

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 test and 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

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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

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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.

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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

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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.

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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).

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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.

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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.

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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.

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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.

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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

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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.

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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

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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.

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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 term analyses) to the U.S. arms control delegations to the NATO, OSCE, 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.

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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.

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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.

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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

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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.

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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.

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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.

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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.

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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.

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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.

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Project CD - Nuclear Arms Control Technology - This Program Element (PE) includes those activities necessary to conduct a comprehensive and integrated DoD research and 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 from 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; and new 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.

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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 technical data 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.

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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.

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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.

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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.

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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.

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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.

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B. <u>Program Change Summary</u>	<u>FY1998</u>	<u>FY1999</u>	<u>FY2000</u>	<u>FY2001</u>
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

	<u>FY 98</u>	<u>FY 99</u>	<u>FY 00</u>	<u>FY 01</u>	<u>FY 02</u>	<u>FY 03</u>
0603711H Verification Technology Demonstration	80.2	0.0	0.0	0.0	0.0	0.0