(11)

UNCLASSIFIED

(White Book)

Amended FY 1992/FY 1993 Biennial Budget Estimates

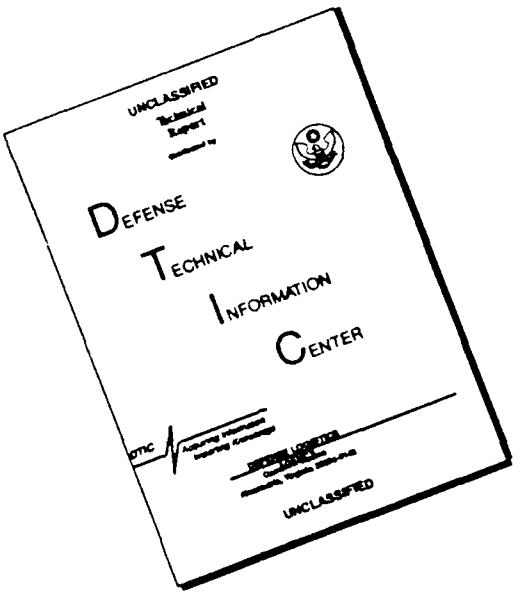
Program Document

Research, Development, Test and Evaluation, Defense Agencies (U)

(Supports Congressional Budget Estimates)
January 1992

UNCLASSIFIED

DISCLAIMER NOTICE



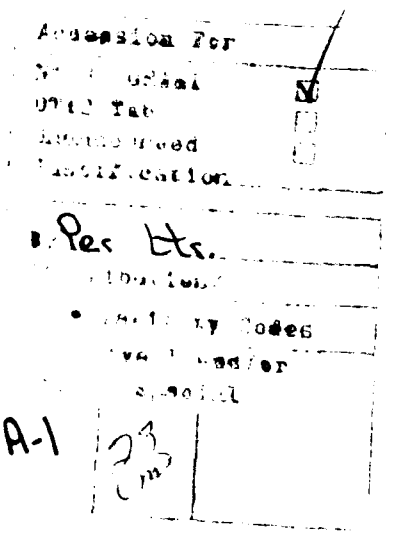
THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

AMENDED FY 1992/FY 1993 BIENNIAL BUDGET ESTIMATES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION DESCRIPTIVE SUMMARIES

DEFENSE NUCLEAR AGENCY

JANUARY 1992



Descriptive Summaries for Program Elements of the Defense Nuclear Agency Research and Development Program

FY 1992/FY 1993

January 1992

1. General. This document has been prepared to provide information on the Defense Nuclear Agency Research, Development, Test and Evaluation (RDT&E) Program to Congressional committees during the FY 1993 hearings. Summaries provide narrative information on all RDT&E Program Elements and projects.

2. Comparison of FY 1991 and FY 1992 Data. A direct comparison of FY 1991 and FY 1992 data in the Program Element Descriptive Summaries dated February 1991, will reveal significant differences. Many of the differences are attributable to the following factors:

a. Program Element #0602109H Superconductive Magnetic Energy Storage: This program element was increased by $10 million in FY 1991 and $40 million in FY 1992 as a result of Congressional action.

b. Program Element #0602715H Defense Nuclear Agency: This program element was increased by $1.1 million in FY 1991 as a result of funding changes subsequent to February 1991, including below threshold reprogramming. The FY 1992 decrease of $75.1 million is a result of Congressional action on the appropriation and Department of Defense (DoD) undistributed reductions.

c. Program Element #0603711H Verification Technology Demonstration: This program element was decreased by $1.5 million in FY 1991 as a result of funding changes subsequent to February 1991, including below threshold reprogramming. The FY 1992 decrease of $.9 million is a result of Congressional action implemented by DoD.

3. Relationship of FY 1993 Budget Structure to the FY 1992 Budget Approved by Congress. All program elements contained in this submission appear on the Base for Reprogramming Action (DD Form 1414) for RDT&E Defense Nuclear Agency, which was prepared pursuant to final Congressional action on the FY 1992 DoD Budget Submission to Congress.

4. Classification. This document is unclassified.

DEFENSE NUCLEAR AGENCY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES

ALPHABETICAL INDEX

DEFENSE NUCLEAR AGENCY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES

R-1 LINE ITEM ORDER INDEX

DEFENSE NUCLEAR AGENCY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES

SUMMARY BY RESEARCH CATEGORY
($ in Thousands)

(THIS SUMMARY IS UNCLASSIFIED)

	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997
6.1 Research							
6.2 Exploratory Development	341,454	406,054	409,957	427,757	451,475	468,430	476,094
6.3 Advanced Development	105,050	82,330	67,079	62,361	65,460	57,253	57,945
6.4 Engineering Development							
6.5 Management and Support							
Total Research & Development (Program 6)							
Total Operational Systems Program							
Total RDT&E - Direct	446,504	488,384	477,036	490,118	516,935	525,683	534,039
Reimbursement	9,200	16,000	16,600	14,300	15,800	15,500	15,500
Total Program	455,704	504,384	493,636	504,418	532,735	541,183	549,539

DEFENSE NUCLEAR AGENCY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES

SUMMARY BY BUDGET ACTIVITY
($ in Thousands)

(THIS SUMMARY IS UNCLASSIFIED)

	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997
1. Technology Base	341,454	406,054	409,957	427,757	451,475	468,430	476,094
2. Advanced Technology Development							
3. Strategic Programs	105,050	82,330	67,079	62,361	65,460	57,253	57,945
4. Tactical Programs							
5. Intelligence and Communications							
6. Defense Wide Mission Support							
Total RDT&E - Direct	446,504	488,384	477,036	490,118	516,935	525,683	534,039
Reimbursement	9,200	16,000	16,600	14,300	15,800	15,500	15,500
Total Program	455,704	504,384	493,636	504,418	532,735	541,183	549,539

R-1

DEFENSE NUCLEAR AGENCY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES

DETAIL BY BUDGET ACTIVITY
($ in Thousands)

(THIS SUMMARY IS UNCLASSIFIED)

	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997
1. Technology Base							
6.2 0602109H Superconductive Magnetic Energy Storage	15,000	40,000	- 0-	- 0 -	- 0 -	- 0 -	- 0 -
6.2 0602715H Defense Nuclear Agency	326,454	366,054	409,957	427,757	451,475	468,430	476,094
3. Strategic							
6.3 0603711H Verification Technology Demonstration	105,050	82,330	67,079	62,361	65,460	57,253	57,945
Total RDT&E - Direct	446,504	488,384	477,036	490,118	516,935	525,683	534,039

DEFENSE NUCLEAR AGENCY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES

SUMMARY BY FYDP PROGRAM
($ in Thousands)

(THIS SUMMARY IS UNCLASSIFIED)

FYDP PROGRAM	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997
0602109H Superconductive Magnetic Energy Storage	15,000	40,000	- 0-	- 0 -	- 0 -	- 0 -	- 0 -
0602715H Defense Nuclear Agency	326,454	366,054	409,957	427,757	451,475	468,430	476,094
0603711H Verification Technology Demonstration	105,050	82,330	67,079	62,361	65,460	57,253	57,945
Total RDT&E - Direct	446,504	488,384	477,036	490,118	516,935	525,683	534,039
Reimbursement	9,200	16,000	16,600	14,300	15,800	15,500	15,500
TOTAL PROGRAM	455,704	504,384	493,636	504,418	532,735	541,183	549,539

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602109H Budget Activity: Technology Base
PE Title: Superconductive Magnetic Energy Storage (SMES)

A. RESOURCES: ($ In Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Superconductive Magnetic Energy Storage (SMES)	15,000	40,000	- 0 -	- 0 -	- 0 -

B. BRIEF DESCRIPTION OF ELEMENT: This program had the goal of demonstrating the feasibility of Superconductive Magnetic Energy Storage (SMES) as a power supply for a ground-based directed energy weapon. The first phase ended with the development of two conceptual designs for an Engineering Test Model (ETM), the demonstration of the feasibility of key elements of the technology, and the identification of five possible sites for locating the ETM. The Department of Defense terminated the SMES program in FY 1991 because of changing priorities in the Strategic Defense Initiative. Congress has directed the initiation of a new SMES program in FY 1992 and appropriated $40 million. Congress also directed that the plan for SMES development be coordinated with the Department of Energy (DoE) and civilian industry. The plan will focus on revalidating the approach for technology demonstration of the SMES concept, identifying measures for reducing technology risk, and transitioning program oversight to the Department of Energy (DoE) in FY 1993.

C. JUSTIFICATION FOR PROGRAM:
FY 1991 Accomplishments:
- Completed review and analysis of Phase I efforts.
- Completed Phase I contract close-out.
- Environmental impact studies initiated.
- Documented Phase I experimental and test results.
- Initiated ETM cost model.

FY 1992 Plans:
- Continue SMES ETM environmental impact studies supporting site selection.
- Develop SMES technology demonstration plan.

Work Performed By: David Taylor Research Center, Annapolis, MD; Wright Laboratories, Dayton, OH; National Institute of Standards and Technology, Boulder, CO; Oak Ridge National Laboratory, Oak Ridge, TN; Bechtel National Inc., San Francisco, CA; Ebasco Services Inc., New York City, NY.

Related Activities: None.

Other Appropriation Funds: None

International Cooperative Agreements: None.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
Budget Activity: Technology Base
PE Title: Defense Nuclear Agency

A. RESOURCES: ($ In Thousands)

Project Number & Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
AA Underground Test	117,030	115,547	118,868	(7,306)	111,562
AB Weapons Effects Simulation	29,281	39,677	57,024	500	57,524
AC Shock Effects	48,354	65,177	62,867	6,925	69,792
AD Biomedical/Lifesciences	16,265	17,096	16,469	1,000	17,469
AE Weapons Operations & Planning	22,918	24,362	20,774	16,415	37,189
AF Radiation Effects	63,576	72,080	90,132	(17,587)	72,545
AG Scientific Computations & Automation	12,281	12,643	27,429	900	28,329
AH Weapons Effects Support	16,749	19,472	12,972	2,575	15,547
AI System Hardness Validation Methodology	0	0	42,000	(42,000)	0
AJ Lethality and Target Hardening	0	0	23,500	(23,500)	0
Total	326,454	366,054	472,035	(62,078)	409,957

B. BRIEF DESCRIPTION OF ELEMENT: This research and development program supports efforts to develop the technology base for nuclear survivability and effectiveness of U.S. strategic and non-strategic weapon systems and forces, and the command, control and communications systems needed to operate those systems and forces in a nuclear conflict. Program increases between FY 1991/1992 and FY 1992/1993 reflect DNA's new responsibilities in nuclear weapons safety and security, the increased cost in underground testing resulting from Department of Energy (DoE) surcharges, development and construction of DECADE radiation simulator, and development of advanced hardening technologies and design protocols for space-based sensors and communication platforms. Efforts encompass:

- Theoretical and experimental research to quantify the effects of nuclear weapons on the survivability of military systems and the vulnerabilities of targets.
- Execution of underground nuclear tests.
- Development and operation of simulators (radiation, blast, thermal, radio propagation and optical background effects) and conduct of field measurements to evaluate nuclear weapon effects on military systems.
- Development of theoretical and experimental techniques for predicting and evaluating the effects of nuclear detonations on the environment, military command and control, and other systems.
- Development of hardness design methodologies and hardness assessment tools to support research, development, test and evaluation of survivable weapon systems.

- Development and validation of a methodology to satisfy requirements for verification of system hardness levels appropriate to offensive and defensive systems.
- Evaluation of nuclear weapons effectiveness against hard targets.
- Utilization of nuclear weapons effects information to support development of adaptive targeting methodologies.
- Conduct of biomedical lifesciences research to protect military personnel from effects of radiation.
- Conduct of quantitative safety assessments of stockpiled nuclear weapons systems and development and maintenance of nuclear weapons system safety data bases.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AA
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Underground Test	117,030	115,547	118,868	(7,306)	111,562

B. BRIEF DESCRIPTION OF PROJECT: Underground nuclear weapons effects testing provides nuclear environments to test/verify nuclear hardness and survivability of strategic and tactical weapon systems, to evaluate component level hardness at key decision points in a weapon system development, to develop and evaluate hardening design technologies and to expand the nuclear effects technology base. Simulators and calculational methods cannot provide required environments or exposure areas for testing large components, major subsystems or complete systems nor account for system integrated responses which occur during exposure to nuclear radiation. Horizontal Line-of-Sight (HLOS) underground nuclear effects tests are required to evaluate survivability of strategic and tactical systems as well as space based sensor and communication systems. Cavity tests are used to investigate weapon effects, such as cratering, non-ideal airblast, and energy coupling issues that allow strategic planners to evaluate effectiveness of modern strategic and tactical nuclear weapons. A third type of test evaluates the effects of source region electromagnetic pulse on Command, Control, Communication and Intelligence (C3I) systems.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:
- Conducted an underground nuclear effects test to evaluate Army weapons system components, and Air Force and Army C3I systems and subsystems.
- Began tunnel excavation and pipe design/fabrication for an HLOS underground nuclear effects test to evaluate nuclear hardness of optics, seeker/sensors and focal plane arrays for space systems.
- Began tunnel excavation for a cavity test to investigate non-ideal airblast effects relevant to targeting of hardened facilities.

FY 1992 Plans:
- Evaluate results of the FY 1991 nuclear effects test.
- Conduct a cavity test designed to investigate non-ideal airblast effects against hardened targets.
- Conduct a HLOS underground nuclear effects test on optics, seeker/sensors, focal plane arrays, and other components of advanced defensive and offensive systems.
- Begin concept development of a low-yield, reusable underground test capability as a low cost alternative to HLOS testing.
- Begin program to exploit state-of-the-art fiber optic technologies to improve data acquisition capabilities.

FY 1993 Plans:
- Continue preparation for a HLOS underground nuclear weapons effects test currently scheduled for early FY 1994.
- Design and build the first the low-yield reusable test bed with execution scheduled for early FY 1994.
- Begin preparations for a FY 1995 HLOS underground nuclear weapons effects test to evaluate electronic, mechanical and optical subsystems designs.

WORK PERFORMED BY: Lockheed Missile & Space Corp, CA and Huntsville, AL; Science Applications International Inc, San Diego, CA; EG&G Energy Measurements, Inc, Las Vegas, NV; S-Cubed, La Jolla, CA; Department of Energy Nevada Operations Office, Las

Vegas, NV; Lawrence Livermore National Lab, Livermore, CA; Los Alamos National Laboratory, Los Alamos, NM; Kaman Sciences Corp, Colorado Springs, CO; Science and Engineering Associates, Inc, Albuquerque, NM; JAYCOR, San Diego, CA.

RELATED ACTIVITIES: This project is conducted in coordination with the Office of the Secretary of Defense, Director of Test and Evaluation, Chairman Joint Chiefs of Staff, Joint Strategic Target Planning Staff, Military Departments, Strategic Defense Initiative Organization, and the Department of Energy. There is no duplication.

OTHER APPROPRIATION FUNDS: None

INTERNATIONAL COOPERATIVE AGREEMENTS: Joint Working Group 26

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H Project Number: AB
PE Title: Defense Nuclear Agency Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Weapons Effects Simulation	29,281	39,677	57,024	500	57,524

B. BRIEF DESCRIPTION OF PROJECT: Nuclear effects simulators are an important complement to underground tests for radiation dominated effects; for other effects such as electromagnetic pulse, blast and thermal, they serve as the primary means for system survivabilities/vulnerability assessments. This project encompasses High Explosives (HE) test beds, radiation simulators, blast/thermal simulators, communication link simulators, radar propagation effects simulators and infrared and optical scene generators. Biennial large scale HE events have served as a community test bed to evaluate blast and shock effects on military equipment. DNA's Large Blast Thermal Simulator (LBTS), currently under construction at White Sands Missile Range, will largely replace the need for such tests beginning in FY 1995. The DECADE x-ray simulator, to be operational in FY 1995, will increase current x-ray simulator capabilities by a factor of ten. This will permit testing at the subsystem level as opposed to the component level. The major increase in funding in this project pertains to the design and construction of the DECADE simulator; the LBTS and DECADE building will be procured with MILCON funding. High priority is being placed on development of infrared and optional scene generators because of their essential role in testing Command, Control, Communication and Intelligence (C3I) systems supporting Strategic Defense Initiative (SDI). All nuclear weapons effects simulators are routinely used by the Services in support of survivable system development.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:
- Executed a large scale 4KT equivalent nuclear airblast test for survivability and vulnerability response of DoD and foreign systems (124 experiments).
- Executed 4 material Nuclear Weapons Effects (NWE) phenomenology and scaled structure tests to support the test bed design of the FY 1992 Underground Test (UGT).
- Executed 19 conventional weapons effects tests in support of DESERT STORM and North Atlantic Treaty Organization (NATO) requirements.
- Completed design study for a High Frequency communication link simulator.
- Completed the 35% design for the DECADE x-ray facility.
- Completed initial development and demonstration (phased Array Radar for tracking reentry vehicles) of Radar Nuclear Effects Propagation Simulator.

FY 1992 Planned Programs:
- Execute a 1000 lb and 20 Ton Height of Burst (HOB) test series to evaluate survivability of scaled buried structures to blast and shock effects.
- Execute precision HE tests to obtain ground shock effects data pertinent to hardened buried structures.
- Execute precision HE tests designed to study missile subsystem response.
- Execute conventional weapons effects tests of hardened facilities.
- Demonstrate the capabilities of the HI-THERM simulator concept for replicating fireball heating.
- Complete Nuclear Infrared Clutter Simulator.
- Start Nuclear Optical Dynamic Display System development.
- Complete testing of the phased array radar for tracking reentry vehicles.
- Complete the design for the DECADE x-ray simulator.

- Continue to provide simulator upgrades and testing to Services and Program Offices in the areas of electromagnetic pulse, blast, thermal and radiation simulators for component/subsystem testing of tactical and strategic systems.

FY 1993 Plans:

- Develop a test capability to generate nuclear dust cloud environment.
- Execute High Explosive tests to develop theoretical understanding of the effects of layering and joints on ground shock.
- Execute conventional weapons tests to evaluate theoretical calculations of modern weapon performance on hardened structures.
- Complete upgrade of the Nuclear Effects Link Simulator.
- Support testing of Nudet Detection System ground terminal.
- Begin testing of a Ballistic Missile Early Warning System radar at COBRA DANE radar installation.
- Start development of a space-based radar propagation effects simulator and a High Frequency communication link simulator.
- Continue DECADE hardware assembly, fabrication and procurement for facility integration.

WORK PERFORMED BY: Science Applications Inc, San Diego, CA; Maxwell Laboratories, Inc, San Diego, CA; Mission Research Corp, Santa Barbara, CA; Physics International Co, San Leandro, CA; Bendix Field Engineering Corp, Columbia, MD; General Electric, Valley Forge, PA; SRI Inc, Palo Alto, CA; Army Engineers Waterways Experiment Station, Vicksburg, MS; University of Dayton, Dayton, OH; Sandia National Lab, Albuquerque, NM; Pulse Sciences, Inc., San Leandro, CA; Naval Surface Warfare Center, White Oak, MD; Kaman Sciences Corp, Alexandria, VA; Arnold Engineering Development Center, Tullahoma, TN.

RELATED ACTIVITIES: This project is conducted in coordination with the Office of the Secretary of Defense, Director of Test and Evaluation, Chairman Joint Chiefs of Staff, Joint Strategic Target Planning Staff, Military Departments, Strategic Defense Initiative Organization, and Commander and Chief of Specified and Unified Commands to satisfy requirements for various systems and weapon effects issues. There is no duplication.

OTHER APPROPRIATION FUNDS: Program element 0602715H, Project #000092, DECADE Simulator (MILCON), and Project #000091, Large Blast Thermal Simulator (MILCON).

INTERNATIONAL COOPERATIVE AGREEMENTS: Foreign Military Sales cases are generated to support requirements of foreign governments as well as Technical Exchange Agreements among our NATO allies.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AC
Budget Activity: Technology Base

A. RESOURCES: ($ In Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Shock Effects	48,354	65,177	62,867	6,925	69,792

B. BRIEF DESCRIPTION OF PROJECT: This project is an integrated theoretical and experimental research effort to provide understanding of mechanical shock effects of nuclear weapons detonated in the atmosphere, underground and underwater and response of weapons systems and structures to these environments. This project also includes research to develop the nuclear hardness technology base for optical systems and associated critical-tolerance structural components on space-based systems. Research results are the basis for determining effectiveness of nuclear weapons against prospective targets as well as determining survivability of U.S. systems. This project includes technology development activities for nuclear weapon safety assessment, and conventional weapons effects.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:

- Performed a quantitative analysis of the lofted dust, smoke and debris from Single Integrated Operations Plan (SIOP) nuclear strike files and assessed the implications on timing and deconfliction of the air breathing leg of the triad.
- Completed theoretical analyses of the influence of nuclear weapon height of burst on damage expectancy against hard targets to optimize fuzing.
- Completed experiment design and gage development for the FY 1992 underground nuclear airblast event.
- Evaluated the relative effectiveness of candidate warhead options for a de-MIRVed Intercontinental Ballistic Missile (ICBM) Force.
- Initiated a Joint Services Handbook for the Design and Analysis of Structures to Resist Conventional Weapons Effects.
- Conducted on-site survey in Iraq and Kuwait of hardened structures damaged in the DESERT STORM conflict.
- Completed an Environmental Assessment at Ft. Knox, KY for testing deep underground structures to simulated nuclear effects.
- Completed development of less expensive superhard silo concepts to accommodate either MMIII or small ICBM.
- Determined the response to blast/shock of a missile silo partially embedded in a rock layer.
- Quantified the blast hardness of selected modern foreign battlefield equipment.
- Collected atmospheric dispersion data for the Kuwait oil field fires for improved predictions of nuclear fallout and dust transport.
- Demonstrated two competing electro-thermal chemical gun cartridge propulsion concepts.

FY 1992 Plans:

- Evaluate data from FY 1992 underground cavity test.
- Deliver software package to Strategic Command (STRATCOM) for deconflicting aircraft sorties from nuclear dust clouds.
- Initiate evaluation of a very low collateral effects nuclear weapon concept.
- Employ advanced numerical methods for predicting dispersal of hazardous chemical/biological/radioactive clouds.
- Complete development of fire damage methodology for strategic targeting and provide to STRATCOM.

- Complete submarine precision model tests to assess fluid-structure interaction for double hull submarines.
- Model structural response of critical-tolerance optic support structures and spacecraft materials subjected to nuclear x-ray environments.
- Develop nuclear hardened mirror coatings and components for space-based sensor optics.
- Complete development of full scale cartridge propulsion concept for a 5" gun system.
- Calculate new matrix of nuclear dust, ice and radioactive debris clouds using improved transport models.

FY 1993 Plans:

- Develop localized structural failure models to describe damage from fragmenting and penetrating weapons.
- Validate reduced collateral effects from low yield penetrators.
- Complete aircraft engine dust ingestion and windscreen erosion testing.
- Complete an evaluation on the vulnerabilities of submarines to nuclear attack.
- Evaluate the response critical-tolerance satellite structures.
- Assess long term exposure space environment effects on optical component performance.
- Develop a probabilistic reentry vehicle fratricide avoidance methodology that includes winds and multiple bursts.
- Perform analyses and tests in support of nuclear weapon safety activities.

Work Performed By: Science Applications International Corp., Alexandria, VA; Weidlinger Associates, New York, NY; S-Cubed, La Jolla, CA; Applied Research Associates, Inc., Albuquerque, NM; California Research & Technology, Inc., Chatsworth, CA; SRI International, Menlo Park, CA; Army Engineer Waterways Experiment Station, Vicksburg, MS; Air Force Phillips Laboratory, Albuquerque, NM; Naval Surface Weapons Center, White Oak, MD; David Taylor Research Center, Carderock, MD; Lawrence Livermore National Laboratory, Livermore, CA; Los Alamos National Laboratory, Los Alamos, NM; Colorado University, Boulder, CO., Boeing Company, Seattle, WA.

Related Activities: This project is conducted in coordination with the Joint Strategic Target Planning Staff, Office of the Assistant to the Secretary of Defense for Atomic Energy; Chairman, Joint Chiefs of Staff, Military Departments, Defense Intelligence Agency, Strategic Defense Initiative Organization and Commander and Chief of Specified and Unified Commands to satisfy requirements for various systems survivability. There is no duplication.

Other Appropriation Funds: None.

International Cooperative Agreements: Joint Working Groups 36 and 43 and Technical Liaison Group 3.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AD
Budget Activity: Technology Base

A. RESOURCES: ($ In Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Biomedical/Lifesciences	16,265	17,096	16,469	1,000	17,469

B. BRIEF DESCRIPTION OF PROJECT: This program is the only in-house Department of Defense (DoD) effort that investigates the biomedical effects of nuclear weapons on biological systems and on the environment. This unique research is conducted by the Armed Forces Radiobiology Research Institute (AFRRI). AFRRI is the leading DoD authority on radiation effects and is dedicated to research to support requirements of the Surgeons General of the Armed Forces. Requirements emphasize strategies to: 1) maintain operational performance such as controlling a vehicle (aircraft, ship or tank); 2) increase survival of personnel through use of radioprotective drugs given before irradiation and/or use of new modalities for treatment of radiation casualties; and 3) minimize deleterious genetic effects, such as cancer and mutations that may result from radiation exposures encountered on earth or in space.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:
- Evaluated combinations of protective agents that will maintain performance of military relevant tasks in an ionizing radiation environment.
- Measured radiation protectant drug effects on genes.
- Determined radiation effects on behavioral tasks.
- Evaluated protective mechanisms to preserve brain function.

FY 1992 Plans:
- Start tests of new biotechnology agents to repair intestinal damage.
- Determine the chromosomal rearrangements that significantly increase radiation resistance.
- Clarify nervous system involvement in radiation-induced vomiting.
- Define effects of radioprotective agents on white blood cell membrane receptors.
- Quantify the effects of heavy charged particles (i.e., space radiation) on behavior and damage to the central nervous system.
- Establish and automate a biological dosimeter for personnel to accurately assess radiation dose.
- Initiate research effort to identify and test compounds which are protective against radiation-induced cancer.

FY 1993 Plans:
- Test and evaluate combinations of new agents developed through biotechnology and new antibiotics to enhance wound healing.
- Maintain goal-oriented performance using new biotechnology drugs.
- Test new therapies for management of radiation casualties.
- Characterize performance-degrading effects of radiation in combination with other expected battlefield stressors.
- Enhance technology transfer from new biotechnology advances for radiological applications.
- Develop a biophysical model to predict probability of early effects from ionizing radiation based on radiation type and dose distribution.

- Develop new site-tailored protective chemicals to mitigate long-term radiation effects.
- Determine effects of radiation damage on key biological transport processes and measure remediation of damage by drugs.

Work Performed By: Defense Nuclear Agency in-house effort supplemented by contracts that include: The National Academy of Sciences, Washington, DC; Merrifield Laboratory, Inc., Merrifield, VA; National Institute of Science and Technology, Gaithersburg, MD; and Uniformed Services University of Health Sciences, Bethesda, MD.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperative Agreements: The Armed Forces Radiobiology Research Institute (AFRRI) has the following Memorandum of Understanding: 1982 to present - Centre de Recherches du Service De Sante des Armees (DEA 1125), France, to conduct collaborative research on the mechanism of radiation from nuclear weapons; and 1986 to present - Defense Research Organization, Netherlands, (DEA 0096), to exchange information on physical, biological, and medical aspects of radiations associated with nuclear devices and other radiation sources.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AE
Budget Activity: Technology Base

A. RESOURCES: ($ In Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Weapons Operations & Planning	22,918	24,362	20,774	16,415	37,189

B. BRIEF DESCRIPTION OF PROJECT: This project: (1) improves nuclear weapons safety survivability, employment planning, command and control, force structure, and force effectiveness; (2) supports assessments of arms control impacts and damage estimation; (3) explores technology needed to enhance theater U.S. and Allied command operations on an integrated battlefield; (4) develops alternative strategies for U.S. strategic weapons employment; (5) addresses the contribution of nuclear weapons effects to strategic nuclear employment objectives; and (6) includes research to improve planning capabilities that provide nuclear commanders with more flexible weapons employment options. The increase in funding between the FY 1993 initial and amended estimates reflects significantly increased funding for nuclear weapons safety evaluations and enhancements.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:

- Completed design of the Transportable Storage System (TSS) with improved safety devices, lightweight ballistic armor, sensors, and security devices in preparation for a full prototype construction.
- Completed accelerated design of the Transportation Safety Container - Variant (TSC-V) in support of the Army European Nuclear Retrograde.
- Continued Lateral Dispersal (LD) support for Allied Air Forces Central Europe (AAFCE).
- Initiated a communications effort to support the tactical nuclear command and control (C^2) link for dispersed forces.
- Completed proof of principle testing of IR/audio/visual suppression materials for for the Deceptive Practices (DP) program.
- Initiated a balanced survivability evaluation for all Supreme Headquarters Allied Powers Europe (SHAPE) Emergency Facilities (SEF).
- Redirected Negotiations Information System (NIS) program to better support the Department of Defense (DoD) Arms Control Community.
- Completed development of Target Analysis and Planning System.
- Modified the Allied Command Europe (ACE) Integrated Nuclear Planning System to include all North Atlantic Treaty Organization (NATO) Nuclear Planning Systems.
- Completed review of approximately 60% of the nuclear weapons effect models used in the Multiple Engagement Models (MEM).
- Completed FY 1991 Nuclear Weapons Development Guidance (NWDG).

FY 1992 Plans:

- Conduct quantitative safety assessment for the W78/MMIII System.
- Develop and validate prototype nuclear weapon system safety data base.
- Complete proof of principle evaluation of on-going Deceptive Practices (DP) programs in radar and electronic countermeasures; transition to the Services.
- Initiate new Deceptive Practices technology programs to support Services.
- Continue Lateral Dispersal (LD) support to Allied Command Europe (ACE) to mitigate current logistical, security and communications shortfalls.
- Continue a Balanced Survivability Assessment of all Supreme Headquarters Allied Powers Europe (SHAPE) Emergency Facilities.
- Complete construction of the Transportable Storage System (TSS) prototype and transition to Services.

- Initiate a survivability analysis of Allied Command Europe (ACE) Survivable Nuclear Command and Control for North Atlantic Treaty Organization (NATO) Communications Installation Systems Agency (NACISA) and Supreme Headquarters Allied Powers Europe (SHAPE).
- Evaluate technology transfer and its impact on nuclear proliferation.
- Assess new strategic posture to determine evolving operational survivability requirements.
- Complete development and transition Negotiations Information Systems.
- Transition Automated Target Tie-Up system to Strategic Command (STRATCOM).
- Complete nuclear weapons effects upgrade for Multiple Engagement Module (MEM).
- Install hardware and initial software for NATO Nuclear Planning prototype.
- Provide technical assessment support to the Nuclear Weapons Council (NWC) and Department of Defense offices responsible for nuclear weapons safety and operations.
- Begin a comprehensive review of tactical nuclear targeting methodologies in light of DESERT STORM experience and increased possibility of regional conflict.
- Provide support to Specified and Unified Commands and the Services on Nuclear Weapon Development Program.

FY 1993 Plans:

- Develop and validate comprehensive nuclear weapon systems safety data base.
- Conduct quantitative safety assessments of stockpiled and developmental nuclear weapon systems at the request of the NWC.
- Conduct nuclear weapon system safety testing to validate safety analysis modeling.
- Complete Transportable Storage System (TSS) proof-of-principle testing and transition to Services.
- Complete ACE Survivable Nuclear Command and Control (C^2) program; transition to NACISA.
- Complete logistical, security and communication Lateral Dispersal (LD) programs in support of SHAPE and respond as required to plans for Southern Region LD.
- Initiate next generation transportable nuclear weapon storage development.
- Focus Non-Strategic Force projects on the reconstitution of intervention forces.
- Continue assessment of technology transfer and its impact on nuclear proliferation in third world nations.
- Evaluate the NATO Nuclear Planning System during exercises.
- Assess survivability and effectiveness impacts of changes to force structure required by U.S. nuclear strategy in the New World Order.
- Modernize nuclear target planning systems to include adaptive, real-time features that could support regional conflict.
- Continue to provide technical assessment support to the NWC and OSD for nuclear weapons safety and operations.
- Complete tactical nuclear targeting methodologies update and provide recommendations to services.

Work Performed By: Science Applications International Corporation, La Jolla, CA; R&D Associates, Mons, Belgium; Lawrence Livermore National Laboratory, Livermore, CA; Sandia National Laboratory, Albuquerque, NM; Booz-Allen and Hamilton, Bethesda, MD, General Dynamics/CONVAIR Division, San Diego, CA; Analytical Systems Engineering Corp., Burlington, MA; Logicon Inc., San Pedro, CA; Applied Research Assoc., Alexandria, VA; Mitre Corp., Bedford, MA; Science Control Technology Corp., Los Angeles, CA.

Related Activities: This project is coordinated with Director of Strategic and Theater Nuclear Forces, Assistant to the Secretary of Defense (Atomic Energy), Strategic Command, Military Departments, Defense Information Systems Agency, Defense Intelligence Agency and Commander in Chief of Specified and Unified Commands to support various systems (Cruise Missiles, KC 135, SRAM, B52, B1, B2). There is no duplication.

Other Appropriation Funds: None.

International Cooperative Agreements: None.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AF
Budget Activity: Technology Base

A. RESOURCES: ($ In Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Radiation Effects	63,576	72,080	90,132	(17,587)	72,545

B. BRIEF DESCRIPTION OF PROJECT: This project addresses the development of nuclear environment models, systems protection measures, methods for operating through intense radiation environments, and test techniques to ensure nuclear survivability of weapon systems and Command, Control, Communication, and Intelligence (C^3I), with current emphasis on space-based communication/sensor platforms. Weapons effects assessed include atmospheric scintillation, blackout, clutter, and redout; transient radiation effects on electronics (TREE); high altitude electro-magnetic pulse (HEMP); source region electromagnetic pulse (SREMP); system generated EMP (SGEMP); box-level internal EMP, and ionizing radiation effects on personnel. This effort also advances the basic technologies (radiation sources, fast opening switches, high energy density capacitors, and pulsed power) required for advanced x-ray simulator development. This project also develops the capability to predict and assess impacts on personnel of prompt and protracted ionizing radiation, thermal radiation, and blast, either individually or in combination. HEMP testing is conducted to assess the survivability of fixed ground-based Command, Control, Communication, Computer and Intelligence (FGBC4I) facilities. Growth in this project beginning in FY 1992 addresses the need for increased generic nuclear survivability work to support advanced offensive and defensive weapon concepts, including space-based and communications systems. The increase will support development of generic hardening techniques, execution of critical validation tests, and development of testing protocols to demonstrate survivability. The decrease in FY 1993 initial and amended estimates reflect the results of Congressional direction.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:

- Provided nuclear propagation effects criteria for Defense Satellite Communications System Super High Frequency (DSCS SHF) Replenishment System.
- Conducted Radar Propagation Effects Simulator demonstration at PAVE PAWS early warning radar.
- Completed TACAMO Pacific Area Communication Effectiveness Study.
- Completed initial "Quick-Look" review of World Wide Military Command and Control System Airborne Resources (WABNRES) for Strategic Air Command (SAC) Bomber Connectivity.
- Developed global HEMP target planning system.
- Quantified human response to combined nuclear weapons effects injury for targeting and safety criteria.
- Completed development of radiation hardened 64K and demonstration of 256K solid state memory devices using insulating technology.
- Evaluated results of underground test to investigate SREMP effects on ground mobile systems.
- Completed HEMP verification tests on Naval Communications Area Master Station/East Pacific (NAVCAMS/EASTPAC) and Hickam Commercial Technical Control (CTC) FGBC4I facilities.
- Constructed quarter-scale DECADE demonstrator using the monolithic design alternative.

- Constructed two pulsed power DECADE demonstration units employing the modular design alternative.
- Demonstrated a 2.2 kJ/kg polymer film for capacitor application.

FY 1992 Plans:

- Provide test support to Defense Support Program Satellite Readout Station upgrade.
- Define hostile environments and candidate solutions for Advanced Warning System.
- Initiate formal update of DoD-STD-2169A for high altitude electromagnetic pulse (HEMP).
- Complete "Quick-Look" analysis of very low frequency/low frequency communication to strategic bombers.
- Complete the consolidated human response model.
- Integrate combined injury data into crew/unit combat performance model.
- Test an system generated EMP (SGEMP)-hardened focal plane cryogenic assembly on an underground nuclear test.
- Initiate development of hardened 1-megabit memory for radiation hardened space computer.
- Complete Ballistic Missile Submarine Electromagnetic Pulse degradation report.
- Evaluate performance of quarter-scale designs for DECADE and DECADE x-ray simulator design.

FY 1993 Plans:

- Evaluate propagation effects for the Global Positioning System/Nuclear Detonation (NUDET) Detection System.
- Provide nuclear environment prediction models for the National Test Bed.
- Complete formal update of DoD-STD-2169A for HEMP environments.
- Quantify human response to long-term radiation exposure.
- Validate fallout portion of operations and force assessment models.
- Complete development of the 1-megabit memory for Radiation Hardened Space Computer.
- Design and fabricate test circuit to evaluate hardened 4-megabit semiconductor.
- Conduct HEMP test on the Navy Defense Satellite Communications System/Jam Resistant Secure Communicator (DSCS/JRSC) SATCOM facility.
- Select 15 MJ/m^3 material for capacitor demonstration.

Work Performed By: US Army Strategic Defense Command, Huntsville, AL; US Air Force Phillips Laboratory, Albuquerque, NM; Physical Research Corporation, Hawthorn, CA; JAYCOR, San Diego, CA; Mission Research Corporation, Santa Barbara, CA; Maxwell Laboratories, San Diego, CA; Physics International Inc., San Leandro, CA; Metatech Corporation, Goleta, CA; Naval Research Laboratory, Bethesda, MD; Harry Diamond Laboratories, Adelphi, MD; Lawrence Livermore National Laboratory, Livermore, CA; Sandia National Laboratory, Albuquerque, NM; Science Applications International Corp., Joppa, MD, and San Diego, CA; Pacific Sierra Research Corp., Santa Monica, CA; Micro-analysis and Design, Boulder, CO; AREA Corp., Arlington, VA; Horizons Technology, Inc., Vienna, VA; Oak Ridge National Laboratory, Oak Ridge, TN; Foreign Science and Technology Center, Charlottesville, VA; Combat Systems Test Activity, Annapolis, MD; US Army Nuclear and Chemical Agency, Springfield, VA; Los Alamos National Laboratory, Los Alamos, NM; Jet Propulsion Laboratory, Pasadena, CA; 3M Corporation, St. Paul, MN; Atochem Sensors, Inc., King of Prussia, PA.

Related Activities: This project is conducted in coordination with the Office of the Secretary of Defense, Chairman Joint Chiefs of Staff, Joint Strategic Target Planning Staff, Military Departments, Strategic Defense Initiative Office, Defense Information Systems Agency, Defense Intelligence Agency, National Security Agency and Commander in Chief of Specified and Unified Commands to support various systems (e.g., MILSTAR, FEWS, GPS-IIR, DSCS-II, HML, JRSC/TWAA, MLRS, ML, 5280 Shelter). There is no duplication.

Other Appropriation Funds: None.

International Cooperative Agreements: Joint Working Groups 35 and 36.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AG
Budget Activity: Technology Base

A. RESOURCES: ($ In Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Scientific Computations and Automation	12,281	12,643	27,429	900	28,329

B. BRIEF DESCRIPTION OF PROJECT: This project provides large scale (supercomputing) computational resources as Government Furnished Equipment (GFE) to DNA contract research scientists to support the spectrum of DNA RDT&E programs. Use of GFE in lieu of allowing contractors to use their in-house computers, or individually contracting for supercomputing timeshare support, provides significant savings to the government by avoidance of contractor overhead and fees that can total as much as 30% in additional costs without any value added by the contractor. Establishment of the GFE program is also critical to a standardized code development environment to ensure that codes/calculations developed by contractors can be subsequently used by both the government and other contractors. The increase from FY 1992 to FY 1993 reflects DNA's plan to replace the CRAY XMP with a CLASS 7 supercomputer in FY 1993 which is addressed in DNA's Future Year Plan as well as the DoD High Performance Computing Modernization Master Plan which will be provided to Congress on 1 April 1993.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:
- Began implementation of wide-area Electronic mail network, using the DNA VAX resources at Los Alamos National Laboratory (LANL).
- Began implementation of Continuity of Operations program for DNA financial systems, using LANL resources on a cooperative basis.
- Continued to provide state-of-the-art supercomputer Scientific Computing resources to DNA researchers.
- Began transition to the CRAY Unix operating system.

FY 1992 Plans:
- Continue implementation of a wide-area Electronic mail network.
- Continue implementation of the Continuity of Operations program for DNA financial systems.
- Continue to provide state-of-the-art supercomputer Scientific Computing resources to DNA researchers.

FY 1993 Plans:
- Replace current CRAY XMP supercomputer used to support contractor researchers. The DNA computing requirements are expected to exceed the CRAY XMP capacity in FY 1992.
- Begin implementation of visualization systems and techniques to aid in the graphic display of scientific information.
- Replace a smaller and obsolete Government Furnished Equipment classified computer with a larger system to support both contractor and DNA in-house requirements.
- Complete transition to the CRAY Unix operating system, enabling DNA researchers to run existing computations on newer, faster computers without rewriting the code.
- Consolidate several contractor hubsites into a high-speed T-1 Hubsite on the west coast to take advantage of technology advancements in modern hardware, and reduce labor costs by exploiting automated switching systems.

- Establish a more tightly integrated Wide Area Network to interconnect DNA computers to computers at various sites for more effective research support. This would allow researchers to compute problems at the most cost effective computer site, while sharing results and files within the project community.

Work Performed By: Department of Energy, Washington, DC; Los Alamos National Laboratory, Los Alamos, NM; Pacific Sierra Research, Placerville, CA; S-Cubed, Albuquerque, NM and San Diego, CA; and Mission Research Corporation, Santa Barbara, CA.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperative Agreements: None.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AH
Budget Activity: Technology Base

A. RESOURCES: ($ In Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Weapons Effects Support	16,749	19,472	12,972	2,575	15,547

B. BRIEF DESCRIPTION OF PROJECT: Conducts nuclear weapons effects (NWE) research and testing support for improving survivability, effectiveness, security, and safety of weapon systems and associated command and control systems. This project supports planning, implementation, integration, application and reporting of DNA's RDT&E achievements in NWE, nuclear policy assessment and operations support. Further provides assistance to Service components in the management of requirements for nuclear survivability during acquisition of mission critical weapon systems.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:

- Completed the "Nuclear Hardness Test Planning Guide" needed by Service Program Management Offices to adequately and cost-effectively plan nuclear hardness testing of new weapon systems.
- Continued to update information on new and emerging technologies generated by DNA RDT&E programs to benefit the entire NWE research community.
- Published and distributed one Chapter of Effects Manual 1 (EM-1), which is the key reference for Nuclear Weapons Effects Information used throughout the government.
- Completed development of an expert system to automate generation of nuclear survivability Data Item Descriptors (DIDs) and perform a top level evaluation of the survivability of a weapon system.
- Initiated a "How-to" manual to assist program managers in generating nuclear survivability system specifications from nuclear weapons effects criteria.

FY 1992 Plans:

- Conduct nuclear weapons effects research in survivability, effectiveness, security, and safety of weapons systems to support U.S. nuclear deterrent.
- Support research of the force mix necessary to retain deterrent capability with a reduced force structure and in light of the evolutionary changes in Europe.
- Publish and distribute 13 EM-1 chapters including the North Atlantic Treaty Organization version; develop the EM-1 Technical Handbook; develop two (2) prototype chapters of EM-1 for the electronic handbook using Hypertext; review and update EM-1 chapters as required.
- Revise and update the Hardness Assurance, Maintenance, and Surveillance (HAMS) Planning Handbook to ensure that all information is consistent with revisions to DoD acquisition policy as promulgated in DoD Instruction 5000.1, which provides core guidance for all DoD Materiel Procurements. Also, update HAMS document to capture techniques applicable to newly developed systems and those projected for near term fielding.
- Continue efforts to prepare a working level manual to permit derivation of survivability criteria from nuclear environments.
- Continue to update information on new emerging technologies generated by DNA RDT&E programs to benefit the entire NWE research community.

FY 1993 Plans:

- Conduct Nuclear Weapons Effects (NWE) research in survivability, effectiveness, security, and safety of weapons systems to support the deterrent capability of U.S. forces.
- Revise Program Managers Guide and Test Planning Guide for Hardening systems against Nuclear Effects to ensure that guide provides current, validated engineering practices and information.
- Continue updating the Effects Manual 1 (EM-1) Chapters; publish and distribute the EM-1 Technical Handbook; develop full electronic version of EM-1 using Hypertext.
- Complete a working level manual on generating nuclear survivability system specifications from nuclear effects criteria.
- Continue to update information on new and emerging technologies generated by DNA RDT&E programs to benefit the entire NWE research community.

Work Performed By: R&D Associates, Marina Del Rey, CA; Kaman Sciences, Santa Barbara, CA; BDM, McLean, VA; S-Cubed, Alexandria, VA; Science Applications International Corp., McLean, VA; Naval Surface Weapons Center, Dahlgren, VA; Aptek, San Jose, CA; Physical Research, Huntsville, AL; Karagozian & Case, Glendale, CA; PSRC, Los Angeles, CA; Applied Research Associates, Albuquerque, NM; Toyon Research Corp., Goleta, CA; Jaycor, Colorado Springs, CO.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperative Agreements: None.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H Budget Activity: Strategic Programs
PE Title: Verification Technology Demonstration

A. RESOURCES: ($ in Thousands)

Project Number & Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
CA	Strategic & Theater Nuclear Forces Technology				
	42,700	23,130	9,920	0	9,920
CB	Conventional Arms Control Technology				
	10,300	18,000	13,500	2,000	15,500
CC	Chemical Weapons Convention (CWC) Technology				
	22,000	22,500	22,500	0	22,500
CD	Yield Measurement Technology				
	30,050	18,700	19,500	(341)	19,159
TOTAL	105,050	82,330	65,420	1,659	67,079

B. BRIEF DESCRIPTION OF ELEMENT: This program element covers verification and compliance RDT&E for arms control treaties including Strategic Arms Reduction Talks (START), Conventional Forces in Europe (CFE), Threshold Test Ban Treaty (TTBT), Peaceful Nuclear Explosions Treaty (PNET) Chemical Weapons Convention (CWC), Open Skies, and Presidential arms control initiatives.

The program specifically includes development of hardware and techniques for on-site inspections in treaty nations and assists the Office of the Secretary of Defense in preparing for U.S. compliance with treaty provisions. Hardware developed is transitioned to the On-Site Inspection Agency (OSIA) (or appropriate international inspectorate in the case of CWC) for use in conducting inspections as required by arms control treaties. Where applicable, RDT&E to meet one treaty's requirements is applied in other areas, eliminating duplicative efforts and maximizing synergistic results.

For example, the START Treaty requires monitoring vehicles exiting a final assembly factory of treaty limited items. The Portal Perimeter Continuous Monitoring System (PPCMS) was designed and developed to meet START specifications. It is scheduled for transition to OSIA in Feb 1992 for use by Entry-Into-Force (EIF), 30 days after ratification. This same RDT&E effort resulted in valuable information for negotiators to use in developing the U.S. position for monitoring sites under a CWC regime.

Arms control treaties require exchanges of data describing treaty accountable items of signatory nations. DNA has developed a data management system, the Compliance Monitoring Tracking System (CMTS), to accommodate these data exchanges and monitor U.S. compliance with treaty provisions. Currently CMTS can provide treaty required data exchanges for START, CFE and Confidence and Security Building Measurements (CSBM). Work is underway to meet CWC requirements, and the system can accommodate requirements for Open Skies and any future arms control initiatives. At completion, DNA will turn over operation of CMTS to OSIA.

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H Project Number: CA
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

A. RESOURCES: ($ in Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Strategic & Theater Nuclear Forces Technology	42,700	23,130	9,920	0	9,920

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITY: This project addresses RDT&E activities required to implement U.S. rights under the Strategic Arms Reduction Talks (START) Treaty, to help assist in U.S. compliance with the Treaty, and to provide technology which will meet requirements of future nuclear arms control agreements. Treaty on-site inspection requirements resulted in a Portal and Perimeter Continuous Monitoring Systems (PPCMS) which will be deployed in Russia during 1992. A portable weigh-in-motion system is being developed to accurately weigh ballistic missiles on their transporters. A START Central Data System (SCDS) was developed to enable the U. S. Government to make Treaty required notifications and compliance assessments. In addition, procedures to accommodate inspections at U.S. rocket motor production facilities were developed and demonstrated. Technology development efforts are planned to satisfy potential future treaty requirements in the most non-intrusive manner, cost effectively count nuclear warheads in situ, determine missile throw-weight, conclude tagging developmental efforts, measure characteristic Treaty Limited Item (TLI) signatures, and provide monitoring capabilities to reduce manpower.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:

- Completed development, testing, and evaluation of PPCMS and demonstrated a rapidly deployable PPCMS.
- Designed, developed, and installed SCDS to manage the database of treaty limited items and provide required notifications.
- Developed a methodology for measuring effectiveness of verification regimes and completed an initial draft of a primer on export policy and licensing procedures.
- Developed, successfully tested, and demonstrated a light weight, portable weigh-in-motion laboratory prototype system to meet On-Site Inspection Agency (OSIA) requirements to weigh TLIs.
- Provided U.S. negotiators with technical data packages used in the START Treaty negotiations.
- Planned and conducted inspection simulation exercises and prepared generic/ mock inspection readiness plans to prepare solid rocket motor manufacturers for inspections.
- Developed a new Cobra Seal Reader and provided it to OSIA.
- Completed first phase of START TLI signature evaluation.
- Designed, constructed, installed and tested a non-damaging imaging (RAPIDSCAN) system to screen containerized cargo and initiated a study to identify alternatives to the CARGOSCAN system to meet future non-damaging imaging requirements.
- Completed a laboratory prototype of the Secure Loop Inspectable Tag/Seal (SLITS), an industrial prototype of the Reflective Particle Tag (RPT) and its associated reader, testing of a laboratory prototype of the Ultrasound Intrinsic Tag (UIT) which could be used to uniquely identify TLIs.

FY 1992 Plans:

- Transition Portal Perimeter Continuous Monitoring System (PPCMS) to the On-Site Inspection Agency (OSIA) and provide them with technical and engineering support during site survey and PPCMS installation.
- Test and complete development of Strategic Arms Reduction Talks (START) Central Data System (SCDS) to facilitate data exchanges, maintain the database of treaty limited items, and generate, check, and transmit required notifications.
- Complete development and demonstrate an industrial prototype light weight, highly accurate portable weigh-in-motion system.
- Finalize implementation plans for Soviet inspections of U.S. solid rocket manufacturers and identify impacts on solid rocket motor manufacturers of inspections authorized by other agreements (e.g., Chemical Weapons Convention).
- Conduct cost analysis to help direct concept definition studies and complete the primer on export policy and licensing procedures to assist performers in preparing to export On-Site Inspection equipment.
- Provide quick-reaction technical support needed to fulfill tasks emanating from the Joint Compliance and Inspection Commission (JCIC).
- Identify concepts capable of accurately determining a ballistic missiles' launch weight.
- Complete the study to identify alternatives to the CARGOSCAN and initiate testing and evaluation of the most promising concepts.
- Determine SCDS system upgrades necessary to satisfy user requirements.
- Develop equipment and procedures to reduce manpower requirements and increase cost effectiveness of the PPCMS.
- Perform adversarial analyses of video motion detection systems, a suite of intrusion detection systems, the Secure Loop Inspectable Tag/Seal/Secure Loop Optical Tag System (SLITS/SLOTS) tagging concepts, and signature exploitation systems.
- Develop a multi-layer tamper-indicating, sealed container for securing and protecting the integrity of devices and equipment used for monitoring/inspections.

FY 1993 Plans:

- Maintain the Technical On-Site Inspection (TOSI) facility as the testbed for evaluation and as a demonstration facility for advanced monitoring and inspection equipment.
- Complete and demonstrate the industrial prototype of the accurate, person-portable weighing system.
- Revise planning aids to update manufacturers on arms control inspections requirements based on inputs from studies of potential new agreement verification regimes.
- Conduct testing/demonstrations of new systems developed to verify the number of RVs carried on a ballistic missile. Initiate prototype system production if testing is successful.
- Develop and test laboratory prototypes of selected signature exploitation systems.
- Begin development of new radiographic system(s) selected as a result of the radiography concept study recommendations and test laboratory prototype(s).
- Initiate prototype development for special tools and equipment to fully exploit site monitoring systems.
- Conduct prototype development and testing efforts on new systems and other instrumentation for remote monitoring applications. Validate selected data authentication systems.
- Perform adversarial analysis of systems equipment capabilities developed by the remote monitoring and site monitoring projects.

Program to Completion: This is a continuing program.

D. WORK PERFORMED BY: National DOE and Service Laboratories; Institute for Defense Analyses, Alexandria, VA; Raytheon, Burlington, MA; Science Application International Corp., McLean, VA; BDM, Albuquerque, NM and McLean, VA; Systems Planning Corporation, Arlington, VA; Meridian, Alexandria, VA; MITRE, Burlington, MA; Texas Transportation Institute of Texas A&M University, College Station, TX; JAYCOR, Vienna, VA.

E. COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY: Since the FY 1992 descriptive summary was provided, the Strategic Arms Reduction Talks (START) Treaty was signed, President Bush and former president Gorbachev presented new initiatives, and the Soviet Union has been dissolved. The program has been adjusted to meet requirements of the signed START Treaty and technology development accounts for verification of potential agreements which could result from Presidential initiatives.

F. PROGRAM DOCUMENTATION: DNA appointed as the Executive Agent for Arms Control Treaty Related R&D; requirements are provided by the Department of Defense treaty manager and are reflected in the OSD Master Plan for RDT&E for Arms Control Cooperative Inspection.

G. RELATED ACTIVITIES: None

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Signed START Treaty.

J. MILESTONE SCHEDULE:
- Treaty to Senate: 25 Nov 91
- Senate Vote: June 92
- Entry Into Force: Jun/July 92
- Baseline Inspections Begin: Aug/Sep 92
- PPCMS Deployment Begins: Aug 92
- Special Access Visits Begin: Jan 93
- Remote Monitoring Testbed IOC: Mar 93
- Portable weighing START: Apr 93
- Device Technical Exchange: Apr 93
- OT&E Third Generation Tag/seal Technology: Apr 93

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H
PE Title: Verification Technology Demonstration
Project Number: CB
Budget Activity: Strategic Programs

A. RESOURCES ($ in Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Conventional Arms Control Technology	10,300	18,000	13,500	2,000	15,500
(CFE Aerial Inspection/Open Skies)	(3,200)	(4,500)	(3,500)	(2,000)	(5,500)

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEMS CAPABILITY: This project covers RDT&E required to verify, ensure compliance and implement existing and emerging treaties and agreements related to conventional arms control (CAC). Relevant agreement include; (1) the Conventional Forces in Europe (CFE) Treaty (and its provisions for Aerial Inspection), ratified by the U.S. in December 1991; and (2) the Agreement on Confidence and Stability Building Measures (CSBM), signed in November 1990. The RDT&E needs for emerging treaty and agreement areas include: (1) the Open Skies Treaty; (2) the Conference on Security and Cooperation in Europe (CSCE) Review Conference; (3) naval issues; (4) regional and proliferation issues; (5) follow-on CFE Treaty negotiations; (6) enhancing Confidence and Stability Building Measures. This project develops hardware and techniques to support on-site and other inspection modes, e.g., CFE Aerial Inspection/Open Skies (AI/OS), and provide aids for U.S. compliance, e.g., a supporting data base for treaty information - the Data Management/Notifications System (DMNS).

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 PROGRAM:

- AI/OS - Delivered requirements document; flew two C135 demonstration flights; established capability of AI/OS mission planning sensor/analysis model; Delivered Treaty Limited Equipment (TLE) signatures/AI/OS sensors analysis.
- Delivered tagging concept and innovative tag report.
- Delivered site monitoring report and demonstration plan.
- Completed initial investigation of European verification technologies.
- Developed DMNS documentation; established data exchange capability, developed operational capability test plan.
- Analyzed naval verification issues.
- Delivered TLE-identification aids to On-Site Inspection Agency (OSIA).
- Initiated evaluation of candidates for advanced imaging technologies.
- Provided CFE AI cost analysis report.
- developed preliminary adversarial analysis of possible CFE Treaty breakout scenarios.

FY 1992 PLANS:

- AI/OS - develop mission planner capability; complete Synthetic Aperture Radar (SAR) prototype assessment/recommendation; begin SAR prototyping.
- Examine signatures associated with proliferation scenarios for verification requirements definition.
- Assess European verification technologies for development.
- Complete DMNS development; integrate CSBM's reporting; transition central nodes

to compatible software; establish DNA DMNS test bed; define data fusion requirements to develop automated analytical tool to access data from various arms control related databases.
- Assess impact of arms control agreements and verification regimes on fielding/modernization of conventional weapons.
- Determine verification and/or compliance cross-treaty synergism to optimize verification RDT&E efforts and investment.
- Investigate potential usefulness of Passive Millimeter Wave Imaging.
- Conduct analyses of inspection regime vulnerabilities to improve On-Site Inspection (OSI) technologies and treaty regimes; identify impacts; recommend hedges.

FY 1993 PLANS:
- AI/OS - Demonstrate and deliver Open Skies Synthetic Aperture Radar; demonstrate and deliver Open Skies mission planner.
- Develop prototype signatures exploitation system technologies to satisfy emerging Conventional Arms Control requirements.
- Perform RDT&E on identified technologies to meet emerging regional/ proliferation requirements.
- Transition Data Management/Notifications Systems (DMNS) to On-Site Inspection Agency (OSIA) and maintain DNA test bed to implement potential upgraded software.
- Expand/modify DMNS to meet Open Skies requirements.
- Identify RDT&E requirements related to emerging treaty areas including Middle East and naval arms control.
- Revise inspector Treaty Limited Equipment handbooks, develop additional inspector aids as needed by OSIA.
- Provide RDT&E recommendations on cross treaty synergism, review implications of inspection methodologies/technologies on conventional force.
- Assess enhanced technologies for upgrading treaty regimes.
- Improve emerging verification technologies and treaty regimes through analysis of vulnerabilities.

Program to Completion: This is a continuing program.

D. WORK PERFORMED BY: Institute for Defense Analysis, Alexandria, VA; BDM, McLean, VA.; System Planning Corporation Alexandria, VA.; Raytheon, Albuquerque, NM.; Argonne National Laboratory, Argonne, IL.; Phillips Laboratory, Albuquerque, NM.; Meridian Corporation, Arlington, VA.; Northrop Corporation, Pico Rivera, CA.; Sandia National Laboratory, Albuquerque, NM.; Science Applications International Corporation, McLean, VA.; Jaycor, Vienna, VA.

E. COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY: The current program emphasis reflects efforts to meet emerging Conventional Arms Control (CAC) requirements in the Conference on Security and Cooperation in Europe (CSCE) Review Conference context as opposed to specific Conventional Forces in Europe (CFE) Treaty driven Research and Development (RDT&E). This is a result of CFE Treaty ratification and its imminent entry into force. Programs now emphasize areas such as Open Skies RDT&E, up grade of CFE DMNS to meet requirements related to CFE 1A, and other potential conventional limitation regimes and approaches that may emerge from the 1992 Helsinki Review Conference. Outyear programs emphasize proactive RDT&E requirements identification related to emerging regional arms control regimes (including Middle East and naval) and weapons proliferation verification regimes.

F. PROGRAM DOCUMENTATION: Appointed as executive agent for arms control treaty related RDT&E; requirements are developed in conjunction with the Conventional Arms Control and Compliance Directorate, OSD(A) and OSD(P)/ESN. Efforts affecting

several treaties are coordinated through the Verification Technology R&D Working Group.

G. RELATED ACTIVITIES: None

H. OTHER APPROPRIATED FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: CFE Treaty signed 19 Nov 90, ratified Dec. 1991; Confidence and Stability Building Measures Agreement signed 19 Nov 90.

J. MILESTONE SCHEDULE: (Note: "T" means tentative or projected)
- CFE Treaty Signature: Nov 90
- CSBM Agreement Signature: Nov 90
- CFE 1a Talks begin: Dec 90
- CSBM Continuation Talks: Dec 90
- CFE Joint Consulative Group begins meeting: Dec 90
- CSBM Entry-into-Force (EIF): Jan 91
- CFE updated data exchange: Feb 91
- CFE Treaty Ratified: Dec 91
- CSCE Review Conference begins: Mar 92
- Open Skies Treaty: Mar 92(T)
- CFE Treaty EIF, OSI starts: Apr 92 (T)
- Conference on Security and Cooperation in Europe (CSCE) Review Conference Mandate: Jun 92 (T)
- Annual CFE data exchange: Each Dec
- Open Skies flights begin: Mar 93 (T)
- CFE Eliminations complete: EIF +40 months
- CFE Aerial Inspections begin: EIF +40 months

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H
PE Title: Verification Technology Demonstration
Project Number: CC
Budget Activity: Strategic Programs

A. RESOURCES: ($ in Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Chemical Weapons Convention (CWC) Technology	22,000	22,500	22,500	0	22,500

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEMS CAPABILITY: This project covers RDT&E required for multinational verification and U.S. compliance with the Chemical Weapons Convention (CWC). It includes development of means to facilitate compliance with treaty provisions, primarily through conduct of On-Site Inspections (OSI) and U.S. planning for compliance activities. Associated costing studies, technology assessments, impact, and implementation plans will also be performed.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:
- Completed assessment of CWC database requirements for handling data declarations and the inspection program.
- Initiated prototype development of a CWC Data Base Management System for handling data declaration and inspection program.
- Completed assessments of sampling, detection, and protective equipment for inspections.
- Completed baseline surveys of operational concepts for verification inspections.
- Initiated equipment field trials to validate operational concepts.
- Developed baseline laboratory requirements for sample analysis.
- Completed an initial assessment of Non-Destructive Evaluation (NDE) technologies.
- Initiated planning for System Field Demonstrations to integrate equipment and procedures for baseline verification inspection systems.

FY 1992 Plans:
- Complete Equipment Field Trials to validate operational concepts and identify baseline equipment requirements for inspections and initiate development.
- Complete System Field Demonstrations to integrate equipment and procedures for baseline verification inspection systems.
- Identify technology gaps for development of enhanced, follow-on inspection equipment and systems and initiate development.
- Establish a prototype National Laboratory for inspection sample analysis.
- Initiate a program to identify, evaluate, and develop new sampling and analytical technologies for CWC analysis.
- Continued development of a prototype CWC Data Base Management System to handle data declaration and inspection program.
- Assess chemical signatures for compliance monitoring.
- Complete an assessment of site monitoring technologies for CWC compliance monitoring.
- Provide a capability for independent test and evaluation of U.S. baseline verification systems.

- Incorporate baseline verification systems into training program being developed for CWC inspectors.

FY 1993 Plans:

- Identify technology gaps during the test and evaluation of baseline verification inspection systems.
- Evaluated emerging sampling and analytical technologies as they become available.
- Develop enhanced verification inspection systems as an extension of FY 1992 efforts.
- Complete development of CWC Data Base Management System.
- Initiate development of National Authority Data Base Management System.
- Perform test & evaluation of advanced verification inspection systems for Chemical Weapons Convention (CWC) compliance monitoring.
- Complete development of an Integrated Training Program for CWC inspectors.
- Initiate development of a methodology for assessing adequacy of Facility Destruction Verification Measures.
- Provide technical support to U.S. representative to the CWC Preparatory Commission.
- Provide technical support to U.S. compliance and implementation planning efforts.

Program to completion: This is a continuing program.

D. WORK PERFORMED BY: U.S. Army Chemical Research, Development and Engineering Center, Aberdeen Proving Ground, MD; U.S. Army Dugway Proving Ground, Dugway, UT; U.S. Army Chemical School, Anniston, AL; U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD; Tooele Army Depot, Tooele, UT; Air Force Technical Applications Center, Patrick AFB, FL; Los Alamos National Labs, Los Alamos, NM; Sandia National Labs, Albuquerque, NM; BDM International, Inc., McLean, VA; Systems Planning Corporation, Arlington, VA; Raytheon Services Company, Burlington, MA; Institute for Defense Analysis, Alexandria, VA; Battelle, Edgewood, MD; Science Applications International Corporation, Newington, VA; General Research Corporation, Santa Barbara, CA; Meridian Corporation, Alexandria, VA; Jaycor, Vienna, VA.

E. COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY: No significant changes have been made.

F. PROGRAM DOCUMENTATION: The key document is the draft Convention on Chemical Weapons (CW treaty "rolling text"). Requirements are also delineated by the Office of Secretary of Defense treaty manager and coordinated with the Verification Technology R&D Working Group.

G. RELATED ACTIVITIES: Work is also being conducted as part of the Chemical Stockpile Disposal Program by the U.S. Army Program Manager for Chemical Demilitarization to meet Congressionally mandated requirement for destruction of the U.S. chemical weapons stockpile. Additionally, compliance planning and implementation efforts related to U.S./USSR Bilateral agreements are being conducted by the U.S. Army Executive Agent for Chemical Treaty Compliance.

H. OTHER APPROPRIATED FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: The draft Convention on Chemical Weapons; the US-USSR Memorandum of Understanding signed at Jackson Hole, WY, 23 Sep 89; the US/USSR Destruction Memorandum of Agreement signed at Moscow, May 90;

the Research Agreement between the U.S. Arms Control and Disarmament Agency and Japan Atomic Energy Research Institute for the development and testing of remote monitoring technology signed Jan 91; and the US/UK/Canada Memorandum of Understanding, Cooperative Program on Research, Development, Production and Procurement of Chemical and Biological Defensive Material, ITF-11 Technologies for CWC Verification signed Mar 90.

J. MILESTONE SCHEDULE:

- CWC Signature (Est.)	May 92
- CWC Preparatory Commission (Est.)	June 94
- CWC Ratification (Est.)	June 94
- CWC entry-into-force (Est.)	July 94

AMENDED FY 1992/FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H Project Number: CD
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

A. RESOURCES: ($ in Thousands)

Project Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Initial Estimate	FY 1993 Change	FY 1993 Amended Estimate
Yield Measurement Technology	30,050	18,700	19,500	(341)	19,159

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITY: Yield Measurement Technology provides the technical and operational capability to field the HYDRO-PLUS measurement package on underground nuclear tests in the Commonwealth of Independent States (CIS) to verify yield compliance in non-standard test geometries in accordance with Threshold Test Ban Treaty protocols. This technology program includes all necessary instrumentation and gauge construction, fielding support, data reduction, and analysis for technology validation in the U.S. and for actual yield verification in the CIS. As a continuing program, it also provides for creation and updating of the HYDRO-PLUS database and for improvements in HYDRO-PLUS instrumentation and gauge packages.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1991 Accomplishments:
- Completed initial operational validation of HYDRO-PLUS on a Department of Engery underground nuclear test.
- Designed and fabricated operational HYDRO-PLUS equipment.
- Performed training and yield measurement exercise under full treaty protocol conditions during a DNA horizontal line of sight underground nuclear test.

FY 1992 Plans:
- Perform exercise under treaty protocol conditions on a large cavity nuclear event.
- Conduct concept validation of gauge emplacement and miniaturization program to reduce fielding costs and time.
- Begin advanced diagnostic instrumentation and fiber optics evaluation to reduce potential for test verification activities compromise of U.S. nuclear design information.
- Perform verification exercise and protocol training for yield measurement on a horizontal line of sight underground nuclear test.
- Prepare instrumentation and recording equipment for potential deployment to the CIS.
- Conduct a RED-BLUE exercise to train U.S. inspectors as if the CIS were inspecting a DNA test.

FY 1993 Plans:
- Perform verification exercises and yield measurement on a high-yield U.S. test.
- Integrate new technology and instrumentation into HYDRO-PLUS equipment for deployment.
- Incorporate new analysis tools into the HYDRO-PLUS methodology.

Program to Completion: This is a continuing program.

D. WORK PERFORMED BY: S-Cubed, La Jolla, CA; Science Applications International Corporation, San Diego, CA; California Research & Technology, Inc., Chatsworth, CA; Stanford Research International, Menlo Park, CA; R & D Associates, Albuquerque, NM.

E. COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY: Since the FY 1992 Descriptive Summary was provided, the Soviet Union has ceased to exist and has been replaced by the Commonwealth of Independent States (CIS), a moratorium on nuclear testing was declared by the Soviet government and continued by the CIS, and the commonwealth republics have declared that future nuclear testing would not be allowed at the existing nuclear test sites. However, there has been discussion by the CIS to move future nuclear testing to an, as of yet, undeclared test site in Siberia. While recognizing the uncertainty regarding a resumption of nuclear testing by the CIS, development of the yield measurement technology is continuing as planned in order to ensure that the U.S. is prepared to fully exercise its rights and obligations under the Threshold Test Ba Treaty protocols.

F. PROGRAM DOCUMENTATION:
- Threshold Test Ban Treaty
- National Security Directive 44, 18 July 1990

G. RELATED ACTIVITIES: Program Elements 0305135BA (O&M, PDA, MILCON), On-Site Inspection Agency, Supporting Activities; 0305898BA (O&M, PDA), OSIA Management Headquarters; 00305136BA (O&M, PDA), OSIA Operations Communications; 0602714E, DARPA.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: The Threshold Test Ban Treaty and its Protocols.

J. MILESTONE SCHEDULE:

- Non-standard exercise on cavity test	Apr 92
- Gauge emplacement and miniaturization	May 92
- Advanced instrumentation and fiber optics evaluation	Jun 92
- Improved instrumentation/recording vans	Jul 92
- HYDRO-PLUS experiments on underground nuclear test	Sep 92
- Foreign Test Verification or U.S. test exercise	Oct 93