then be evaluated in an Advanced Concept Technology Demonstration (ACTD), and a residual operational capability provided to the warfighters.

A second counterforce CP ACTD was approved by DUSD(AT). The original CP ACTD has been retitled CP1 ACTD for the first CP ACTD. The second CP ACTD is called the Second Counterproliferation Counterforce Advanced Concept Technology Demonstration (CP2 ACTD). FY98 was the transition year with CP1 ACTD concluding and CP2 ACTD starting.

This project builds on previous Defense Threat Reduction Agency (DTRA), previously named the Defense Special Weapons Agency, projects to develop and mature sensor systems to provide additional capabilities for pre-, trans- and post-attack target characterization, and damage and collateral effects assessments. The project further develops and

Project P539 – Counterforce (cont'd) -
accelerates capabilities in collateral effects prediction, target/weapon interaction prediction, and funds the integration of these capabilities into Service/CINC target planning systems. The project also builds on Service programs in advanced weapon guidance, penetration and fuze enhancements. Service weapon development expertise will be used to integrate complementary, demonstrated technologies into prototype weapons that can improve prompt response, enhance lethality and control collateral effects. The project milestones are broken into four major product areas or subprojects, sensors, collateral effects, target planning and weapons, plus the operational demonstrations.

Sensors - This effort will provide improved warfighting residual capabilities for facility characterization, battle damage assessment (BDA) and collateral effects assessment against the spectrum of NBC facilities. Research and development has been conducted at DTRA to characterize signatures from shallow underground facilities for exploitation by tactical unattended ground sensors (TUGS). Objectives of the program included development of techniques for source identification, localization, and performing change detection in trans-attack signatures for weapon effectiveness analysis. Intelligence community (IC) and Department of Energy (DoE) programs involved research and development to assess sensor performance and approaches for optimum sensor application for surface target detection and underground facility detection and characterization. Other project activities included enhancing the performance of existing forward looking infrared (FLIR) sensors. This sub-project has leveraged existing programs to (1) define concept of operations and sensor system (ground and air) architectures for BDA, collateral effects assessment, and facility characterization; (2) develop and demonstrate sensor technologies and prototype sensor systems for BDA and facility characterization; (3) produce data fusion and processing module for BDA and facility characterization to meet user requirements on existing platforms; (4) produce an integrated BDA module to support airborne sensors; (5) develop and demonstrate a man-emplaced TUGS system that includes multi-sensor arrays; (6) integrate stand-off and point sensors onto air platforms and demonstrate the ability to confirm, identify, and assess the release of chemical and biological agents in support of

Project P539 – Counterforce (cont'd) - attacks on NBC facilities. CP2 ACTD sensors and data fusion will address confirming the presence of chemical and/or biological agents post attack and assist in predicting transport patterns by updating pre-strike predictions of the potentially hazardous plume with real-time data. The CP2 ACTD sensor program will leverage on-going sensor efforts within the chemical and biological defense community to minimize program risk in developing sensors for counterforce missions. This program will also monitor the progress of remote biological agent detectors for potential incorporation into the collateral effects assessment system. For FY99, the sensor sub-project will continue to analyze CINC requirements for collateral effects assessment, assess the maturity of chemical and biological detector technologies, conduct risk reduction activities for a few key technologies, and define the systems to be demonstrated as a part of CP2 ACTD. CP2 ACTD sensor development will start in FY00.

Collateral Effects - The Collateral Effects program provides predictive tools for NBC expulsion and dispersion resulting from attacks on WMD facilities as well as acts of terrorism and hostile use of WMD for a variety of applications supporting NBC target attack planning. Requirements include high-resolution weather models 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 model 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) predicts the release and transport of NBC materials and the subsequent collateral effects. The high resolution weather prediction capability provides timely wind, cloud, and precipitation data necessary for NBC collateral effects predictions. Weather data currently does not have the resolution or quality necessary. This weather data will be available to other users in the theater such as Joint Warning Network (JWARN). These tools will be integrated into target attack planning tools to assess the consequences of attacks on WMD facilities.

Project P539 – Counterforce (cont'd) –
Target Planning - This effort will provide a new deliberate 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 Mission 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 subproject. The current effort will produce the Integrated Target Planning Tool Set (ITPTS) that will provide a spectrum of planning capabilities from deliberate to crisis. ITPTS includes IMEA II and high resolution weather prediction. IMEA II will import target data and import attack assessment data from prior planned strikes. ITPTS will also predict weapons performance and associated NBC collateral effects, develop targeting solutions that minimize collateral effects, and provide the results through the appropriate interfaces for a variety of targets including functionally and structurally complex facilities. The major differences between IMEA and IMEA II is a greatly enhanced interface to the Intelligence community and upgrades to handle additional target types including complex facilities, to handle additional weapons and platforms, to provide more operator friendly displays, to import attack assessment data, and to efficiently interface with Service planning systems. The ITPTS interfaces include but are not limited to Global Command and Control System, the Service targeting and strike execution control systems, strategic and tactical intelligence and sensor systems, the weather community, and the NBC warning system. The "plug and play" architecture is required to accommodate differing CONOPS, theaters, and performers in several geographic locations. The deliberate planning capability requires significant input from the intelligence community including data regarding NBC facilities, processes, and surrounding populations. This effort will support the intelligence community in developing the necessary interfaces to provide for the efficient transfer of intelligence data. ITPTS will include IMEA, an advanced wind and weather prediction capability, and a "plug and play" architecture to facilitate additional capabilities. This effort will

Project P539 – Counterforce (cont'd) – execute a full verification and validation program, in accordance with the Joint Technical Coordinating Group for Munitions Effects Procedures, for all delivered capabilities including extensive field testing at all functional levels.

Weapons - Conventional explosive-filled weapons are often relatively ineffective in destroying large underground reinforced concrete facilities. Even if the weapon detonates inside the facility, substantial interior walls and/or floors often confine the blast and fragmentation thus causing significant overpressure and venting through the penetration hole. Likewise conventional explosive-filled weapons often result in complete and uncontrolled destruction of soft buried and aboveground facilities. When these facilities protect NBC, the random use of conventional weapons greatly increases the risk of agent dispersal that may result in extensive civilian or force casualties. This sub-project will develop, integrate and demonstrate advanced conventional weapons technologies to improve mission effectiveness against NBC facilities while mitigating collateral effects. For CP1 ACTD, these technologies included improvements in adverse-weather/precision guidance, enhanced penetrating capabilities, and advanced fuzing options. Technologies that were successfully demonstrated are being weaponized into systems. Advanced fuzes enable weapons employment options to maximize lethality and/or control collateral effects. The focus for CP2 ACTD is to provide the warfighter with a demonstrated option to attack NBC facilities in a standoff mode. CP2 ACTD will improve on existing standoff weapon platforms to provide enhanced penetration and advanced fuzing. Standoff weapons to be enhanced include a Tactical Tomahawk version called the Tactical Tomahawk Penetrator Variant (TTPV) and the Conventional Air Launched Cruise Missile (CALCM). Enhanced payloads can reduce collateral effects by neutralizing agents before they are released orby reducing the amount released. The enhanced payload technologies are less mature and will remain in technology base development. Once matured, enhanced payloads efforts will explore alternate warhead options to conventional blast/fragmentation with the objectives of mitigating collateral effects associated with dispersal of NBC materials while also minimizing the number of weapons required to functionally defeat WMD facilities.

Project P539 – Counterforce (cont'd) –
Operational Demonstrations - The Counterproliferation ACTD 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 sensors, weapons, collateral effects prediction and target planning tools, evaluate the technologies in an operational context, and transition improved capabilities rapidly to warfighters. Specifically, this project will enhance and accelerate existing programs to provide integrated target planning to include collateral effects prediction codes and sensors for facility simulated chemical production facilities using the characterization and BDA, and advanced weapons development programs to meet NBC target defeat requirements. This project will also support demonstration operations to include system operational concept, demonstration planning, scenario development, and execution of the ACTD and post-demonstration analysis. Planning and execution of the ACTDs uses a time phased approach to screen candidate technologies for maturity, develop prototype systems and demonstrate enhancements in military capability against a warfighter 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.

Two operational demonstration series were defined for the CP1 ACTD. The first demonstration, named Dipole Orbit (DO), was successfully completed in February 1997. This first demonstration used new target planning tools to determine the "best" employment of current weapons with a smart fuze against simulated biological agents housed in soft aboveground bermed structures. The second and final demonstration series, named Dipole Jewel (DJ), was completed in October 1998. This demonstration assessed improved capabilities in weapons, sensors, and enhanced planning tools against a simulated, hardened chemical weapons production facility in a shallow-buried, cut-and-cover structure. After the start of CP1 ACTD, the sponsoring command identified a need to understand their ability to conduct counterforce operations against soft aboveground-simulated chemical production facilities using the TLAM-C. The Dipole Tiger (DT)

Project P539 – Counterforce (cont'd) – demonstration series was added as a quick response to the users' request. DT ran from April 1997 through May 1997.

Three operational demonstration series are planned during CP2 ACTD over the period of FY2000-2003 to provide the sponsor 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 exploit near-term technology by demonstrating the baseline capabilities of the Joint Air-to-Surface Stand-off Missile (JASSM) to conduct chemical/biological (C/B) counterforce missions 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. The objective of the third demonstration, 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, and a TTPV stand-off attack penetrating weapon capability. Specific collateral effects assessment sensors to participate in these three demonstrations will be defined during FY99.

FY 1998 Accomplishments
Funding and activities accomplished under PE 0603160D8Z.

Project P539 – Counterforce (cont'd) –
FY 1999 Plans

Sensors ($2,698K)

Continue design, fabrication, and demonstration of modifications for standoff chemical sensor.

Evaluate biological sensors for the counterforce role.

Continue development of the High Frequency Active Auroral Research Program (HAARP)

Collateral Effects ($6,750K)

Deliver a theater weather server and provide high-resolution predictive weather capability for regional operations.

Continue validation tests for collateral effects modules.

Deliver HPAC 4.0 Prototype.

Deliver soft chemical facility hazard source term model.

Initiate urban collateral effects model development.

Develop world-wide land cover and population database for collateral effects casualty predictions.

Target Planning ($14,550K)

Develop and deliver a multiple weapon capability for IMEA.

Execute scale tests/analyses and validate target planning tools.

Enhance WMD component damage prediction models to include multiple weapons.

Initiate development of ITPTS and demonstrate prototype with three integrated tools.

Complete and deliver IMEA 4.0 software to support CP2 ACTD.

Support SOF project (details are classified).

Initiate WMD facility analysis and database population for the Counterproliferation Analysis and Planning System (CAPS).

Project P539 – Counterforce (cont'd) –
Weapons ($13,045K)

Fabricate and test Hard Target Smart Fuze (HTSF) hardware with expanded capabilities.
Conduct CALCM penetrator systems design and integration.
Conduct TTPV penetrator systems integration.
Initiate TTPV penetrator payloads system design.
Initiate TTPV penetrator missile systems design and engineering.
Initiate TTPV penetrator air-vehicle modification design and fabrication.
Continue smart fuze design to meet Navy certification requirements.
Continue TTPV penetrator warhead design, fabrication, and test.
Initiate TTPV penetrator command and control modifications.
Initiate TTPV penetrator system test and evaluation.
Complete scale tests of selected high temperature incendiaries (HTI) and chemical neutralization agents against simulated chemical and biological agents.
Continue modeling and simulation to support enhanced payloads concept screening and down select.

Project P539 – Counterforce (cont'd) –
Operational Demonstrations ($3,145K)
- Prepare Dipole East (DE) 165 target (1/4 refurbishment of Dipole Jewel target structure).
- Conduct Dipole East 165 demonstration.
- Complete target construction for Dipole Yukon 1.

FY 2000 Plans
Sensors ($9,000K)
- Initiate design, fabrication, and demonstration modifications of air platform to provide remote sensing capability.
- Continue design and test of mini-UAV modification.
- Continue to configure, fabricate, integrate, and test components for combat assessment mini-UAVs.
- Continue to develop concept of operations, communications, data fusion/display ground station, and interface requirements.

Collateral Effects ($6,300K)
- Deliver a biological hazard source model and transport capability for soft facilities.
- Develop high resolution databases for real populations and real land surfaces for customer determined locations.
- Develop human effects model for civilian populations to better predict WMD collateral effects (casualties).
- Deliver theater weather server with high fidelity weather model.
- Deliver initial urban collateral effects capability.
- Deliver HPAC 4.0.

Target Planning ($15,760K)
- Demonstrate ITPTS prototype with five integrated tools.

Project P539 – Counterforce (cont'd) –

Deliver Joint Air-to-Surface Standoff Missile (JASSM) weapon effects/performance models for IMEA.
Complete modeling capability for a complex aboveground target.
Deliver sub-system level validation report for planning tools.
Complete and deliver IMEA 5.0 software to support Dipole Yukon.
Deliver weapons effects/performance models for the Tactical Tomahawk Penetrator Variant.
Initiate cruise missile (TTPV and CALCM) performance models for IMEA.
Continue WMD facility analysis and database population for CAPS.

Weapons ($18,800K)

Conduct CALCM penetrator systems design and integration.
Conduct TTPV penetrator systems integration.
Continue TTPV penetrator warhead design, fabrication, and test.
Continue TTPV penetrator command and control modifications.
Continue TTPV penetrator payloads system design.
Continue TTPV penetrator missile systems design and engineering.
Continue TTPV penetrator air-vehicle modification design and fabrication.
Conduct TTPV penetrator system test and evaluation.
Conduct enhanced payloads static scaled tests against soft chemical/biological targets.

Project P539 – Counterforce (cont'd) –
Conduct modeling and simulation support for enhanced payloads scale testing.
Operational Demonstrations ($10,457K)
Conduct Dipole East 166 and 167 demonstrations.
Analyze demonstration results and report.
Complete target construction for Dipole Zodiac demonstration.
Conduct Dipole Yukon 1 demonstration.
Conduct Dipole Zodiac 1 demonstration.
Complete target construction for Dipole Yukon 2.
Support CP analysis for concept of operations development.

FY 2001 Plans
Sensors ($9,000K)
Integrate and test mini-UAV on air platform.
Continue remote sensor testing on air platform.
Conduct tests of combat assessment component in mini-UAV.
Continue simulant and agent tests for remote and point sensors.
Continue to develop concept of operations, communications, data fusion/display ground station, and interface requirements.
Collateral Effects ($7,500K)
Deliver final hazard source models for CP2 ACTD standoff weapons.

Project P539 – Counterforce (cont'd) –

Develop modeling for urban internal transport.
Deliver Meteorological Data Server in ITPTS architecture.
Deliver human effects module integrated with population data.
Validate weather models and wind field data for priority regional areas.
Complete ITPTS access to all HPAC capabilities.

Target Planning ($13,900K)

Complete and deliver ITPTS 1.0 with interoperability among the seven integrated tools.
Deliver CALCM weapon effects/performance models.
Enhance penetration model for complex targets and angle of attack.
Enhance WMD damage prediction and expulsion models to include fermenters and stills.
Complete and deliver IMEA 6.0 software to support Dipole Zodiac.
Continue WMD facility analysis and database population for CAPS.

Weapons ($16,289K)

Complete CALCM penetrator systems design and integration.
Conduct TTPV penetrator systems integration.
Continue TTPV penetrator warhead design, fabrication, and test.
Complete TTPV penetrator command and control modifications.
Continue TTPV penetrator payloads system design.
Continue TTPV penetrator missile systems design and engineering.

Project P539 – Counterforce (cont'd) –

Continue TTPV penetrator air-vehicle modification design and fabrication.
Conduct TTPV penetrator system test and evaluation.
Conduct full scale enhanced payloads tests against chemical/biological targets.
Complete modeling and simulation of selected enhanced payloads concept.

Operational Demonstrations ($8,389K)

Conduct Dipole Yukon 2 demonstration.
Analyze demonstration results and report.
Complete target construction for Dipole Idle 4 demonstration.
Conduct Dipole Zodiac 2 demonstration.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE **February 1999**
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/Advanced Technology Development – BA3**	R-1 ITEM NOMENCLATURE **Counterproliferation Support-Advanced Development; 0603160BR**

B. Project Change Summary	FY1998	FY1999	FY2000	FY2001
Previous President's Budget	0	70.6	68.1	64.2
Current President's Budget	0	53.0	81.2	75.8

Change Summary Explanation:

The FY99 President's Budget of $70.6M was reduced by $25.0M during the appropriations cycle which transferred the funds to the Special Reconnaissance Capabilities Program. Funding was increased by $7.4M in support of the CAPS and HAARP Programs. The FY00 request restores CINC priority initiatives in Sensor and SOF programs deferred by the FY99 reduction and adds funding for CAPS ($10.0M FY00, $8.9M FY01)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/Advanced Technology Development - BA3**					**R-1 ITEM NOMENCLATURE** **Verification Technology Demonstration; 0603711BR**				
COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete
Total 0603711BR Cost	80.2	57.3	58.5	55.3	51.9	50.5	51.2	51.9	Continuing
Project CA Strategic Arms Control Technology	7.8	6.4	9.8	10.9	11.0	11.2	11.4	11.7	Continuing
Project CB Conventional Arms Control Technology	9.0	5.6	7.7	7.9	8.0	8.1	8.3	8.5	Continuing
Project CC Chemical Weapons Convention	9.3	8.7	10.4	12.3	12.6	12.9	13.2	13.5	Continuing
Project CD Nuclear Arms Control Technology	54.1	36.6	30.6	24.2	20.3	18.3	18.3	18.2	Continuing

A. Mission Description and Budget Item Justification - This program element covers implementation, compliance, monitoring and inspection, research development testand evaluation (RDT&E) for existing and emerging arms control treaties and agreements. The funded projects conform to requirements presented and approved by the Office of the Under Secretary of Defense (Acquisition & Technology) through the DoD Arms Control Requirements Assessment Board (RAB) process. RDT&E fulfills the technical requirements 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 III); the Anti-Ballistic Missile (ABM) Treaty; the Intermediate-Range Nuclear Forces (INF) Treaty; the Conventional Armed Forces in Europe (CFE) Treaty; the Open Skies (OS) Treaty; the Convention on Certain Conventional Weapons (CCW); the Chemical Weapons Convention (CWC); Comprehensive Test Ban Treaty (CTBT); the CFE Adaptation negotiations; the Anti-Personnel landmine negotiation; Presidential arms control initiatives; and other existing and emerging arms control related agreements, treaties, and initiatives, such as the United Nation’s (UN) Transparency in Armaments; the Organization on Security and Cooperation in Europe’s

Mission Description and Budget Item Justification (cont'd) - Vienna Document 94 (VD-94) and the Global Exchange of Military Information (GEMI); Missile Technology Control Regime (MTCR) and the UN's Transparency in Armaments Agreement. It also provides confidence and transparency building capabilities to support DoD efforts concerning the Biological Weapons Convention (BWC), and 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 and or reduction of nuclear, chemical, biological, and other advanced conventional weapons. Technical assessments are made to provide the basis for sound project development, to evaluate existing programs, and to provide the data required to make compliance judgments. Technology developments and system improvements 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, 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. For example, work includes an assessment to determine the susceptibility of a CTBT verification regime to evasive measures. Results will be used by the CTBT negotiators to develop a mechanically robust International Monitoring System (IMS). 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. For example, development of remote monitoring capabilities for future START Treaty applications will also be evaluated for use to verify limits and activities in a future conventional arms control regime. The technologies and procedures developed in the

Mission Description and Budget Item Justification (cont'd) - 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 being used to implement the provisions of United Nations Resolution 715. The Agency's synergistic approach to fulfilling arms control requirements has been maximized in data management development. Arms control treaties require extensive exchanges of data 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. A DoD system, Chemical Accountability Management Information Network (CAMIN), is under development to create the capability to transmit CWC required data. The Open Skies Notification System (OSNS) is being developed to support an anticipated 1st/2nd QTR FY1999 treaty entry-into-force (EIF). Operational control of the CMTS was transitioned to On-Site Inspection Agency (now the Defense Threat Reduction Agency) in a phased approach starting with Data Management/Notification System (DMNS) and START Central Data System (SCDS) in FY1997. The Chemical Weapons Convention Information Management System (CWCIMS) was offered to the Preparatory Commission at The Hague by the United States Government (USG). The Commission accepted the U.S. offer and the system was delivered in late FY1996.

In FY 1999, the architecture for presentation/execution of this program changed. Elimination and realignment of the Implementation and Compliance (I&C) category resulted in all negotiation, compliance, and implementation efforts moving to the Technical Assessments category. All hardware and software developments in I&C have moved to the Technology Development or Improvements category to reflect the actual nature of the effort.

Project CA - Strategic Arms Control Technology - This project consists of research, development, test and evaluation (RDT&E) activities required to provide the capabilities needed to conduct monitoring, inspections, and data exchanges under the Strategic Arms Reduction Treaty (START), START II, START III, Missile Technology Control Regime (MTCR), Safeguards, Transparency and Irreversibility (STI) Agreement, Anti-Ballistic Missile (ABM) Treaty, and the Intermediate-Range Nuclear Forces (INF) Treaty. It also assists the United States Government (USG) and industry in compliance with the treaties and development of technology to meet requirements of future strategic arms control agreements. The projects conform to requirements presented and approved by the Office of the Under Secretary of Defense (Acquisition & Technology), (OUSD(A&T)), through the DoD Arms Control Requirements Assessment Board (RAB) process and OSD/Arms Control Implementation and Compliance memorandum of 31 July 1997, subject: Guidance, Mission Needs and Requirements Summary.

The START Central Data System (SCDS), as part of the Compliance Monitoring and Tracking System (CMTS), enables the U.S. to generate treaty-required notifications, perform treaty compliance assessments, and transmit notifications to treaty states for START. The START II Treaty, signed in January 1993, requires inspections of converted SS-18 silos and authorizes additional re-entry vehicle on-site inspections of Intercontinental Ballistic Missiles (ICBMs) installed in the converted silos. It also introduces new rules for counting strategic forces that complicate START reporting. Tools developed by this program will enable the USG to effectively exercise treaty inspection rights and monitor compliance and reporting. Technology development efforts are planned to support anticipated future treaty requirements in the most non-intrusive and cost-effective manner. Future strategic arms control regimes may consider non-deployed missiles and warheads in all phases, to include conversion and/or elimination, and would require the development of new procedures and equipment to accomplish the monitoring task. The primary focus of the efforts is on more effective methods of measuring characteristic Treaty Limited Item (TLI) signatures with technologies such as object and pattern recognition and micro-machined integrated neutron detector and providing

Project CA - Strategic Arms Control Technology (cont'd) - monitoring/inspection capabilities to ultimately reduce cost and increase the flexibility of U.S. inspectors.

Overall RDT&E requirements and implementation timelines are dependent on the desired robustness and implementation schedule for the various components of the verification regime. RDT&E is being initiated now to ensure that monitoring and inspection systems are available at treaty entry into force (EIF) and that negotiators have the technical information to make informed decisions on key issues. This project supports the JCS Warfighting Capability of counterproliferation.

FY 1998 Accomplishments

Technical Assessments ($4.257K)

- Completed implementation of future START/START II treaties data and information exchange revisions into CMTS SDSC.
- Completed assessment of Tools and Information Needs (TINA) for OUSD(A&T)/ACI&C.
- Provided treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
- Conducted assessment of regional arms control technology needs for the Pacific Rim.
- Provided technical and engineering support to START Treaty commissions (JCIC/BIC).
- Explored "offense/defense" systems differentiation issues and potential future force structure effects posed by START III/IV negotiations.
- Evaluated technical needs for arms control implementation that may arise between nuclear states on proposing significant reduction of offensive nuclear capabilities while increasing defenses against nuclear attack.
- Initiated impact analysis on arms control agreements of using missiles as targets for U.S. missile defense testing.
- Initiated review of adjunct monitoring concepts and technologies which could enhance inspector performance in the implementation of current treaties.
- Completed research on technologies to support post-START II requirements to monitor mobile delivery systems, non-deployed nuclear weapons and delivery systems, and warhead inventories.

Project CA - Strategic Arms Control Technology (cont'd) -
Technology Development ($3.600K)

- Completed CMTS SCDS documentation and delivered source code.
- Selected promising warhead accountancy technologies for vulnerability analysis and further development.
- Began design and development of ABM/Theater Missile Defense (TMD) computer analysis models.
- Incorporated START II software modifications to support CMTS interface with international data exchange formatting.
- Completed Object and Pattern Recognition proof of concept development for unattended monitoring of nuclear weapons facilities.
- Continued Emerging Technologies investigations for future treaty requirements through industry, academia and national laboratories.
- Determined the potential utility of tagging as a monitoring aid in future strategic arms control regimes.
- Initiated development of two non-nuclear radiation measurement technologies to support nuclear warhead monitoring activities.
- Initiated development of verification technology, in cooperation with Russian researchers, for identifying, monitoring, and accounting for strategic nuclear weapons.
- Evaluated novel neutron detection technology for use in nuclear warhead monitoring system.
- Initiated development of portable gamma spectrometer for warhead monitoring and inspection.
- Continued emerging technologies investigations for warhead inspections which do not require nuclear radiation detection.

FY 1999 Plans
Technical Assessments ($2.300K)

- Assess requirements for OUSD(A&T)/ACI&C information processing system developments for ABM/National Missile Defense (NMD).

Project CA - Strategic Arms Control Technology (cont'd) -

Provide negotiation support for information processing issues.
Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
Conduct assessment of regional arms control technology needs for the Middle East.
Evaluate alternatives for expansion of the current Missile Launch Notification System (MLNS).

Technology Development ($4.135K)

Initiate information processing system development for Anti-Ballistic Missile/Theater Missile Defense (ABM/TMD).
Initiate development of Arms Control Information and Notification System (ACINS).
Continue evaluation of novel neutron detection technology for use in nuclear warhead monitoring system.
Continue development of two non-nuclear radiation measurement technologies to support nuclear warhead monitoring activities.
Continue development of verification technology, in cooperation with Russian researchers, for identifying, monitoring, and accounting for strategic nuclear weapons.
Complete development of portable gamma spectrometer for warhead monitoring and inspection.
Continue emerging technologies investigations for warhead inspections which do not require nuclear radiation detection.
Initiate technology demonstrations in support of potential treaty regimes.

FY 2000 Plans

Technical Assessments ($2.700K)

Assess technology adequacy and needs under the New York Accords for complying with their provisions for ABM/TMD demarcation.

Project CA - Strategic Arms Control Technology (cont'd) -

Continue negotiation support for information processing issues.
Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
Assess technology requirements resulting from multilateral (U.S., Russia, and China) nuclear issues that arise from potential START II follow-on agreements.
Provide technical and engineering support to START Treaty commissions (JCIC/BIC).
Continue evaluating measurable warhead parameters as a means for identifying warheads by type or kind during inspections.
Examine multiple sensors and data processing integration to satisfy potential START III monitoring requirement to include remote monitoring.
Assess potential multilateral strategic arms control verification needs as treaties move from bi-lateral to multi-lateral agreements.

Technology Development ($7.078K)

Complete evaluation of novel neutron detection technology for use in nuclear warhead monitoring system.
Complete development of two non-nuclear radiation measurement technologies to support nuclear warhead monitoring activities.
Investigate acoustic analysis and imaging methods as an inspection tool for identifying features unique to nuclear warheads.
Initiate proof-of-concept of using tags as a monitoring aid in future strategic arms control regimes.
Continue development of information processing system for TMD data requirements.
Initiate multi-media training for information processing users.
Continue development for Arms Control Information and Notification System (ACINS).
Continue development of verification technology, in cooperation with Russian researchers, for identifying, monitoring, and accounting for strategic nuclear weapons.

Project CA - Strategic Arms Control Technology (cont'd) -

- Initiate development of multi-spectral monitoring techniques, incorporating the best of previously investigated techniques, to provide enhanced and extended capabilities.
- Investigate visible, Infrared (IR) and Millimeter Wave (MMW) imaging methods as an inspection tool for identifying features unique to nuclear warheads.
- Complete proof-of-concept of using tags as a monitoring aid in future strategic arms control regimes.
- Initiate development of tools for assessing interceptor compliance with the ABM treaty.
- Continue technology demonstrations in support of potential treaty regimes.

FY 2001 Plans

Technical Assessments ($2.100K)

- Continue negotiation support for information processing issues.
- Conduct post-START assessment for information processing requirements.
- Conduct Missile Technology Control Regime (MTCR) assessment for information processing requirements.
- Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
- Assess technology requirements resulting from multilateral (U.S., Russia, France, and UK) nuclear issues that arise from potential START II follow-on agreements.
- Provide technical and engineering support to START Treaty commissions (JCIC/BIC).
- Initiate review of adjunct monitoring concepts and technologies to support START IV.
- Continue assessing potential multilateral strategic arms control verification needs as treaties move from bi-lateral to multi-lateral agreements.
- Conduct adversarial analysis of tools and methodologies developed to ensure that U.S. TMD deployments do not present a realistic threat to strategic nuclear forces of the states parties of the ABM.

Project CA - Strategic Arms Control Technology (cont'd) -
Technology Development ($8.784K)

- Initiate development of information processing system for START III data requirements.
- Continue development of information processing system for ABM/TMD data requirements.
- Continue development of information processing system for ACINS data requirements.
- Continue development of multi-media training.
- Continue development of verification technology, in cooperation with Russian researchers, for identifying, monitoring, and accounting for strategic nuclear weapons.
- Continue development of multi-spectral monitoring techniques, incorporating the best of previously investigated techniques, to provide enhanced and extended capabilities.
- Evaluate and demonstrate tags and tamper indicating devices to assure the integrity of accounts for warheads in storage, in transit to elimination facilities, and during joint dismantlement exhibitions.
- Develop concepts for monitoring closed or constrained nuclear warhead processing facilities and verifying Treaty Accountable Items in storage or in non-deployed locations.
- Develop a facility monitoring system that includes capabilities for data acquisition, processing, authentication, storage, and transfer.
- Continue development of tools for assessing interceptor compliance with the ABM treaty.

CB - Conventional Arms Control Technology - This project covers research, development, test & evaluation (RDT&E) required to: meet on-site and aerial monitoring, transparency, confidence-building, and peacekeeping monitoring technology requirements for existing, emerging, and potential treaties, agreements, and initiatives related to Conventional Arms Control (CAC) and compliance monitoring of peacekeeping regimes; ensure compliance; implement agreements; and provide technical support to negotiations. The funded projects conform to requirements presented and approved by the Office of the Under Secretary of Defense (Acquisition & Technology) through the DoD Arms Control Requirements Assessment Board (RAB) process and described in the Office of the Secretary of Defense (OSD)/Arms Control Implementation and Compliance (ACI&C) Memorandum, dated 1 July 1998, Subject: Guidance, Mission Needs and Summary Requirements. Relevant agreements which require continuing RDT&E support include: (1) the Conventional Armed Forces in Europe (CFE) Treaty, (2) Open Skies (OS) Treaty (projected Entry-Into-Force FY1999); (3) the Organization for Security and Cooperation in Europe (OSCE) Confidence- and Security-Building Measures (CSBMs) contained in Vienna Document 94 (VD-94) to include the Global Exchange of Military Information (GEMI) signed in December 1994 and the OSCE agreements contained in the Lisbon Document of 5 December 1996; (4) the United Nation's Transparency in Armaments (TIA) Agreement established in 1993; and the April 1996 Wassenaar Arrangement on Export Controls for Conventional Arms and Dual Use Goods and Technologies. The RDT&E needs for emerging treaty and agreement areas include: (1) the OSCE Review Conferences, with its OSCE Forum for Security Cooperation (2) the CFE Review Conferences and CFE Adaptation negotiations; (3) regional/sub-regional arms control and peacekeeping to include RDT&E arms control implementation support for the Dayton Agreement and conventional arms proliferation issues; (4) enhancing CSBMs, and (5) the Convention on Certain Conventional Weapons (CCW) and the Anti-Personnel Landmine (APL) negotiations in the Conference on Disarmament and the Ottawa Process. This project also supports U.S. implementation of and compliance with the decisions of consultative commissions, arms control negotiating and coordinating organizations including: the 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

CB - Conventional Arms Control Technology (cont'd) - Working Group on Arms Control and Regional Security; the Wassenaar Arrangement; and the Open Skies Consultative Commission. Decisions in negotiating fora and by coordinating organizations listed above have resulted and will continue to result in new or revised implementation and compliance requirements to which the U.S. must abide. Further, they require technical advice and assessments to support U.S. positions and evaluate proposals to ensure DoD equities are protected. New treaty areas not previously addressed include the APL and expanded regional security and peacekeeping monitoring applications, and Small Arms/Light Weapons measures. This project supports the JCS Warfighting Capability of counterproliferation.

FY 1998 Accomplishments

Technical Assessments ($3.500K)

- Provided treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
- Conducted assessments of technologies to support on-going or emerging conventional arms control negotiations and peacekeeping requirements for monitoring; completed assessment of APL agreements needs.
- Completed a technology survey on APL minefield detection and mapping.
- Held four workshops on identifying DoD equities in the process of APL treaty negotiations.
- Continued analysis of new classes of sensors for modification of the Open Skies regime and other aerial observation regimes.
- Assisted the OSCC Sensors Working Group in the development of standardized Infra-Red Line Scanner (IRLS), video, and Synthetic Aperture Radar (SAR) digital data formats for exchange of imagery.
- Initiated preliminary assessments of international developments regarding the Small Arms/Light Weapons (SA/LW) issue.
- Initiated technical assessment of regional arms control needs for Asia/Pacific Rim, and conducted workshop on regional stability issues.
- Initiated Arms Control Tools and Information Needs Assessment (TINA).
- Evaluated candidate digital video and infrared sensors for U.S. Open Skies implementation.

CB - Conventional Arms Control Technology (cont'd -
Conducted flight tests of candidate infrared sensors.
Completed assessment of OS sensor defocusing filters.
Completed assessment of alternate sensor resolution determination techniques.

Technology Development ($5.410K)
Provided technical support to the U.S. delegations to the Open Skies Consultative Commission (OSCC), the Joint Consultative Group and CFE Adaptation, the Forum for Security Cooperation, the APL negotiation, and regional arms control negotiations.
Continued development of a standard digital format for Open Skies digital sensors data and coordinated the new standard with Russian, German and British counterparts.
Delivered the baseline Open Skies Management and Planning System (OSMAPS) to the On-Site Inspection Agency and other user organizations.
Continued development of the Regional Inspection Simulation Tool (RIST) for use by OSIA/ACDA/State Department, and provided a preliminary RIST prototype for demonstration in the Middle East.
Continued emerging technologies investigations for future treaty requirements through cooperative efforts with industry, academia and the national laboratories.
Updated Compliance Monitoring and Tracking System (CMTS) to comply with decisions of the OSCE Forum for Security Cooperation and the CFE Review Conference.
Delivered Compliance Monitoring and Tracking System (CMTS) Version 5.0.
Conducted concurrent testing of CMTS compliance updates.
Delivered CMTS/Data Management/Notification System (DMNS)/Open Skies Notification System (OSNS)/Data Management and Reporting System (DMRS) documentation and source code.
Initiated development and testing Theater Site Equipment Identification Module to support CFE/CSBM compliance.

FY 1999 Plans

Technical Assessments ($2.800K)
Provide technical support (to include quick turn around and longer term analyses) to

CB - Conventional Arms Control Technology (cont'd) -

the U.S. delegations to the OSCC, the Joint Consultative Group and CFE Adaptation, the Forum for Security Cooperation, the APL negotiation, SA/LW and regional arms control negotiations.

Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.

Conduct assessments of technologies to support on-going or emerging conventional arms control negotiations and peacekeeping requirements for monitoring.

Conduct technical assessment of regional arms control needs for the Middle East region.

Initiate Open Skies sensor performance evaluations.

Initiate assessment of aerial monitoring as a tool to verify multiple treaties, including CFE, CTBT, and environmental agreements.

Provide support for the expansion of the Arms Control Technology Reference and Display Center to include new promising arms control technologies.

Document and maintain prototypes to support current and future conventional arms control agreements.

Initiate Assessment of technologies for wide area detection of APL minefields.

Technology Development ($2.819K)

Continue development of a standard digital format for Open Skies digital sensors data.

Complete planned OSMAPS baseline updates, modifications and independent validation and verification of software.

Continue to develop technologies and prototypes to meet U.S. implementation and compliance requirements.

Conduct independent validation and verification of the development of arms control information processing software.

Continue development of the RIST.

Continue development of Theater Site Equipment Identification Module.

Initiate modifications to DMNS to accommodate CFE Adaptation negotiated agreements.

Initiate development of an improved DMNS/DMS interface to provide a current force structure for the CFE Treaty.

CB - Conventional Arms Control Technology (cont'd) -

Initiate development automated tools for management and reporting of existing and emerging arms control treaties/agreements on a new architecture suggested by the TINA assessment.

Continue emerging technologies investigations for future treaty requirements through industry, academia and national laboratories.

FY 2000 Plans

Technical Assessments ($3.400K)

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

Provide treaty compliance assessments and planning support to OUSD(A&T/ACI&C.

Continue Open Skies performance evaluations, and provide acquisition support for IRLS and video.

Conduct assessments of technologies to support on-going or emerging conventional arms control negotiations.

Conduct technical assessment of regional arms control needs in the Balkans region.

Conduct integrated system feasibility of stand off APL detection and mapping.

Continue aerial monitoring assessment for multi-treaty applications.

Continue the evaluation of new technologies for inclusion in the Arms Control Reference Technology and Display Center.

Document and maintain prototypes to support current and future conventional arms control agreements.

Technology Development ($4.303K)

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 U.S. reporting requirements.

CB - Conventional Arms Control Technology (cont'd) -

- Continue treaty system independent verification and validation to ensure efficient development of arms control information processing software.
- Begin proof-of-concept of follow-on technologies to support implementation and compliance with the future APL agreements.
- Continue Emerging Technologies investigations for future treaty requirements through industry, academia and national laboratories.
- Complete development and deployment of the RIST.
- Initiate development of VERITY Search System to identify international sites and assets within a defined area.
- Continue modifications to DMNS to accommodate CFE Adaptation negotiated agreements.
- Conduct APL sensor demonstrations for the purpose of APL treaty applications.

FY 2001 Plans

Technology Assessment ($3.600K)

- Provide treaty technical support to OSCC, APL/CCW, and other on-going and future treaties support.
- Continue performance evaluation of Open Skies sensors and recommend enhancements as needed.
- Assess CFE treaty needs based on historical performance of inspections.
- Conduct OSMAPS life cycle and mission needs planning.
- Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
- Conduct an assessment to develop the necessary technologies to support changes resulting from the CFE Review Conferences.

Technology Development ($4.256K)

- Develop an aerial monitoring system to verify multiple treaties and agreements.
- Complete the development of the extended digital processor.
- Support emerging technology development.
- Build a prototype of an APL Safe Detection system to comply with APL treaties.
- Initiate OSMAPS life cycle upgrades and perform independent verifications and validation.

CB - Conventional Arms Control Technology (cont'd) -

Complete development of VERITY Search System and deliver final documentation and source code.

Complete development of an improved DMNS/DMS interface and deliver final documentation and source code.

Continue APL Ban information system development to satisfy U.S. reporting requirements.

Continue development of an automated tool for management and reporting of existing and emerging arms control treaty/agreements on a new architecture defined by the tools and information needs assessment.

Continue deployment and adaptation of RIST and its subsequent modules.

Project CC - Chemical/Biological Arms Control Technology - This project funds research, development, test and evaluation (RDT&E) necessary to meet DoD requirements for the implementation of chemical and biological arms control agreements and technical analyses to support and protect DoD equities in the negotiation and review of arms control agreements. The DoD requirements are documented in OUSD(A&T)/ATSD(NCB) "Program Guidance, Mission Needs and Requirements Summary", dated 6 February 1997. The primary focus in this project has been and continues to be preparing for international verification of, and U.S. compliance with, the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on their Destruction (CWC). This project develops and validates technologies to ensure that on-site sampling and analysis is effective and that DoD equities are protected during the course of all CWC inspections. The focus is on sample screening, sample preparation and analytical equipment and procedures which are accurate without revealing sensitive DoD information. Technologies developed to support DoD in its implementation of the CWC, synergistically support both the U.S.-Russian chemical weapons Bilateral Destruction Agreement and international peacekeeping efforts such as the UN Special Commission on Iraq. The U.S. policy with respect to the Biological Weapons Convention (BWC), as articulated by President Clinton during his January 1998 State of the Union address, is to, "…strengthen that treaty with an international inspection system to help detect and deter cheating." Towards that end this project provides for technical assessments, the development of on-site analysis technologies, and the design and development of a BWC data management and declaration system. The assessments assist DoD and U.S. policy makers and negotiators in determining the impact of proposed inspection methodologies and requirements on DoD equities. Additionally, the assessments assist negotiators in their preparation for and during BWC Ad Hoc Group meetings where the BWC Protocol is being developed. RDT&E for on-site identification and analysis technologies are essential for ensuring that the development of a strengthened inspection system is balanced against the need to protect legitimate DoD/U.S. equities. It is probable that a mandatory BWC declaration, with distinct similarities to the existing voluntary BWC confidence building measures, will be an integral part of an international inspection system. This project provides for the

Project CC - Chemical/Biological Arms Control Technology (cont'd) - development of data management and declaration systems that support this requirement. Finally, the project also provides technical assessments of transparency measures considered as part of planned exchange visits among the US/UK/Russia, in accordance with the 1992 Trilateral Statement. The objective of this statement is to resolve ambiguities in compliance with the BWC while promoting transparency of legitimate military BW defense programs.

This project descriptive plan supports the JCS Joint Warfighting Capability of counterproliferation.

FY 1998 Accomplishments

Technical Assessments ($3.200K)

Chemical:

Provided technical support to OSD representatives in a variety of international chemical and biological arms control fora.

Initiated independent analytical peer review on the Swept Frequency Acoustic Interferometer (SFAI).

Initiated independent testing and validation of Flow Injection Trace Gas Analyzer (FITGA).

Delivered CW treaty reference collection.

Initiated independent testing and validation of MicroSpot Screening Kit.

Biological:

Provided technical support to OSD representatives during negotiation of the Biological Weapons Convention (BWC) Protocol.

Updated the biological weapons (BW) History Database and enhanced its usability.

Completed report on the utility of environmental sampling and analysis for biological agents.

Hosted US/UK DoD/MoD discussions on potential BWC investigation/visit scenarios.

Developed BWC protocol vulnerability assessments for use during BWC Ad Hoc Group meetings.

Identified potential requirement for a distributed DoD BWC declaration information management system.

Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Continued development of the Agents of Biological Origin (ABO) Library.
Completed study of technologies for on-site biological detection and identification.
Reviewed and assessed on-site sampling and analysis technologies developed by Porton Down, UK for the identification of biological agents.

Technology Development ($6.166K)

Chemical:
Initiated field-testing of SFAI.
Updated hardware display and software algorithm for SFAI.
In collaboration with Finland, updated the analytical method for sample preparation to facilitate Chemical Weapons Convention (CWC) inspection and verification efforts.
Developed FITGA prototype for validation.
Incorporated dual generator system into Supercritical Fluid Extraction (SFE) system.
Developed and fielded software upgrades for Chemical Accountability Management Information Network (CAMIN) and commenced its turnover to the Army.
Develop algorithms for chemical class identification and use of retention indices to incorporate into GC/MS Automated Chemical Identification Software (AMDIS).
Delivered source code and documentation for CAMIN Version 4.0.
Successfully tested CAMIN Version 5.0 software release.

FY 1999 Plans

Technical Assessments ($2.300K)

Chemical:
Conduct peer review for Capillary Ion Electrophoresis (CIE) and Rapid Sample Screening.
Evaluate suitability of Ion Mobility Spectroscopy for CW analysis.
Assess current gaps in existing sampling and analysis methods.
Assess follow-on Non-Destructive Evaluation (NDE) technologies.

Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Biological:
Identify support required to fulfill DoD's BWC data processing needs.
Maintain and update BW History Data base to include U.S. BW defense program.
Continue providing technical support to OSD(P) for negotiating the BWC Protocol.
Conduct technical analyses and DoD vulnerability assessments on implementing the BWC protocol and visits to Military Biological Facilities (MBF) under the Trilateral Statement.
Determine system requirements for developing a data management system of BWC related reference material (e.g., agents of biological origin, BW manufacturing and dispersal techniques).
Provide quick reaction technical support to OSD(P) in support of BWC negotiations.
Conduct analytical peer review of BW on-site analysis technologies and methodologies.

Technology Development ($6.404K)

Chemical:
Conduct alpha testing of AMDIS Version 2.0.
Improve AMDIS to facilitate identification by chemical class and retention index estimation.
Develop methods for CIE and Rapid Sample Screening.
Complete source code and documentation for CAMIN.
Develop automated QA/QC for AMDIS.
Initiate technology transfer for SFE and FITGA.
Commence development of standoff acoustic based NDE equipment.
Design, develop, and implement a CD-based multimedia training curriculum for users and operators of CAMIN.

Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Upgrade information processing capabilities and data management techniques to satisfy reporting requirements for the CWC.

Biological:

Provide information processing capabilities and data management techniques to satisfy reporting requirements for the BWC.

Test and evaluate analytical equipment and methods to assess their operational performance, environmental durability, safety and overall effectiveness.

Develop a data management system of BWC related reference material.

FY 2000 Plans

Technical Assessments ($3.100K)

Chemical:

Review rapid GC, with new detectors and other alternative technologies for determinative analysis.

Evaluate Surface Acoustic Wave (SAW) devices.

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

Identify site and facilities building assets for specified area of intent to conduct challenge inspections.

Biological:

Update BW History on-line database improving user responsiveness.

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

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

Technology Development ($7.345K)

Chemical:

Conduct beta testing of AMDIS Version 2.0.

Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Develop enhanced time efficient sample screening methods for on-site inspections.
Integrate inspection methods and equipment to optimize throughput of samples, utilizing commercial off-the-shelf (COTS) equipment.
Continue development of follow-on NDE capabilities for standoff munition classification, identification, and quantification.
Biological:
Conduct technology integration for on-site analytical equipment and methodologies.
Test and evaluate analytical equipment and methods to assess operational performance, environmental durability, safety and overall effectiveness.
Develop a distributed DoD data management system for compiling and submitting BWC declarations.

FY 2001 Plans

Technical Assessments ($3.100K)

Chemical:
Define user and system requirements for new generation of analytical equipment to identify software requirements.
Evaluate advanced Mass Spectrometry technology.
Evaluate implications and consequences for DoD of potential changes to the CWC scheduled chemicals and verification technology made by the CWC Review Conference (REVCON).
Biological:
Provide technical support to OSD(P) in preparation for BWC Review Conference (REVCON).

Technology Development ($9.270K)

Chemical:
Commence development of GC/MS follow-on technology capable of determinative analysis.
Continue testing and evaluating inspection equipment for performance, ruggedness, safety, and effectiveness.
Develop alternative technologies for determinative analysis.

Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Biological:

Revise and enhance on-site BW determinative analysis technologies and methodologies based on BWC PrepCom requirements.

Update a distributed DoD data management system for compiling and submitting BWC declarations based on PrepCom requirements.

Test and evaluate on-site analytical equipment and methods to assess their efficacy and efficiency based on PrepCom and anticipated REVCON requirements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE **February 1999**
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/Advanced Technology Development - BA3**	R-1 ITEM NOMENCLATURE **Verification Technology Demonstration; 0603711BR**

Project CD - Nuclear Arms Control Technology – This Program Element (PE) includes those activities necessary to conduct a comprehensive and integrated DoD researchand development program to support preparation, implementation, compliance, and verification of agreements limiting nuclear testing such as the Comprehensive Test Ban Treaty (CTBT); execution of those tasks associated with the Nuclear Non-proliferation treaty and the international Fissile Materials Control agreements; those tasks that arise form the bilateral fissile materials control agreements that evolve under the auspices of the Safeguards, Transparency, and Irreversibility efforts; and those activities related to research and development in support of international cooperation in nuclear monitoring capabilities.

Specific activities include following:

U.S. Monitoring Stations - This program will enable the U.S. to independently monitor and detect nuclear test activities worldwide and fulfill its obligations under the CTBT. The Treaty will require the U.S. to contribute 40 stations and data exchange to the IMS. This funding supports R&D and prototyping for the four technologies required by the treaty.

Data Analysis Systems – Major elements include developing, prototyping, and transition an International Data Center that will have the capability to acquire, archive, process, and analyze data from approximately 320 IMS sensor stations positioned around globe, and to disseminate raw data products to all States Parties; initiating a variety of new activities associated with the transition to the Vienna facilities of the CTBTO; andnew initiatives to develop technology required for U.S. monitoring and compliance activities. This system allows U.S. a processing capability from a large number of cooperating facilities that critical to achieving low-levels of detection in remote parts of the world.

Project CD - Nuclear Arms Control Technology (cont'd) -

U.S. Verification Systems Support - The U.S. must develop, integrate, test, and evaluate an interface to the international CTBT organization to support routing of data between U.S. facilities and the IDC; to support the U.S. National Authority in the execution of Treaty related exchanges and decisions; and to function as a backup data archive and research analysis center. This funding supports initial prototyping of the National Authority interface.

Basic Research - The U.S. agreement to a zero-yield CTBT is contingent upon the capability to independently monitor nuclear activities worldwide. Understanding, processing, and analyzing monitoring data and providing actionable information based on these data and products will require significant basic research and exploratory development in the areas of seismic, hydroacoustic, infrasound, and radionuclide monitoring. This R&D work has no parallel in other arms control treaties. This effort requires an understanding of geophysical and physical phenomena that have not yet been studied or understood but must be developed if the treaty is to be successfully monitored. The objectives of the R&D program are to enhance monitoring capabilities to meet current limited nuclear testing agreements' standards at decreasing cost over time and to enhance monitoring capabilities to detect potential violators.

Implementation/Compliance Support - The DoD must facilitate the transfer of technicaldata and information from the nuclear monitoring R&D program to the interagency and U.S. delegation for arms control impact analysis, including verification and verification technology requirements; implementation planning and oversight; treaty compliance reviews; coordination and R&D program support; education; and management information system (MIS) support for arms control-related data bases. This funding supports technical analysis, technology demonstration plans, test plans, etc. in anticipation of requirements based on the current monitoring and verification technologies needed by the CTBT Preparatory Commission or any other R&D programs related to the CTBT.

Project CD - Nuclear Arms Control Technology (cont'd) -
FY 1998 Accomplishments

U.S. Monitoring Stations ($4.400K)
- Repaired Wake Island hydroacoustic station.
- Installed prototype radionuclide aerosol samplers.
- Installed research seismic array at NTS.
- Tested and evaluated infrasound sensors.
- Started development of xenon radionuclide sensors.

Data Analysis Systems ($26.900K)
- Integrated proven seismic, hydroacoustic, infrasound, and radionuclide data exploitation techniques into the automated and interactive systems.
- Transitioned the prototype IDC systems version 1 to the international CTBT organization.
- Continued developing upgrades to increase the prototype IDC capability to support on-going R&D.

U.S. Verification Systems Support ($1.876K)
- Started development of U.S. Data Routing protocol and interface with IDC.
- Started development of tools and methodologies to support National Authority.

Basic Research ($16.400K)
- Continued research and development of new methods for enhancing detection, location, screening, and identification for seismic, oceanic and atmospheric events.
- Continued developing computerized, rapidly executing techniques and algorithms to detect, locate, and identify seismic, acoustic and gases signals from operational sensor systems.
- Continued research and development to improve understanding of source phenomenology and propagation for events near detection threshold.

Implementation/Compliance Support ($4.500K)
- Conducted analysis and assessments of selected CTBT implementation and compliance issues.

Project CD - Nuclear Arms Control Technology (cont'd) -
Developed the types of information to be presented to policy/decision makers.
Developed cost effective techniques for arms control related databases.

FY 1999 Plans
U.S. Monitoring Stations ($.500K)
Maintain and operate existing stations.
Continue station certification with CTBT Organization.
Data Analysis Systems ($13.600K)
Integrate proven seismic, hydroacoustic, infrasound, and radionuclide data exploitation techniques into the automated and interactive systems.
Continue transition of the prototype IDC systems Version 2 and 3 to the international CTBT organization.
Validate prototype for initial operational testing and evaluation.
Develop upgrades to increase the prototype IDC capability to support on-going R&D.
U.S. Verification Systems Support ($3.700K)
Continue the development of U.S. Multi-tasking Data Routing protocol and interface with IDC and exercise and evaluate the procedures.
Develop enhanced tools and methodologies to support verification.
Basic Research ($8.500K)
Continue to derive new methods for enhancing detection, location, screening, and identification of seismic, oceanic, and atmospheric events.
Continue to develop computerized, rapidly executing techniques and algorithms to detect, locate, and identify seismic, acoustic and gases signals from operational sensor systems.
Continue research and development to improved understanding of source phenomenology and propagation for events near detection threshold.

Project CD - Nuclear Arms Control Technology (cont'd) -
Implementation/Compliance Support ($.289K)
- Identify CTBT implementation and compliance issues.
- Develop the types of information to be presented to policy and decision makers in support of interagency and international groups.
- Develop cost effective techniques for arms control related databases.

Nuclear Detection Sensors ($10.000K)
- Develop innovative nuclear detection and analysis technology in accordance with Congressional emphasis on supporting nuclear treaty verification and compliance.

FY 2000 Plans
U.S. Monitoring Stations ($5.500K)
- Initiate test and evaluate prototype seismic stations.
- Initiate test and validation of infrasound sensors.
- Initiate prototype radionuclide sensors.
- Continue certification of monitoring stations.

Data Analysis Systems ($10.000K)
- Continue transition of the prototype IDC systems with delivery of version 4 software to the international CTBT organization.
- Conduct validation of operational test and evaluation of software releases for IDC systems.
- Develop upgrades to increase the prototype IDC capability to support on-going R&D.

U.S. Verification Systems Support ($5.000K)
- Integrate enhanced tools to support National Authority.
- Continue research and development efforts in support of the National Authority and National Data Center.

Basic Research ($7.900K)
- Develop cost effective methods for enhancing detection, location, screening, and identification of underground, oceanic, and atmospheric events through a peer-reviewed program of basic research.

Project CD - Nuclear Arms Control Technology (cont'd) -

Develop cost effective computerized, rapidly executing techniques and algorithms to detect, locate, and identify seismic, acoustic and gases signals from operational sensor systems.

Continue research and development to improve understanding of source phenomenology and propagation for events near detection threshold.

Implementation/Compliance Support ($2.129K)

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

Develop decision making tools for policy and decision makers to support interagency and international groups.

Develop cost effective techniques for arms control related databases.

FY 2001 Plans

U.S. Monitoring Stations ($0.900K)

Complete test and evaluation of Wake Island prototype digital station.

Complete test and evaluate prototype seismic stations.

Prototype new hydroacoustic technology at Wake Island station.

Complete test and validation of infrasound sensors.

Complete prototype radionuclide sensors.

Complete certification of monitoring stations.

Data Analysis Systems ($7.000K)

Complete transition of the prototype IDC systems to the international CTBT organization.

Conduct validation of operational test and evaluation of software releases for IDC systems.

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

U.S. Verification Systems Support ($6.000K)

Continue research and development efforts in support of the National Authority and National Data Center.

Project CD - Nuclear Arms Control Technology (cont'd) -

Provide technical support to the National Authority as events require.

Basic Research ($8.200K)

Develop cost effective methods for enhancing detection, location, screening, and identification of underground, oceanic, and atmospheric events through a peer-reviewed program of basic research.

Develop cost effective computerized, rapidly executing techniques and algorithms to detect, locate, and identify seismic, acoustic and gases signals from operational sensor systems.

Continue research and develop improved understanding of source phenomenology and propagation for events near detection threshold.

Implementation/Compliance Support ($2.115K)

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

Develop decision making tools for policy and decision makers to support interagency and international groups.

Develop cost effective techniques for arms control related databases.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE **February 1999**
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/Advanced Technology Development - BA3**	R-1 ITEM NOMENCLATURE **Verification Technology Demonstration; 0603711BR**

B. Program Change Summary	FY1998	FY1999	FY2000	FY2001
Previous President's Budget	80.8	63.0	60.4	59.3
Current President's Budget	80.2	57.3	58.5	55.3

Change Summary Explanation:

In accordance with the November 1997 Defense Reform Initiative, resources for FY1999 and out which were previously addressed in PE 0603711H have been transferred to this PE. FY 1999 program reflects added emphasis in the area of nuclear detection systems.

C. Other Program Funding Summary

	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
0603711H Verification Technology Demonstration	80.2	0.0	0.0	0.0	0.0	0.0

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/RDT&E Management Support - BA6					R-1 ITEM NOMENCLATURE Critical Technology Support PE 0605110BR				
COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete
Total Program Element (PE) Cost	0.0	0.0	2.215	2.103	2.308	2.223	2.256	2.311	Continuing
Critical Technologies Program DA	0.0	0.0	2.215	2.103	2.308	2.223	2.256	2.311	Continuing

A. Mission Description and Budget Item Justification

This program element supports development and publication of the Congressionally mandated Militarily Critical Technologies List (MCTL). The MCTL is the fundamental source document for identification of leading edge and current technologies which must be monitored and assessed world-wide for national security and nonproliferation control of weapons of mass destruction and advanced conventional weapons. Efforts encompass:

- Continuous technical support to interdepartmental and international processes which develop multinational control agreements on technologies of concern to DOD.
- Foreign technology assessments for the MCTL and other critical technologies efforts.
- Identification and determination of technical parameters for proposals for international control of weapons of mass destruction.
- Technical assessments to support treaty compliance inspections and decisions on foreign ownership of US industrial assets.
- Identification of foreign technologies of interest to the DOD and develops opportunities for international cooperative research and development.

Mission Description and Budget Item Justification (cont'd) - This program element is responsive to time critical requirements established in interdepartmental and international processes required to meet Congressional mandates to identify, control, transfer and develop militarily critical technologies.

1998 Accomplishments
Funding and activities accomplished under PE 0605110D8Z.

FY 1999 Plans
Funding and activities will be accomplished under PE 0605110T. The DCSA will reimburse DTRA for FY 1999 activities.

FY 2000 Plans
Develop and publish updated MCTL Parts I, II and III in both hard copy and electronic versions incorporating results of the assessments completed in FY 1999 and changes in multinational control regimes. ($1,215K)

Monitor and assess dual use and military technologies worldwide and develop technology assessments to support national military and economic security actions and identify candidate technologies for applications in US weapon systems. These assessments will reflect security concerns, effects of the proliferation of weapons of mass destruction and the rapid advancement of technology worldwide. ($900K)

Develop proposals for international control/decontrol of technologies for multinational negotiations for the Wassenaar Arrangement, Nuclear and Biological Warfare/Chemical Warfare (BW/CW) export control regimes. ($100K)

FY 2001 Plans

Develop and publish updated MCTL Parts I, II and III in both hard copy and electronic versions incorporating results of the assessments completed in FY 2000 and changes in multinational control regimes. ($1,103K)

Monitor and assess dual use and military technologies worldwide and develop technology assessments to support national military and economic security actions and identify candidate technologies for applications in US weapon systems. These assessments will reflect security concerns, effects of the proliferation of weapons of mass destruction and the rapid advancement of technology worldwide. ($900K)

Continue to develop proposals for international control/decontrol of technologies for multinational negotiations for the Wassenaar Arrangement, Nuclear and (BW/CW) export control regimes. ($100K)

B. Program Change Summary

	FY1998	FY1999	FY2000	FY2001
Previous President's Budget	0.0	0.0	0.0	0.0
Current President's Budget	0.0	0.0	2.215	2.103

Change Summary Explanation:

The November 1997 Defense Reform Initiative (DRI) transferred responsibility for this program from the Office of the Under Secretary (Acquisition and Technology) to DTRA. The associated funding remained in Defense Security Cooperation Agency. The transfer of resources for FY 2000 and out from PE 0605110T reflects the administrative transfer to accommodate the DRI decisions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-wide/RDT&E Management Support - BA6**	**R-1 ITEM NOMENCLATURE** **Critical Technology Support** **PE 0605110BR**

C. Other Program Funding Summary

	FY1998	FY1999	FY2000	FY2001
0605110D8Z Critical Technology Support P204	2.6			
0605110T Critical Technology Support P204		2.6		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE **February 1999**	
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/RDT&E Management Support – BA6**					R-1 ITEM NOMENCLATURE **Counterproliferation Support; 0605160BR**				
Cost *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete
Total 0605160BR Cost	0.0	9.3	5.3	4.6	4.8	5.1	5.2	5.4	Continuing
Project P542 CP Architecture Studies and Management Oversight	0.0	7.3	5.3	4.6	4.8	5.1	5.2	5.4	Continuing
Project P545 Nuclear Matters	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	Transferred

A. Mission Description and Budget Item Justification - In August 1994, DoD established the Counterproliferation Support Program specifically to address the DoD shortfalls in counterproliferation operational capabilities documented in the May 1994 Report to Congress titled *Report on Nonproliferation and Counterproliferation Activities and Programs*. Counterproliferation Support Program funds are used to leverage DoD acquisition programs to meet the counterproliferation priorities of the Commanders-in-Chief (CINCs) of the Combatant Commands and accelerate the deployment of enhanced capabilities to the field. Specifically, the goal of the Counterproliferation Support Program is to improve specific military counterproliferation capabilities by (1) building on ongoing programs in the Services, DoD agencies, Department of Energy and US Intelligence; (2) focusing on the most critical counterproliferation shortfalls to address major gaps in deployed capabilities (as reflected in the CINCs' priorities and the Counterproliferation Review Committee's (CPRC) prioritized list of counterproliferation Areas for Capability Enhancements); (3) leveraging existing program funding to more rapidly field capabilities by accelerating the deliverables of DoD programs; (4) identifying and enhancing the development of high payoff technologies to accelerate capabilities to the warfighter; (5) identifying and promoting key non-material initiatives that complement technological advances; (6) transitioning Counterproliferation Support Program projects to the Services as soon as practicable; and (7) procuring counterproliferation unique development products for the CINCs.

Mission Description and Budget Item Justification (cont'd) -
Counterproliferation (CP) is the activities in DoD to combat the spread of nuclear, biological, and chemical (NBC) weapons and their means of delivery. These activities include arms and export control, intelligence collection and analysis, counterforce, active defense, passive defense, and consequence management. Effective in October 1998, DoD created a single agency, the Defense Threat Reduction Agency (DTRA), who is responsible for all the counterproliferation activities except active defense and intelligence. The DTRA now manages the Counterproliferation Support Program. The focusing of counterproliferation activities in DTRA will improve integration and further leverage capabilities for the warfighter. The funds in this program element support requirement identification; monitoring the technology base for exploitation; oversight/management for the Counterproliferation Support Program; studies and technical analyses to determine the best combination of technologies, acquisition programs, doctrine and concepts of operation to provide CINCs' required capabilities; and CP investment strategy (master plan) development.

After FY 1999, Project 545, Nuclear Matters, is transferred to DDR&E where the management responsibilities remain.

Project P542 – Counterproliferation Architecture Studies and Management/Oversight - The Defense Threat Reduction Agency (DTRA) has been designated by the Secretary of Defense as the focal point for counterproliferation (CP) activities. The CP Support Program provides this focus of activities within the DoD. This project provides essential technical, architectural and integration support to the CP Support 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 the critical support necessary to support the DTRA in conducting the day-to-day operation of the CP Support Program and in providing the necessary management oversight.

FY 1998 Accomplishments
Funding and activities accomplished under PE 0605160D8Z.

FY 1999 Plans
System Engineering and Technical Analysis ($3,360K)
- Identify and integrate warfighters' CP requirements.
- Develop and maintain a CP master plan for DoD.
- Support CP technical analyses and technical program oversight.
- Coordinate CP interagency program and integrate activities (CPRC, Nonproliferation and Arms Control Technology Working Group).
- Deliver the CPRC Annual Report to Congress.
- Participate in CINC exercises to demonstrate the value added from new CP capabilities.
- Support PA&E and Joint Staff analysis for NBC weapons effects on a US campaign.

Conduct CP architectural studies and technical assessments ($3,935K)
- Conduct trade-off analyses of contributions of selected DoD acquisition efforts to DoD counterproliferation capabilities.
  - Assess technology needs to enable US forces to engage and defeat potential adversaries who proliferate NBC weapons.

Project P542 Counterproliferation Architecture Studies and Management/Oversight (cont'd) -
- Assess hard target kill technologies including mission planning tools, battle damage assessment and intelligence preparation of the battlefield.
- Assess first responder/SOF CP technology needs.

Monitor the technology base for exploitation.
Support the warfighter by identifying non-material solutions and delivering material solutions to required CP capabilities.
Define and plan for new advanced concept technology demonstrations to meet CINC needs.
Continue CP Capabilities Working Group.

FY 2000 Plans

Warfighters' CP requirements ($2,304K)
Develop and maintain a CP master plan for DoD.
Support CP technical analyses and technical program oversight.
Coordinate CP interagency program and integrate activities (CPRC, Nonproliferation and Arms Control Technology Working Group).
Deliver the CPRC Annual Report to Congress.
Participate in CINC exercises to demonstrate the valued added from new CP capabilities.

Conduct CP architectural studies and technical assessments ($3,011K)
Conduct trade-off analyses of contributions of selected DoD acquisition efforts to DoD counterproliferation capabilities.
- Assess new Service technology areas to support CP activities.
- Assess CP technologies for exploitation and inclusion in the CP master plan.

Monitor the technology base for exploitation.
Support the warfighter by identifying non-material solutions and delivering material solutions to required CP capabilities.
Define and plan for new advanced concept technology demonstrations to meet CINC needs.
Continue CP Capabilities Working Group.

Project P542 Counterproliferation Architecture Studies and Management/Oversight (cont'd) - FY 2001 Plans

Warfighters' CP requirements ($1,373K)

- Develop and maintain a CP master plan for DoD.
- Support CP technical analyses and technical program oversight.
- Coordinate CP interagency program and integrate activities (CPRC, Nonproliferation and Arms Control Technology Working Group).
- Deliver the CPRC Annual Report to Congress.
- Participate in CINC exercises to demonstrate the valued added from new CP capabilities.

Conduct CP architectural studies and technical assessments ($3,256K)

- Conduct trade-off analyses of contributions of selected DoD acquisition efforts to DoD counterproliferation capabilities.
  - Assess technologies supporting CINC CP priority capability needs.
  - Assess technologies for inclusion in a follow-on advanced concept technology demonstration.
- Monitor the technology base for exploitation.
- Support the warfighter by identifying non-material solutions and delivering material solutions to required CP capabilities.
- Define and plan for new advanced concept technology demonstrations to meet CINC needs.
- Continue CP Capabilities Working Group.

Project P545 - Nuclear Matters - Nuclear weapons receive special consideration within OSD because of the political and military importance, their destructive power and the potential consequences of an accident or an unauthorized act. Consequently, nuclear weapons issues must receive senior level attention and action/support. Complex and demanding issues exist pertaining to stockpile levels and stockpile maintenance and stewardship in collaboration with the Department of Energy, especially in view of an aging stockpile and the moratorium on underground nuclear testing. Project 545 provides support for analysis and assessments of issues associated with the reliability, safety, security, transportation, command and control, maintenance, storage and sustainability of the enduring stockpile.

FY 1998 Accomplishments
Funding and activities accomplished under PE 0605160D8Z.

FY 1999 Plans
Nuclear Matters ($2,012K)
- DoD oversight of DOE stockpile stewardship activities.
- Nuclear Weapons Council support.
- Support activities of CP in the conduct of international foray.
- Support to DoD policy formulation on nuclear weapons safety, use control, survivability, certification, transportation and reliability.
- Analyses and support activities for senior level advisory groups.

FY 2000 Plans
Funding and activities transferred to PE 0605160D8Z.

FY 2001 Plans
Funding and activities transferred to PE 0605160D8Z.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE **February 1999**
APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/RDT&E Management Support – BA6**	R-1 ITEM NOMENCLATURE **Counterproliferation Support; 0605160BR**

B. Project Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous President's Budget	0	9.9	9.7	10.3	Continuing
Current President's Budget	0	9.3	5.3	4.6	Continuing

Funds for Project P545, Nuclear Matters, were transferred to DDR&E into PE 0605160D8Z where the management responsibilities remain and to PE 0603160BR to fund SOCOM requirements.

C. Other Program Funding Summary:

	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005
PE 0605160D8Z, Counterproliferation Management Support P545	1.3	0	0	0	0	0	0	0