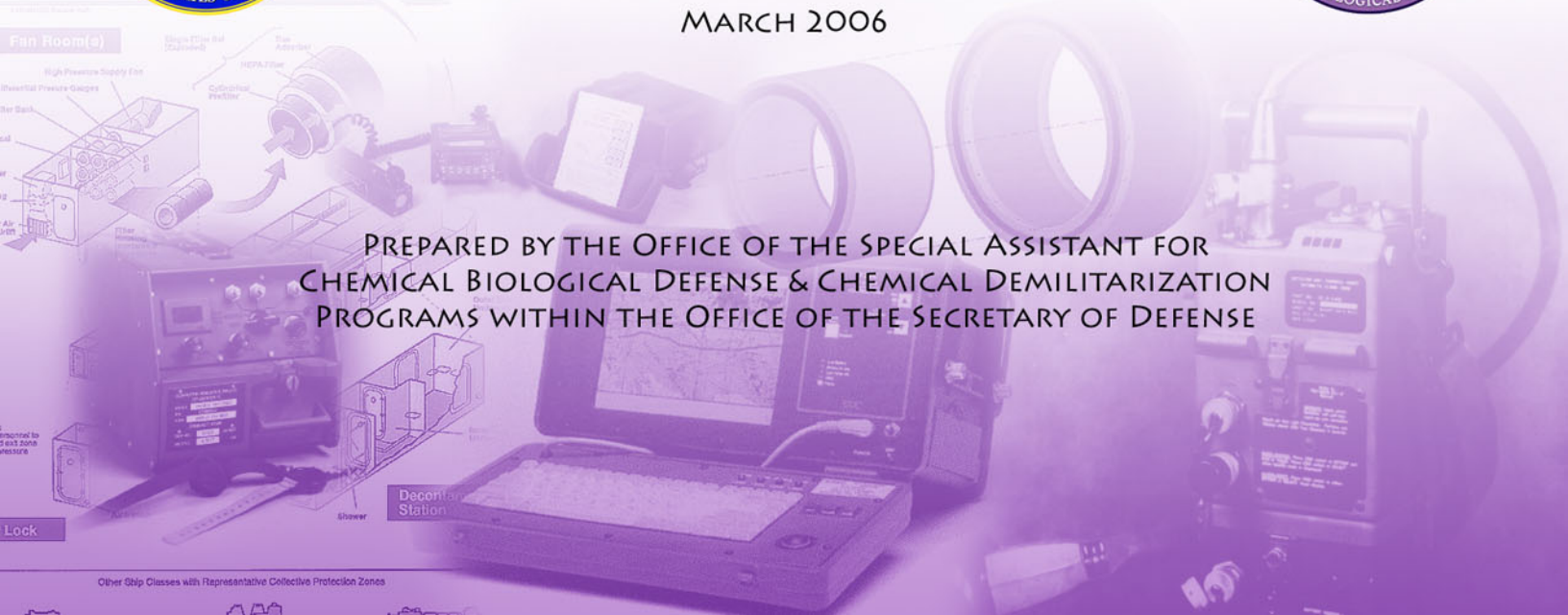
Department of Defense
Chemical and Biological Defense Program
Annual Report to Congress
March 2006



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Programs within the Office of the Secretary of Defense

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Executive Summary

This Annual Report of the Department of Defense (DOD) Chemical and Biological Defense Program (CBDP) provides information in response to several reporting requirements. First, this report is provided in accordance with 50 U.S. Code Section 1523. (The complete reporting requirement is detailed at ***Annex L***) This report is intended to assess:

(1) the overall readiness of the Armed Forces to fight in a chemical biological (CB) warfare environment and steps taken and planned to be taken to improve such readiness; and,

(2) requirements for the chemical and biological warfare defense program, including requirements for training, detection, and protective equipment, for medical prophylaxis, and for treatment of casualties resulting from use of chemical and biological weapons.

The CBDP provides an integrated collection of chemical and biological defense systems to U.S. forces. The overall readiness of U.S. forces is dependent on many factors. One key factor is the availability of equipment. ***Chapter 2*** summarizes equipment requirements and the status of research, development, test and evaluation (RDT&E) and acquisition efforts across all capability areas. ***Chapter 3*** details the logistics status of CB defense systems. The overall logistical readiness status of the Department's CB defense equipment has improved slightly. Several factors have had an adverse effect on the overall DOD readiness and sustainment status: increased demands by the Services for some CB defense equipment; the increased overall Service requirements in order to support operations in Iraq and Afghanistan; the re-organization and the approved strength increase of the Army; and equipment modernization efforts in all of the Services.

Another key factor in overall readiness is the education, training, and exercises conducted by U.S. forces to remain prepared for chemical and biological threats. Education, training, and exercises are detailed in ***Chapter 4***. Readiness for specific operations is highly dependent on the training and equipping of specific units and the nature of the specific operation. Such information is both time dependent and generally classified.

This report supplements the DOD CBDP FY07 President's Budget, March 2006, which has been submitted to Congress.[1] A performance plan for FY05–07 is provided under a separate cover. The CBDP performance plan demonstrates compliance with the Government Performance and Results Act (GPRA), and provides detailed information demonstrating linkage between research, development, and acquisition (RDA) programs and the operational missions of the warfighter. The performance plan accomplishes this by demonstrating the linkage between the program investment (and accomplishment) and the vision of the program (see ***Figure 1***) and the corresponding operational goals and objectives supporting the vision.

[1] Annex I details the CBDP budget and expenditures. For FY07, the total budget request is $1.465 billion, of which $0.506 billion is for procurement, and $0.959 billion is for research, development, test, and evaluation.

Combat weapons of mass destruction through a strong chemical and biological defense program.

Figure 1 Chemical and Biological Defense Program Vision

The DOD CBDP is a key part of a comprehensive national strategy to counter the threat of CB weapons as outlined in *The National Strategy to Combat Weapons of Mass Destruction (WMD),* December 2002. The national strategy is based on three pillars:

(1) Counterproliferation to Combat WMD Use;
(2) Strengthened Nonproliferation to Combat WMD Proliferation; and,
(3) Consequence Management to Respond to WMD Use.

The DOD CBDP provides RDA programs primarily to support the first and third pillars. In support of counterproliferation, the DOD CBDP provides operational capabilities tailored to the unique characteristics of the various CB weapons, including emerging threats, to facilitate passive defense and force protection missions. These capabilities also provide U.S. forces the ability to rapidly and effectively mitigate the effects of a CB attack against our deployed forces. In support of consequence management, the DOD CBDP provides capabilities to respond to the effects of WMD use against our forces deployed abroad, and in the homeland.

A number of potentially hostile states possess or seek WMD. For these states, WMD provide the means to assert regional hegemony and intimidate others. They may brandish nuclear, chemical and biological weapons to ensure regime survival, deny the United States access to critical areas, or deter others from taking action against them. Even when they do not pose a direct military threat to the United States, these states may threaten the United States or its allies indirectly by transferring weapons or expertise to terrorists.

Technological trends heighten the threat. Bioengineered biological agents, and non-traditional chemical agents, once the sole purview of large, complex state weapons programs, will be within reach of a growing number of actors in the coming decades. Technological advances and widely distributed technical information are making ever more dangerous weapons easier to produce.

It is extremely difficult to collect reliable intelligence on WMD programs and activities, which are closely guarded secrets. The prevalence of dual-use technologies and legitimate civilian applications means nuclear, chemical and biological research efforts are easy to conceal and difficult to detect and monitor. Based on the demonstrated ease with which uncooperative states and non-state actors can conceal WMD programs and related activities, the United States, its allies and partners must expect further intelligence gaps and surprises.

As outlined in the 2006 Quadrennial Defense Review (QDR), the Department has refined its Force Planning Construct, dividing its activities into three objective areas: Homeland Defense, War on Terror/Irregular (Asymmetric) Warfare, and Conventional Campaigns. In each area, it accounts both for activities that the Department conducts continuously (steady-state) as well as those it conducts episodically (surge). In addition to normal force generation, sustainment and training activities, this wartime force planning construct calls for U.S. forces to be able to:

- Defend the Homeland;

- Prevail in the War on Terror and Conduct Irregular Operations; and,
- Conduct and Win Conventional Campaigns.

One key programmatic decision the QDR proposes to launch in FY07 is to fund a $1.5 billion initiative, also referred to as the Transformational Medical Technologies Initiative (TMTI), over the next five years to develop broad-spectrum medical countermeasures against the threat of genetically engineered bio-terror agents. The TMTI focuses on broad-spectrum defenses against intracellular bacterial pathogens and hemorrhagic fevers. This initiative builds on efforts started in FY06 as a result of the Enhanced Planning Process and shifts the investment balance to reduce future risks and decrease overall program risk by maintaining a balance among countermeasures against near through far-term threats. Additional initiatives will include developing advanced detection and deterrent technologies and facilitating full-scale civil-military exercises to improve interagency planning for complex homeland security contingencies.

The FY07 President's Budget Submission for the DOD CBDP builds on the existing capabilities fielded to protect U.S. forces against CB threats. The CBDP budget provides a *balanced investment strategy* that includes investment in procurement of capabilities to protect U.S. forces in the near-term (FY07-FY08), investment in advanced development to protect U.S. forces in the mid-term (FY09-13), and investment in basic research and the science and technology base to protect U.S. forces through the far-term (FY14-23) and beyond. In addition, the FY07 budget continues support of an increased investment in the test and evaluation infrastructure necessary to maintain the technological advantage against emerging threats. The investment in the science and technology base and the supporting infrastructure will yield advanced capabilities that will continue to be fielded through the far-term.

The capabilities for CB defense are necessary to counter the complex and varied threats from CB weapons. Chemical weapons include nerve, blood, blister, and choking agents, toxic industrial chemicals, and novel threat agents. Biological weapons include viral, bacterial, rickettsial, and toxic agents, and potentially novel or genetically engineered agents. The threat is complicated by the numerous potential means of delivering these weapons; including bombs, spray devices, missiles, or novel delivery devices. The unique physical, toxicological, destructive, and other properties of each type of CB threat requires that operational and technological responses be tailored to the threat or developed to counter multiple threats. CB defense capabilities must also support the diverse requirements of military operations supporting national security and homeland security missions.

Chapter 2 provides modernization tables for each commodity area (contamination avoidance, battlespace management, individual and collective protection, decontamination, medical systems, and consequence management) summarizing planned progress through the far-term as a result of the RDA investment. The FY07 CBDP budget provides a *balanced investment* that provides the comprehensive array of systems, capabilities, and T&E investments balanced among the operational capabilities to ***Sense*** (Reconnaissance, Detection, and Identification), ***Shape*** (Battlespace Management), ***Shield*** (Individual & Collective Protection, and Medical Pre-treatments), and ***Sustain*** (Medical Diagnostics and Therapeutics, Decontamination and Restoration) U.S. forces for passive defense, force protection, and consequence management missions.

The CBDP funds research to exploit leading edge technologies to ensure that U.S. forces are equipped with state-of-the-art capabilities to defend against CB threats through the far-term. This budget includes support of a comprehensive *science and technology base* program to ensure continued advances in CB defense capabilities. CBDP Basic Research provides core capabilities to ensure U.S. technological advantages through the far-term, including research into advanced CB detection systems, advanced materials for improved filtration systems and protection systems, advanced decontaminants, investigations into the environmental fate of chemical warfare agents, advanced information technologies, T&E technologies and supporting scientific data, medical biological defense research (including the Transformational Medical Technologies Initiative), diagnostics, therapeutics, and vaccines for viral, bacterial, toxin, and novel threat agents), and medical chemical defense (including investigations of low level chemical warfare agent exposures, diagnostics, therapeutics, pretreatments for classical chemical warfare threats and novel threat agents).

The CBDP also supports numerous Defense Technology Objectives (DTOs), which represent the key science and technology base programs for demonstrating advanced capabilities in the near-term (FY07-08) and mid-term (FY09-13). During FY07, DTOs support operational capabilities to Sense, Shape, Shield, and Sustain U.S. forces for passive defense, force protection, and consequence management missions. The science and technology strategy is outlined in ***Chapter 2***, and detailed descriptions of the DTOs are provided in the annexes of this report. In addition, the FY07 President's Budget includes an increased investment in research to develop countermeasures against emerging threats that may result from advances in genetic engineering and related scientific disciplines.

Technologies currently in *advanced development* (Budget Activities 4 through 7) provide leading edge tools that will enhance CB defense capabilities for U.S. forces in all CB defense missions in the near-term. As described in the *National Strategy to Combat Weapons of Mass Destruction*, the response to chemical and biological threats requires tailored approaches that recognize the fundamental differences between chemical and biological weapons (and even the different types of these threats). This budget details the integrated collection of systems under development essential to support principles of contamination avoidance, protection, and decontamination, along with the required T&E capabilities for each area.

Included in advanced development is an increased investment in the Test and Evaluation (T&E) infrastructure. Before 2004, T&E infrastructure needs were identified and submitted as separate needs, and were unfunded. In the FY07 President's Budget Submission, budget needs for the T&E infrastructure continue to be integrated with the research, development, and acquisition (RDA) programs. This budget is based on technology needs and directions, restructured acquisition programs, and integrated the T&E capabilities to execute these programs. The programs are time and funding sequenced to be executable in terms of having the technologies demonstrated and transitioned in synchronization with the T&E capabilities. Thus, the milestones of the acquisition programs are based on the availability of not only the financial resources, but also the technology and T&E resources needed to execute the programs. In addition, the CBDP institutional funding of its Major Range and Test Facility Base (MRTFB) will be increased to cover all operating and modernization costs in compliance with Public Law 107-314, Section 232. This greatly increases the MRTFB stability and availability of critical test facilities to support CBDP test programs in a timely and cost

effective manner. Planned capabilities and T&E infrastructure improvements are aligned and planned to support RDA programs in each major commodity (non-medical), including:

- Contamination Avoidance (*Sense* Functional Area);
- Information Systems and Battlespace Management (*Shape* Functional Area);
- Individual and Collective Protection (*Shield* Functional Area); and,
- Decontamination (*Sustain* Functional Area).

The FY07 program continues to support the consequence management (CM) mission. CM projects fund the development of the Unified Command Suite (UCS) and Analytical Laboratory System (ALS) Block upgrades. CM funding provides for the modernization to address objective operational capabilities for the National Guard WMD Civil Support Teams (CSTs), the Reserve Component (RC) Reconnaissance, and RC Decontamination Teams. It provides full funding for: (1) type-classified protection, detection, and training equipment; (2) development and fielding of upgraded analytical platforms for the detection, identification, and characterization of chemical, biological, and radiological agents used by terrorists in a civilian environment; (3) development and fielding of communication capabilities that are interoperable with other federal, state, and local agencies; (4) testing and evaluation to ensure that the systems fielded are safe and effective; and, (5) program management funds.

Finally, in FY07, the CBDP will start or continue *procurement* on a variety of CB defense systems intended to provide U.S. forces with the best available equipment to survive, fight, and win in CB contaminated environments. Systems beginning procurement in FY07 include the Joint Effect Model (JEM), Joint Warning and Reporting Network (JWARN) Block II, and Joint Service Transportable Decontamination System-Small Scale (JSTDS-SS) Increment 1. Initial Operational Capability (IOC) will be achieved for Joint Protective Air Crew Ensemble (JPACE) Block 1, and the Joint Service Mask Leakage Tester. Full Rate Production will be achieved for the Civil Support Teams' Analytical Laboratory System (ALS) Block 1, and Joint Service Aircrew Mask (JSAM). In addition, the CBDP will continue procurement and fielding of systems to support all operational capability areas for national security and homeland security support missions.

Overall, the FY07 President's Budget achieves a structured, executable, and integrated medical and non-medical joint CB Defense Program that balances urgent short-term procurement needs that include securing the homeland from terrorist attack, and long-term S&T efforts to mitigate future CB attacks. The two primary areas of increased emphasis in this year's budget are the CB Defense Program's test and evaluation infrastructure and novel biodefense initiatives. The budget improves our biological and chemical research labs infrastructure/ability to address known and emerging threats. It also adds and re-allocates funding for novel biodefense initiatives which take advantage of biotechnology and genetics advances. The focus of these biodefense initiatives is on interrupting the disease cycle before and after exposure, as well as addressing the bioengineered threat.

The program supports our commitment to ensure full dimensional protection for all our fighting men and women operating at home and abroad under the threat of chemical and biological weapons. All of these capabilities are integrated as a family-of-systems essential to avoid contamination and to sustain operational tempo on an asymmetric battlefield, as well as satisfy emerging requirements for force protection and consequence management. In summary,

the DOD CBDP remains committed to establishing the optimal balance between the near-term requirement to field modernized equipment to the field, and the need to protect and replenish our long-term investment in technology.

OVERVIEW OF THE REPORT

Chapter 1 describes the accomplishments, processes, and issues related to program management and oversight.

Chapter 2 provides information on medical and non-medical CB defense requirements and research, development, and acquisition programs. This chapter outlines plans and strategies for the development and acquisition of capabilities in each of the program commodity areas; including contamination avoidance, individual protection, collective protection, modeling and simulation, medical chemical and biological defense, and research, development, and acquisition efforts to address homeland security and provide for force protection. ***Chapter 2*** also provides a description and assessment of the test and evaluation infrastructure of the CBDP. This chapter provides an overview of the capabilities and limitations of the current infrastructure and proposed investments that began with the FY06 budget to improve the infrastructure.

Chapter 3 provides an analysis of CB defense logistics posture. The analysis reviews the status of quantities, characteristics, and capabilities and limitations of all fielded CB defense equipment, industrial base requirements, procurement schedules, and problems encountered. ***Annex H*** provides detailed logistics data.

Chapter 4 assesses and documents the status of CB defense education, training, exercises and doctrine conducted by the Services, individually and jointly, in order to ensure the readiness of the Armed Forces. Each of the Services' training standards and programs are included. In accordance with Section 1702 of Public Law 103-160 (the FY94 National Defense Authorization Act), CB warfare defense training activities of the DOD have been consolidated at the U.S. Army Chemical School. This chapter also introduces the CBD Education and Training Integration Directorate established in FY04 as part of the Chemical and Biological Defense Program Office.

Finally, there are several annexes to this report. ***Annexes A through G*** provide detailed information on Joint- and Service-unique CB defense equipment, including (A) contamination avoidance, (B) biological defense systems, (C) information systems, (D) protection, (E) decontamination, (F) medical programs, and (G) homeland security and installation protection programs. ***Annex H*** provides detailed logistics data. This annex reflects the logistics status at the end of FY05. Assessments were conducted during FY04 to determine the specific warfighter requirements based on the "1-4-2-1" force sizing structure and additional mission requirements for force protection, consequence management, and homeland security. Detailed descriptions are provided for systems and equipment that have been fielded, are in production, or are under development. ***Annex I*** provides a summary of funds appropriated, budgeted, and expended by the DOD CBDP. This information supplements information in ***Chapter 3***. ***Annex J*** provides a statement regarding chemical and biological defense programs involving human subjects as required by 50 U.S. Code Section 1523. As detailed in the annex, no such testing has been conducted in over two decades, and none is planned. ***Annex K*** provides information

on the status of DOD efforts to implement the Chemical Weapons Convention, which was ratified by the United States and enforced as of 1997. This annex also includes a summary of plans and activities to provide assistance to other countries in response to an appeal by another State Party to the Chemical Weapons Convention, pursuant to Article X of the Chemical Weapons Convention. ***Annex L*** provides the text of the congressional language requiring this report. ***Annex M*** provides a list of the many acronyms and abbreviations used throughout this report.

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Chapter 1

Department of Defense Chemical and Biological Defense Program Management and Oversight

1.1 INTRODUCTION

In accordance with 50 USC 1522, research, development, and acquisition (RDA) of chemical and biological (CB) defense programs* within the Department of Defense (DOD) are overseen by a single office within the Office of the Secretary of Defense. The Assistant to the Secretary of Defense for Nuclear, Chemical and Biological Defense Programs, ATSD (NCB), serves as this single office. This chapter describes the management and oversight processes and activities related to the effective oversight and management of the Department's CB Defense Program (CBDP), including interagency and international coordination efforts.

1.2 MANAGEMENT IMPLEMENTATION EFFORTS

The roles and responsibilities of all departmental organizations are detailed in the "Implementation Plan for the Management of the Chemical and Biological Defense Program," which was approved on April 22, 2003. The current processes, roles, and responsibilities are described in Section 1.3.

1.3 KEY ORGANIZATIONAL RELATIONSHIPS, ROLES, AND RESPONSIBILITIES

Key organizational relationships within the DOD CBDP are portrayed in ***Figure 1-1***. The CBDP management structure applies to the processes (1) to provide policy guidance, (2) to conduct planning, programming, budgeting, and execution of CBRN defense *research, development and acquisition*, (3) to establish military *requirements* for CBRN defense, (4) to *test and evaluate* CBRN defense programs, (5) to manage chemical and biological defense *science and technology* programs, (6) to provide program analysis and integration, and (7) for program oversight.

This section summarizes selected roles and responsibilities of key individuals and organizations within the CBDP. The JRO-CBRN Defense was formally established on October 1, 2002. The JRO-CBRN Defense charter was approved on February 4, 2003. The establishment of a JPEO-CBD that reports through the Army Acquisition Executive was directed on September 19, 2002. The specific roles and responsibilities are detailed in the implementation plan for the management of the DOD CBDP, which was approved on April 22,

* While the scope of the public law specifically addresses only chemical and biological defense RDA activities, DOD planning also includes radiological and nuclear defense along with chemical and biological defense in its planning activities. However, radiological and nuclear defense capabilities within the CBDP are limited to certain types of radiation detection equipment, modeling and simulation capabilities, and limited medical research on radioprotectants. Various other radiological and nuclear defense efforts, including systems for nuclear and radiation hardening, nuclear detection, medical radiological defense, and other selected other programs are outside the scope of the CBDP. These efforts are discussed where they are related to or complement CBDP efforts.

2003. The 2005 Report to Congress identified the need to establish a directorate within OSD to focus on CBRN Defense Education and Training Integration. That directorate was established in FY05.

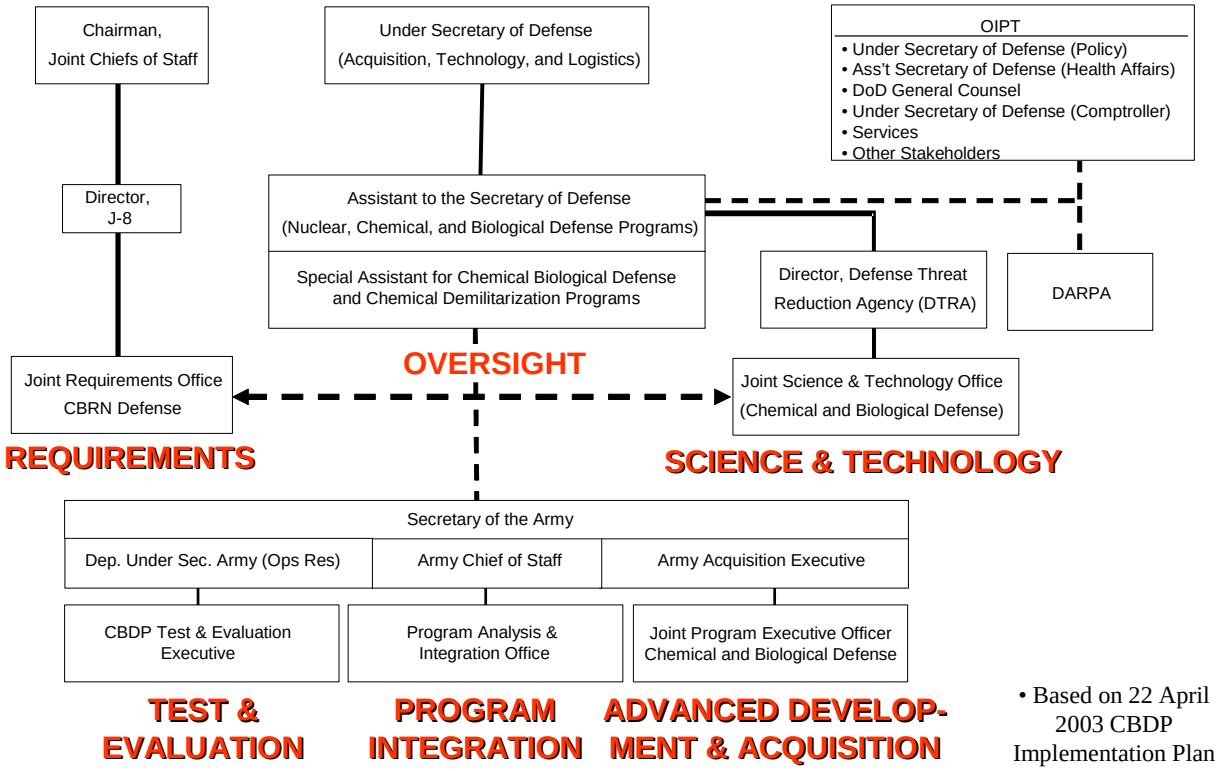

Figure 1-1 CBDP Management & Oversight Structure

1.3.1 Under Secretary of Defense for Policy, USD(Policy)

The USD(Policy) serves as the policy advisor for the DOD CBDP, providing oversight and guidance to ensure that CBDP activities support defense planning guidance and forces policy, Department of Defense relations with foreign countries and the Department's role in U.S. Government interagency policy making. USD(Policy) also provides oversight for the interagency Technical Support Working Group (TSWG) through the Assistant Secretary of Defense for Special Operations and Low Intensity Conflict, ASD(SO/LIC).

1.3.2 Under Secretary of Defense for Acquisition, Technology & Logistics, USD(AT&L)

The USD(AT&L) serves as the Defense Acquisition Executive (DAE) for the DOD CBDP. As the DAE, the USD(AT&L) serves as the Milestone Decision Authority (MDA) for the overall program and key selected systems—also referred to as "sentinel" programs.

While total CBDP funding surpasses the funding threshold of a Major Defense Acquisition Programs (MDAP), the CBDP is not categorized as an MDAP since no individual system reaches this funding threshold. USD(AT&L) funding oversight is tailored by creating an "index of systems" to measure performance of CBDP functional areas. These index systems are referred to as "Sentinel" systems. A Sentinel System is a program in advanced development, that represents a balance of *cost*, *complexity*, and *criticality* to justify the

USD(AT&L) monitoring the cost, schedule, and performance of the Sentinel system as an indicator of the general programmatic health, not just cost, which is the primary criteria for MDAPs. A summary of Sentinel System performance is provided in the CBDP Performance Plan. During 2006, DOD is reviewing the use of these index systems and considering alternatives to ensure appropriate oversight and accountability for the program.

The USD(AT&L) delegates Milestone Decision Authority to the Army Acquisition Executive, who has further delegated MDA responsibility to the Joint Program Executive Officer for Chemical and Biological Defense (JPEO-CBD). This structure maintains a vertically integrated chain-of-command.

USD(AT&L) responsibilities include (1) approving Overarching CBDP Strategic Plan, (2) establishing a CBDP Overarching Integrated Product Team (OIPT) within the Office of the Secretary of Defense, (3) chairing DAE Oversight Reviews for the CBDP, and (4) approving recommended Program Objectives Memorandum (POM) and submitting to Secretary of Defense.

1.3.3 Assistant to the Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, ATSD(NCB)

The ATSD(NCB) serves as the single focal point within the Office of the Secretary of Defense (OSD) responsible for overall oversight, coordination and integration of the DOD CBDP in accordance with 50 USC 1522. The ATSD(NCB) serves as the permanent chair of the CBDP Overarching Integrated Process Team (OIPT). The objective of the OIPT is to assist the DAE with overseeing the CBDP in accordance with the Defense Acquisition Board (DAB) process. Members of the OIPT include the Under Secretary of Defense (Policy), the Under Secretary of Defense (Health Affairs), the DOD General Counsel, the Under Secretary of Defense (Comptroller), the Services, and others, as listed in the Implementation Plan. The OIPT will oversee the following Working IPTs (WIPTs):

- *Joint Requirements*—Chaired by the JRO-CBRN Defense,
- *Science and Technology*—Chaired by DTRA(CB),
- *Test and Evaluation*—Chaired by the CBDP Test and Evaluation Executive,
- *Advanced Concept Technology Demonstration Oversight Group*—Chaired by Deputy Under Secretary of Defense for Advanced Systems and Concepts.

Additional WIPTs may be formed by the OIPT to address specific issues. WIPTs are advisory bodies and will convene as required to address specific issues that need resolution. WIPTs will not convene as part of the normal coordination process. Unresolved issues will be elevated to the OIPT in a timely manner. Membership in the OIPT and WIPTs includes all appropriate OSD, Service, Joint Staff, and Defense Agency stakeholders.

The ATSD(NCB) provides oversight of the CBDP science and technology base (S&T) programs. Science and technology programs are reviewed at the Defense Technology Objective level through the Technology Area Review and Assessment (TARA), or alternative process, to provide assessments of key projects, overall areas within the program, and identify any major findings or issues related to S&T.

Within the office of the ATSD(NCB), the Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs, SA(CBD&CDP), is the principal

deputy to for CBDP matters, and the primary staff action office for ATSD(NCB) responsibilities. As the principal deputy, the Special Assistant also supports the USD(AT&L) in carrying out its MDA and oversight responsibilities for the CBDP.

The SA(CBD&CDP) established the CBD Education and Training Integration Directorate to lead and guide the integration of DOD CBRN defense educational and training initiatives. The CBD Education and Training Integration Directorate strategy optimizes Joint CBRN warfighter capabilities to implement new strategic concepts of global engagement. This Directorate will synchronize baseline capability assessments by identifying successful education and training initiatives, and exploring ways to alleviate any training gaps, misalignments or redundancies. This approach will facilitate an integrated approach to CB Defense education and training. The first phase of this strategy establishes an Education and Training Integration Council (ETIC) with representatives from all military Departments. An initial outcome of the ETIC will be a document, or a series of documents, that identifies standards and a coordination process across the Services and the Combatant Commands for CBRN defense education and training. This will ensure that all DOD personnel and organizations engaged in military and other operations related to CBRN defense receive education and training based on a validated standard. An integrated approach to CBRN defense education and training will provide warfighters, commanders, senior leaders, and decision makers with consistent skills so that each level has an appropriate strategic, tactical, and/or operational awareness and understanding of CBRN defense capabilities that in the end maximize continuity of operations and survivability.

1.3.4 Joint Requirements Office for Chemical, Biological, Radiological, and Nuclear Defense (JRO-CBRN Defense)

The JRO-CBRN Defense began official duties on October 1, 2002. The official charter was approved on February 4, 2003. The JRO-CBRN Defense coordinates with the combatant commands and Services to develop Joint CBRN requirements, and overarching CBRN defense architecture and a joint capabilities roadmap. The JRO-CBRN Defense defines the required system interoperabilities and operational architectures and validates the development of Joint CBRN defense capabilities through both simulation and technology demonstrations. These efforts will be documented in a Joint CBRN Defense Modernization Plan for validation by the Joint Requirements Oversight Council (JROC).

The JRO-CBRN Defense is a single office within DOD under the Chairman of the Joint Chiefs of Staff responsible for planning, coordination, and approval of joint CBRN defense operational requirements and serving as the focal point for Service, combatant command, and Joint Staff requirements generation. These responsibilities include development of CBRN defense operational requirements, joint operational concepts, and architectures for passive defense, consequence management, force protection, and homeland security. JRO-CBRN Defense leads the development of the DOD CBDP POM with JPEO-CBD and DTRA Science and Technology (S&T) support in accordance with Section 6 of the Implementation Plan.

1.3.5 Military Departments

Each of the Military Departments—Army, Air Force, and Navy, including the Marine Corps—plan and execute CBRN defense programs, from basic research through procurement and sustainment. In fulfilling their responsibilities, the Military Departments ensure

coordination and integration with other CBRN defense organizations. Following are selected responsibilities of the Military Departments within the CBDP.

- Validate Joint operational concepts and develop Service-sponsored CBRN defense requirements documents using the guidance set forth in the Joint CBRN Defense Modernization Plan. Where new materiel requirements are identified, submit requirement documents to the JRO-CBRN Defense and recommend for inclusion into the Modernization Plan.
- Include the participation of the JRO-CBRN Defense as early as possible in the concept development phase for potential CBRN defense requirements.
- Provide acquisition and fielding data for respective CBRN defense requirements to the JRO-CBRN Defense during development of the DOD CBDP Program Objectives Memorandum (POM).
- Support development of Service annexes to Joint CBRN Defense requirement documents.
- Provide representatives to all appropriate CBRN defense meetings and organizations.
- Provide representatives for the CBDP OIPT, which is chaired by the ATSD(NCB), to assist the DAE with overseeing the CBDP.
- Conduct CBRN defense training, readiness, and sustainment.
- Participate in the review, development and validation of the Modernization Plan, Joint Future Operational Capabilities, and the Joint Priority Lists.
- Perform Service responsibilities to support Joint Programs as assigned by the JPEO-CBD. ***Figure 1-2*** illustrates current Service responsibilities to support Joint Programs.

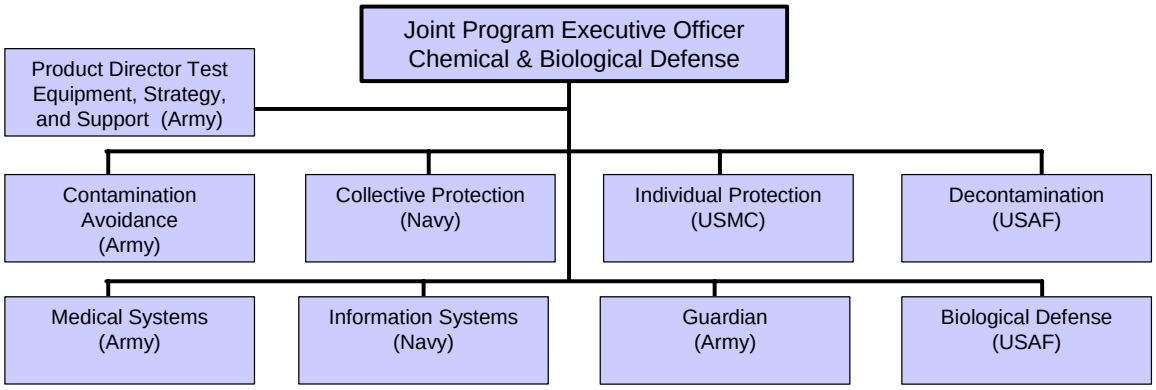

Figure 1-2 Service Responsibilities for Joint Program Management within the JPEO-CBD

The military departments play a critical role in the execution of all phases of research, development, and acquisition. The military departments provide the essential infrastructure, which includes personnel with unique scientific, technical, and management expertise, and the laboratory and test facilities to meet the demands of developing and fielding CBRN defense equipment. Included in Chapter Three of this report is a detailed description and assessment of the military's chemical and biological defense test and evaluation infrastructure, and the supporting laboratory infrastructure. These include capabilities for handling live chemical and

biological agents and conducting a variety of tests. Selected key military facilities, for which more detail is provided in chapter two (Section 2.9), include the following:

- U.S. Army Edgewood Chemical Biological Center (ECBC)
- U.S. Army Dugway Proving Ground
- U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)
- U.S. Army Medical Research Institute of Chemical Defense (USAMRICD)
- U.S. Navy Medical Research Center (NMRC)
- Naval Surface Warfare Center (NSWC), Dahlgren
- U.S. Air Force Operational Test & Evaluation Center (AFOTEC).

1.3.6 Army as Executive Agent

In accordance with 50 USC 1522, the Army serves as the Executive Agent for the CBDP and coordinates and integrates research, development, test and evaluation, and acquisition requirements of the military departments for CBRN defense programs of the DOD. The Secretary of the Army serves as the Executive Agent for the CBDP, and the Assistant Secretary of the Army for Acquisition, Logistics and Technology, ASA(ALT), serves as the Army Acquisition Executive (AAE). Following are selected key responsibilities of Army as the Executive Agent.

- Review all funding for the CBDP.
- Review and recommend approval of the CBDP POM.
- Serve as the Milestone Decision Authority (MDA) for delegated programs, with authority to delegate to the JPEO-CBD. (Note: While the USD(AT&L) is designated as the single MDA for the CBPD, MDA status is delegated by the USD(AT&L) to the AAE. Thus there are two MDAs, though based on a single authority.)
- Serve as Joint Service Materiel Developer to coordinate and integrate acquisition for the CBDP through the JPEO-CBD.
- Provide Program, Analysis and Integration functions for the CBDP.
- Provide the Test and Evaluation Executive for the CBDP.
- Serve as the Joint Combat Developer for the CBDP through the JRO.

1.3.6.1 Joint Program Executive Office-Chemical Biological Defense (JPEO-CBD). The JPEO-CBD reports to the AAE and serves as the CBDP Material Developer and oversees Life Cycle Acquisition Management for assigned system acquisition programs within the CBDP. The JPEO-CBD provides centralized program management and Joint Service acquisition program integration for all assigned non-medical and medical chemical and biological defense programs. Following are selected key responsibilities of the JPEO-CBD.

- Serve as the CBDP Milestone Decision Authority for delegated programs.
- Develop and approve program and acquisition strategies.
- Provide the planning guidance, direction, control, and support necessary to ensure systems are developed in accordance with DOD acquisition guidance.
- Integrate interoperability with civilian emergency response agencies in the planning, guidance, direction, and control of newly acquired systems whenever possible.

- Oversee the development, coordination, and commitment to an acquisition program baseline and ensure immediate reporting of all imminent and actual breaches of approved baselines. In addition, ensure development of a recovery plan.
- Prepare required input to POM, Budget Estimate Submission, President's Budget, and other required documentation. Support development of the annual Research, Development, and Acquisition (RDA) Plan in coordination with DTRA S&T Manager and the Program Analysis and Integration Office.
- Prepare the Joint Logistics Support Plan for medical and non-medical programs for which JPEO-CBD maintains Life Cycle Management to include sustainment in cooperation with the Services and in coordination with the JRO.
- Establish Technology Readiness Levels (TRLs) and conduct reviews to identify opportunities for transition of chemical and biological S&T programs to acquisition in conjunction with DTRA.
- Ensure interagency cooperation and timely transition of technologies to advanced development programs in order to reduce development cycle times.
- Develop and approve Test and Evaluation Master Plans (TEMP) for assigned programs.
- Provide technical and functional integration across assigned medical and non-medical programs. For medical programs, ensure integration with related DOD material programs required for force health protection.
- Execute Test and Evaluation (T&E) capabilities development projects to support overall T&E infrastructure investment strategy.

1.3.6.2 Program Analysis and Integration Office (PAIO). The PAIO supports the CBDP by providing analysis to the OSD oversight office, JRO-CBRN Defense, JPEO-CBD and DTRA. The PAIO provides independent analysis functions to all other elements of the CBDP under operational direction of the Army Deputy Chief of Staff for Programs (G8) as the Army Executive Agent.

In support of the CBDP OIPT, the PAIO provides independent analysis for decision makers to enable review and recommendations concerning impacts to the overall integrated CBDP. This analysis includes the CBDP oversight process, published plans, and overall programmatic health of the CBDP. The PAIO will review and analyze fiscal programs, requirements, resource planning, and resource allocation for the program years. The PAIO also maintains the DOD CBDP Future Years Defense Program (FYDP) and provides support to the JRO-CBRN Defense for the POM build. PAIO supports the JPEO and the Program Managers (PMs) to perform normal Planning, Programming, Budgeting, and Execution System (PPBES) functions necessary to guide assigned programs through each milestone within approved baselines.

1.3.6.3 CBDP Test & Evaluation Executive. The Deputy Under Secretary of the Army for Operations Research (DUSA(OR)) is the Army T&E Executive, and was designated as the CBDP T&E Executive. DUSA(OR) chairs the T&E Executive Working Integrated Process Team (WIPT), membership of which includes each Service T&E executive, and executive representatives from JRO-CBRND, JPEO-CBD, DTRA/JSTO, Operational Test Activity representatives, the Director, Operational Test and Evaluation (DOT&E) and the Defense Test Resource Management Center (DTRMC). This WIPT assists the CBDP T&E Executive to resolve major T&E and related issues at the highest level, which often impact the associated

TEMPs and test plans for Director, Operational Test and Evaluation (DOT&E) approval, when required. The T&E Executive is also responsible for oversight of CBDP T&E infrastructure to ensure that adequate T&E is conducted for CBDP systems, and is responsible for establishing test standards, processes, and procedures.

1.3.6.4 Joint Combat Developer for CBRN Defense (JCD-CBRND). Under the direction of the JRO-CBRND, and supported by the Services and the U.S. Coast Guard (USCG), the JCD-CBRND will coordinate and oversee execution of Joint and multi-Service experiments used to validate the Joint Integrating Concept for CBRN Defense by systematically exploring new and innovative combinations of medical and non-medical Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) capabilities.

Experiments will initially address the full spectrum of CBRN passive defense, force protection, consequence management, and homeland defense. The focus on CBRND limited scale experiments and capabilities differentiates the JCD-CBRND role from that of the much larger Joint Forces Command (JFCOM) role as the DOD Executive Agent for Joint Experimentation.

The JCD-CBRND concept experiments will complement the Science and Technology (S&T) and Advanced Development efforts managed by the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD) and the JPEO-CBD, respectively. Where appropriate, and as directed by the JRO-CBRND, the JCD-CBRND will partner with the JFCOM in the broader DOD joint experimentation process.

Though the U.S. Army Chemical School (USAMCLS) provides a myriad of resources well suited for CBRND experimentation, the JCD-CBRND will take maximum advantage of other personnel, equipment, and facilities available throughout each of the Services, and other government organizations to reduce costs, shorten timelines, and improve experimental designs. Where possible, the JCD-CBRND should strive to leverage planned exercises and other experiment venues outside of the CBDP.

1.3.7 Defense Threat Reduction Agency (DTRA)

DTRA serves two key roles in support of the DOD CBDP—Funds Manager and Joint Science and Technology Manager. These roles are filled by DTRA's Chemical and Biological Defense Directorate, DTRA(CB), also designated as the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD). The JSTO-CBD provides funds management functions under the oversight of the ATSD(NCB). JSTO-CBD also manages and integrates chemical and biological defense science and technology base (S&T) programs, which are coordinated with Service S&T principals. S&T management responsibilities include the development and integration of S&T program in response to OSD and JRO-CBRN Defense guidance. The JSTO-CBD provides the necessary programming, planning, and budgeting documentation for chemical and biological defense S&T programs. The JSTO-CBD works with the JPEO-CBD to ensure effective transition of S&T efforts to advanced development. Other JSTO-CBD responsibilities include the maintenance and leveraging of a robust Service S&T laboratory base to respond to DOD S&T needs, including T&E, providing a DOD CB defense S&T liaison with various organizations (to include DARPA, Technical Support Working Group (TSWG), industry, academia, and other government agencies), providing support for

DOD CB defense S&T international programs, and providing management and integration of CB defense ACTDs.

1.4 COORDINATION WITH RELATED PROGRAMS AND INITIATIVES

DOD CBDP activities are coordinated with other U.S. Government agencies and with other nations to ensure all CB defense capabilities are integrated and coordinated within the interagency community. Management of the development and implementation of national security policies related to CB defense activities by multiple agencies of the U.S. Government are coordinated by the NSC Policy Coordination Committee for Proliferation, Counterproliferation, and Homeland Defense. An overview of key intra- and interagency and international coordination is provided below.

1.4.1 Other U.S. Government Organizations

Several organizations within the U.S. Government are developing CBRN defense technologies. Five organizations with which the CBDP currently has formal coordination efforts include: (1) the Defense Advanced Research Projects Agency (DARPA), (2) the Counterproliferation Program Review Committee (CPRC), (3) the Technical Support Working Group (TSWG), (4) the Department of Homeland Security (DHS) Science and Technology Directorate, and (5) National Institute of Allergies and Infectious Diseases (NIAID). An overview of these programs is provided below.

1.4.1.1 DARPA Biological Warfare Defense Program. DARPA is charged with seeking breakthrough concepts and technologies that will impact our national security. DARPA's Biological Warfare (BW) Defense Program is intended to complement the DOD CB Defense Program by anticipating threats and developing novel defenses against them. The DARPA program is unique in that its focus is on the development of technologies with broad applicability against classes of threats. DARPA invests primarily in the early technology development phases of programs and the demonstration of prototype systems.

In accordance with 50 USC 1522, the Director of DARPA shall seek to avoid unnecessary duplication of activities under the program with chemical and biological warfare defense activities of the military departments and defense agencies and shall coordinate the activities under the program with those of the military departments and defense agencies. The DARPA BW Defense Program coordinates its efforts with numerous organizations, including the SA(CBD&CDP) and DTRA(CB) and by participation in the Technology Area Review and Assessment (TARA) process. A panel of chemical and biological defense experts is routinely consulted by DARPA to evaluate programs and to ensure that National Institutes of Health (NIH) efforts are not being duplicated. DARPA also participates in the BW Seniors Group, which provides government coordination outside of DOD and works closely with the military Services to ensure that technologies are effectively transitioned into the hands of the user community. Additionally, the immune building program routinely coordinates activities across government including with the EPA and DHS.

1.4.1.2 Counterproliferation Program Review Committee (CPRC). The National Defense Authorization Act for Fiscal Year 1994 (Public Law 103-160, §16050) established the CPRC to optimize funding and ensure development and deployment of technologies and capabilities in support of U.S. counterproliferation policy and efforts, including efforts to stem the proliferation of WMD and to negate paramilitary and terrorist threats involving WMD. The

CPRC is an interagency executive committee composed of the Secretary of Defense (Chair), the Secretary of Energy (Vice Chair), the Director of Central Intelligence, Chairman of the Joint Chiefs of Staff, and the ATSD(NCB) as the Executive Secretary. The CPRC Standing Committee, established in 1996, meets regularly to perform the duties and implement the recommendations of the CPRC. The Standing Committee is chaired by the ATSD(NCB). The SA(CBD&CDP) serves as the Executive Secretary. The Congressional mandate also directs the CPRC to identify and eliminate redundancies and uncoordinated efforts, establish program and funding priorities, encourage and facilitate interagency funding, and ensure DOE programs are integrated with operational needs of other government agencies. The CPRC is also chartered to report annually to congressional defense committees on the activities and programs of the DOD, the DOE, the intelligence community and the Joint Chiefs of Staff related to enhancing U.S. capabilities to counter the proliferation of NBC WMD (including their means of delivery) and NBC terrorism.

1.4.1.3 Technical Support Working Group (TSWG). The TSWG is an interagency forum that identifies, prioritizes, and coordinates interagency and international research and development (R&D) requirements for combating terrorism. Policy oversight is provided by the Department of State and execution oversight is provided by DOD, specifically the Assistant Secretary of Defense for Special Operations and Low Intensity Conflict, ASD(SO/LIC). The TSWG rapidly develops technology and equipment to meet the high-priority needs of the combating terrorism community, and addresses joint international operational requirements through cooperative R&D with the United Kingdom, Canada, and Israel. The TSWG also has an effective outreach program so that state and local agencies can benefit from new technology developments and facilitating interoperability between DOD elements and other federal, state, and local agencies. TSWG co-chairs the Science and Technology Subgroup of the Interagency Board for Equipment Standardization and Interoperability (IAB).

TSWG membership includes representatives from nearly eighty organizations across all levels of government. These representatives work together by participating in one or more of TSWG's eleven subgroups. One of the subgroups is the Chemical, Biological, Radiological, and Nuclear Countermeasures (CBRNC) subgroup, which is co-chaired by representatives from the Department of Defense and the Food and Drug Administration. The CBRNC subgroup identifies and prioritizes interagency chemical, biological, radiological, and nuclear combating terrorism requirements, and identifies solutions for detection, protection, decontamination, containment, mitigation, and disposal.

The DOD CBDP and TSWG coordinate requirements and projects to maximize leveraging opportunities. However, equipment requirements for combating terrorism may differ from equipment requirements for the warfighter due to operational, regulatory, legal, and other considerations. The escape masks deployed throughout the Pentagon and in the Capitol are one example of TSWG-funded research.

1.4.1.4 Department of Homeland Security Science & Technology Directorate. The Department of Homeland Security (DHS) Science & Technology (S&T) Directorate was established to tap into scientific and technological capabilities in the United States to provide the means to detect and deter attacks using weapons of mass destruction. DHS S&T will guide and organize research efforts to meet emerging and predicted needs and will work closely with universities, the private sector, and national and federal laboratories. The DOD and DHS are

currently developing a Memorandum of Agreement to ensure effective cooperation on the science and technology and related initiatives being pursued by both agencies.

1.4.1.5 National Institute of Allergies and Infectious Diseases (NIAID). The president's 2006 budget request at the Department of Health and Human Services (HHS) included more than $4 billion for biodefense activities to improve local and state public health systems, to expand existing biosurveillance efforts, and to fund research on medical countermeasures against potential bioterror agents. Within the HHS biodefense budget, approximately $1.7 billion will fund medical research and product development at the National Institute of Allergy and Infectious Diseases (NIAID). NIAID, part of the National Institutes of Health, conducts and supports much of the research aimed at developing new and improved medical tools against potential bioterrorism agents. NIAID has set research priorities and goals for each microorganism that might be used as an agent of bioterrorism, with particular emphasis on "Category A" agents—-those considered by the Centers for Disease Control and Prevention to be the worst bioterror threats. NIAID's research agenda and strategic plan cover the following categories:

- **Basic biology**, understanding how microorganisms and their toxic products function and cause disease
- **Immunology and host response**, understanding how the human immune system interacts with and defends the body against potential agents of bioterrorism
- **Vaccines**, working closely with industry to create new and improved vaccines
- **Drugs**, closely working with industry to develop and test drugs to treat diseases that may result from a biological attack
- **Diagnostics**, developing devices or methods to quickly and accurately diagnose diseases caused by bioterrorism agents
- **Research resources**, establishing biosafety laboratories, databases, and other resources to help scientists conduct safe and effective biodefense research.

Although NIH is a leading agency in government-sponsored research to develop medical countermeasures against biological, chemical, or radiological terrorist threats, it is by no means the only agency involved; the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), the DOD, the Department of Homeland Security (DHS), the Department of Agriculture (USDA), the Department of Energy (DoE), and other governmental organizations also play important roles. Coordination among the various agencies involved is, therefore, extremely important. In broad terms, NIH supported medical countermeasures research activities are coordinated using similar mechanisms, at three distinct levels: within NIH, within the Department of Health and Human Services (DHHS), and across the government as a whole.

In addition to formal coordinating structures, NIAID collaborates daily with the other federal agencies and is party to a large number of interagency programs, informal contacts, and communication mechanisms that significantly contribute to the efficiency and effectiveness with which medical countermeasures research is carried out across the U.S. Government. For example, members of the NIAID staff meet regularly with the research community at Fort Detrick and the United States Army Medical Research and Materiel Command, and with the staff of Armed Forces Radiobiology Research Institute (AFRRI). Through such meetings, synergy in research and mutual support leading to the development of new drugs, vaccines, and

diagnostic tests for the nation are achieved. NIAID personnel also hold meetings periodically with the Defense Threat Reduction Agency and the Defense Advanced Research Projects Agency, two important entities within the research infrastructure in the DOD.

1.4.1.6 Other Interagency Coordination. The CBDP participates in efforts to coordinate research, development, and other efforts related to CBRN defense with other organizations throughout the Federal Government. Following are some highlights of these coordination efforts:

- *The InterAgency Board for Equipment Standardization and Interoperability* (known as the IAB), is a partnership with federal, state, and local agencies focused on the capabilities necessary for fire, medical, and law enforcement responses to WMD terrorism.
- Interagency Agreements with departments of Justice's Office Domestic Preparedness to purchase equipment in support of Justice's grant program.
- The White House Office of Science and Technology Policy chaired Weapons of Mass Destruction Program, Research and Development Subgroup.
- The National Security Council.
- Department of Health and Human Services (including the Food and Drug Administration, and the Centers for Disease Control and Prevention)
- U.S. Department of Agriculture.
- Department of Justice.

1.4.2 International Cooperation

The key objectives of international cooperative CBD programs are to reduce defense system acquisition costs through cooperative development, production, and support; and to enhance interoperability with coalition partners. To ensure DOD's access to the best CBD technologies available worldwide and to promote interoperability, a range of international agreements and programs provide the legal and procedural framework for implementation via Information Exchange Agreements (IEAs), Foreign Military Sales, Engineer and Scientist Exchange Programs, Foreign Comparative Testing, Technology Research and Development Project Agreements (TRDPs), Equipment and Material Loans, and Research, Development and Acquisition Memoranda of Understanding (MOU).

(Cooperative efforts in doctrine and training are codified in Standardization Agreements, which are described in Section 4.2 of this report.)

DOD's international program efforts play an essential role in integrating the CBDP into the global CB defense community. In FY05, the CBDP expanded its international reach by establishing several important new relationships and strengthening existing ones. This network now extends to more than 20 different nations. Partnerships typically begin with an exchange of technical information through an IEA of which more than 50 currently exist. When synergies are identified these exchanges may lead to the development of an MOU or TRDP, which support more extensive international collaborative activities. Ongoing critical projects to accelerate the transition of future technologies into the hands of the warfighter include such areas as water monitoring and chemical and biological collective protection.

The most valuable international CBD efforts fall under large multilateral agreements. One particularly successful area has been the joint development and acquisition of vaccines against identified BW agents. Project Arrangements on the development and licensure of biodefense vaccines are underway with additional countermeasure against BW agents being explored. Through these cooperative ventures, the U.S. will obtain significant financial assistance in developing critical medical countermeasures, while at the same time mitigating risk in the development process.

The CBDP continues to make effective use of international programs to gain unique access to foreign technology and infrastructure, extend the reach of its funding through cost sharing, ensure the seamless integration of equipment and procedures with our nation's allies, and leverage international efforts to establish multinational standardized test procedures and common data.

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Chapter 2

Chemical Biological Defense Requirements and Research, Development, and Acquisition Program Status

2.1 INTRODUCTION

This chapter describes Joint Service chemical and biological (CB) defense requirements and research, development, and acquisition (RDA) programs and the status of these programs—from science and technology base through procurement. This chapter is organized within the framework of the seven operationally oriented commodity areas. These commodity areas (and the sections within this chapter) are:

- Contamination Avoidance (*Sense*) (2.2)
- Biological Defense (*Sense*) (2.3)
- Information Systems (*Shape*) (2.4)
- Decontamination (*Sustain*) (2.5)
- Individual Protection (*Shield*) (2.6)
- Collective Protection (*Shield*) (2.6)
- Medical Systems (*Shield* and *Sustain*) (2.7)

The seven commodity areas above address traditional warfighting activities outlined in Joint Publication 3-11, *Joint Operations in a NBC Environment*. In addition, Section 2.8 addresses specific activities related to CB defense homeland security and force protection. Activities related to the test and evaluation for program-specific activities are provided in each of the sections. Activities related to the overall test and evaluation infrastructure and related efforts are detailed in Section 2.9.

During 2005, the Joint Staff Joint Requirements Office for CBRN Defense (JRO-CBRND) initiated a Capabilities-Based Assessment of Joint CBRN Defense warfighting operational capabilities that supersedes the baseline capabilities assessment completed in 2003. This Capabilities-Based Assessment provides a structured process that aligns programs with national security strategies and Departmental strategies. In addition, it brings the process in line with the Joint Capabilities Integration and Development System (JCIDS), the Department's process for defining and developing system requirements, as defined in CJCSI 3170.01E. The focus of the Capabilities-Based Assessment is on the passive defense portion of the Combating WMD mission, as outlined in the National Military Strategy for Combating WMD. Similar assessments are being conducted for consequence management and radiological and nuclear defense. CBRND is aligned into the four operational elements—Sense, Shape, Shield, and Sustain. Core capabilities for ***sense*** include reconnaissance, detection and identification (Contamination Avoidance); ***shape*** includes information systems; ***shield*** includes individual and collective protection, and medical prophylaxes and pre-treatments, and ***sustain*** includes decontamination, restoration, and post-exposure medical capabilities (i.e., therapeutics and diagnostics). The linkage between these joint enabling concepts and capabilities is illustrated in ***Figure 2-1***.

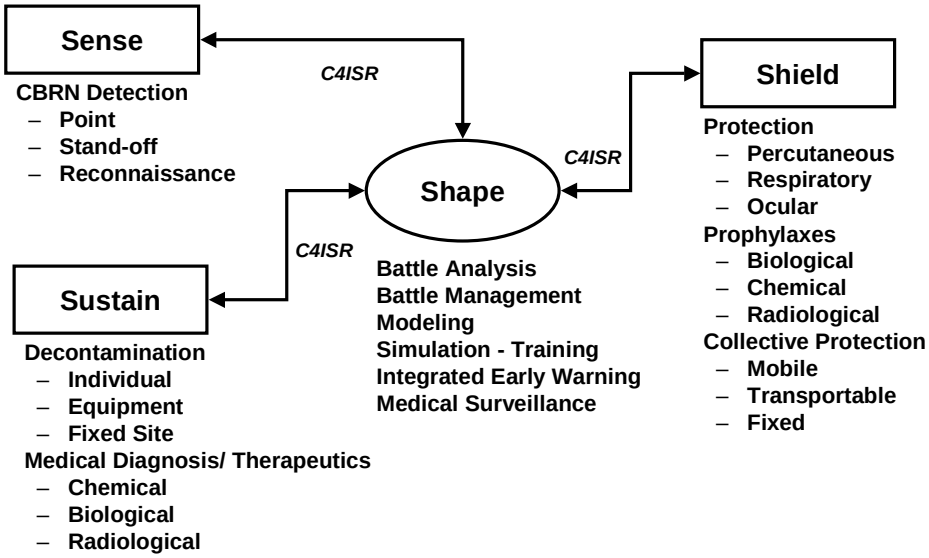

Figure 2-1 Joint CBRN Defense Enabling Concept and Supporting Core Capabilities

When a valid operational need has been identified the Services examine the range of non-materiel solutions first (Doctrine, Organization, Training, Leadership, Personnel, Force Structure) within the Joint CBRN Defense construct in order to provide the most effective force while operating in a CBRN environment. If it is determined that none of the non-materiel options meet the required need, equipment or materiel solutions are pursued through the materiel acquisition process. The research and development modernization process will identify technological approaches that may result in a new operational capability or an upgrade to an existing operational capability.

The FY07 President's Budget Submission integrates science and technology investments, acquisition programs, and the test and evaluation (T&E) capabilities to execute these programs. Schedules and resources are sequenced to synchronize technologies demonstrations and transitions to advanced development in concert with T&E capabilities to support a fully executable program. Thus, the milestones of the acquisition programs were based on the availability of not only the financial resources, but the technology and T&E resources needed to execute the programs.

2.2 CONTAMINATION AVOIDANCE (Reconnaissance, Detection, and Identification)

The CBRN contamination avoidance capability area develops CBRN detectors and identifiers for point, standoff, and early warning applications for use in CBRN reconnaissance, detection and identification. For fixed sites where contamination cannot be avoided or for missions requiring operations in a contaminated environment, reconnaissance, detection, and identification are critical to ensure that forces can assume the optimal protective posture so that they can continue to sustain operations and rapidly identify and decontaminate (if possible or necessary) affected areas, equipment, and personnel. Sensors for the individual warfighter and systems capable of detecting multiple agents and characterizing new agents are being developed. Advances in technology are being pursued in the areas of chemical and biological standoff detection, early warning detection, miniaturization, and interconnectivity;

enhancements in detection sensitivity, interferents rejection, logistics supportability, and affordability are also being addressed. The increased lethality and heightened operational tempo of future battlespaces demand responsive detection and warning capabilities in order to reduce force degradation caused by CBRN contamination. These capabilities are critical for force readiness and will continue to be emphasized by the DOD community in the near and far term. Early detection and warning are keys to avoiding CBRN hazards. The following sections detail contamination avoidance science and technology efforts, modernization strategy, and Joint Service programs.

2.2.1 Detection Science and Technology Efforts

Within the science and technology base, detection efforts for detection of chemical and biological agents are jointly managed. This section provides an overview of science and technology efforts that are intended to support programs of both the Joint Project Manager for Contamination Avoidance (described in section 2.2) and the Joint Project Manager for Biological Defense (described in section 2.3). The science and technology efforts include standoff detection, bio point identification, lightweight integrated identification, water detection and monitoring, and aerosol science.

2.2.1.1 Goals and Timeframes. The goal of the detection and technology area is to provide a real-time capability to detect, identify, characterize, quantify, locate, and warn against all known or validated CBRN warfare agent hazards, to include toxic and industrial chemical and non-traditional agents (see ***Table 2-1***).

a. Near Term. To meet near-term needs, a number of sensor technologies are being optimized while alternative detection technologies mature. Four major Defense Technology Objectives (DTO)* will be completed in the near term as part of this effort. DTO CB.35 (Stand-Off Biological Aerosol Detection) develops and demonstrates technologies to detect and discriminate biological agents in both day and night-time operations at ranges of at least 1 km while decreasing the false alarm rates to no more than one per week. DTO CB.53 (Wide-Area Aerial Reconnaissance) demonstrates the performance envelope of the current state-of-the-art hyperspectral imaging technology. Real-time data processing is used to perform phenomenology studies to explore the optimal trade-offs between speed, spatial and spectral resolution for mapping CW threats in an airborne reconnaissance application. DTO CB.50 (lightweight Integrated CB Detection) tested and downselected, from three competing technology concepts to the Rapid Aerosol Agent Detection (RAAD) concept which uses a combination of multi-wavelength fluorescence and laser-induced breakdown spectroscopy to detect and discriminate biological agents. This technology is being considered for technology insertion as a spiral improvement to the aerosol trigger in the Joint Biological Point Detection System (JBPDS). DTO CB.37 (Chemical/Biological Agent Water Monitor) will complete with an advanced prototype that will be demonstrated and transitioned to meet the biological detection requirements of Increment I of the Joint Chemical Biological Radiological Agent Water Monitor (JCBRAWM) program at the end of FY06. Other non-DTO efforts include technology transition from DARPA with Semiconductor Ultraviolet Optical Sources (SUVOS) technology to develop a low cost biological aerosol detector in collaboration between the

* A DTO is a project (or a collection of closely related projects supporting a specific objective) that states a specific set of objectives, the schedule, costs, specific warfighter payoffs (stated quantitatively against two or more metrics), and the customers for whom the technology is being developed.

CBDP and the Department of Homeland Security, characterization and assessment on the performance of prototype designs for detecting low-volatility aerosolized agents for transition to the Joint Chemical Agent Detector (JCAD) program, as well as the development of new test methodologies to support Developmental/Operational Test and Evaluation requirements of the CBDP.

b. Mid Term. Mid-term technologies focus on developments to improve tactical detection and identification capabilities for both chemical and biological warfare agents. To this end, work on a first-generation prototype based on millimeter wave spectroscopy for biodetection is being continued along with UV Resonant Raman (UVRR) spectroscopy for detection and identification of biological materials. Efforts to develop technologies, which will detect surface residuals for post-decontamination, are being initiated this year. Efforts are being initiated to predict passive standoff technology response to aerosols, and in detection modalities to detect sentinel species from biological chemical warfare materials and processes.

c. Far Term. Far-term science and technology efforts focus on multi-agent sensors for CBRN agent detection and remote/early warning CBRN detection. These far-term objective technologies seek to integrate chemical and biological point and remote/early warning detection modules into a single system. Research and development efforts seek to optimize and balance system sensitivity, size/weight, cost, power consumption, signature suppression and false alarm rate. Ultimately the goal is direct integration of CBRN detectors as a single system into various platforms linked into command, control, communication, computer, and intelligence (C4I) networks.

Table 2-1 Detection Science and Technology Strategy

Near (By 2008)	Mid (By FY2013)	Far (By FY2023)
• Develop low-volatility agent detection technology for insertion into Joint Chemical Agent Detector (JCAD) • Downselect technologies and transition development of lightweight and portable automatic biological agent detection for Joint Biological Tactical Detection System (JBTDS) • Demonstrate laser enhanced RAMAN technology to detect the presence of chemical agents on surfaces. Support transition of technology into Chemical Unmanned Ground Reconnaissance (CUGR) ACTD • Demonstrate, downselect, and transition technologies for Joint Chemical, Biological, and Radiological Agent Water Monitor (JCBRAWM) • Develop and transition hyper-spectral technology with real-time analysis for an improved chemical standoff capability.	• Develop and catalog biological agent and background interferent signature libraries • Develop a surface detection technology to measure and quantify residuals from decontamination process • Develop first generation reagentless biological detection and identification prototypes based on "non-traditional" spectroscopic regions such as millimeter wave, and terahertz and/or resonant spectrums such as Ultraviolet Resonant Raman (UVRR) • Develop and mature Micro-Electro-Mechanical Systems (MEMS) sensors for both chemical and biological detection applications • Explore nano-sensor concepts and technologies	• Transition rapid broad-spectrum and reagentless biological monitoring, detection, and identification technologies to applicable joint acquisition programs • Develop and transition miniaturized combined chemical and biological detection technologies that integrate with C4I networks

As identified in the *Defense Technology Area Plan* and the *Joint Warfighting Science and Technology Plan,* the following are Defense Technology Objectives (DTOs) focused on near and mid-term science and technology goals.

New and Ongoing DTOs:

- Stand-off Biological Aerosol Detection (DTO CB.35)
- Chemical Biological Agent Water Monitor (DTO CB.37)
- Lightweight Integrated CB Detection (DTO CB.50)
- Wide Area Aerial Reconnaissance for Chemical Agents (DTO CB.53)
- CBRN Unmanned Ground Reconnaissance (CUGR) ACTD (DTO JA.40)

The CUGR ACTD (DTO JA.40) will exploit next-generation sensor technology to demonstrate an improved CBRN contamination detection capability in the current manned reconnaissance capabilities and demonstrate the military utility of CBRN unmanned ground reconnaissance systems.

2.2.1.2 Potential Payoffs and Transition Opportunities. Future CBRN detection systems will provide the capability to detect, identify in real time, map, quantify, and track all known CBRN contamination in a theater of operations. This will enable commanders to avoid CBRN contamination, determine the need for and verification of effective reconstitution procedures, and assume the appropriate protective posture required to continue fighting and sustain their mission with minimal performance degradation and casualties. CBRN detection technologies have dual use potential in Occupational Environmental Health Surveillance for monitoring air pollution, noxious fumes inside enclosed areas, and municipal water supplies.

2.2.1.3 Major Technical Challenges. The major technical challenges are in the areas of biological collection, detection and identification including; remote/early warning sensing, improved agent discrimination and quantification, sample processing, interferent (*i.e.*, false positive and negative alarms) and ambient biological background rejection. Among other technical challenges for detection are the size, weight, and power reduction of detectors; power generation and consumption; development of integrated biological and chemical detection systems, the fusion of sensor data with mapping, imagery, and other data for near real-time display of events; detection on surfaces; standoff detection; and detection and quantification of low level exposures. The ability for wireless remote control and to obtain near real time information from detectors employed by expeditionary forces is a key challenge. Challenges for T&E capabilities development include: those of realistically portraying an agent threat environment in a live agent chamber; performing robust, valid agent-simulant correlations; and developing the analytical methodologies and modeling & simulation required to fully characterize the detector system performance under battlefield conditions.

There are two critical challenges facing biological agent detection. Current technologies require a *high level of logistical support* and *lack discrimination in biological standoff detection*. The challenge in reducing logistical support stems from dependence on reagents and trade-offs among size, weight, and power requirements of the systems. Several efforts are aimed at providing minimum reagent requirements with higher sensitivity, better stability, and fewer supporting reagents, and scientific and engineering strategies to reduce size, weight, and power requirements, especially in the sample collections components. There are several factors directly limiting the ability to discriminate biological agents using standoff detection technologies. Key factors include: (1) a lack of fundamental data in understanding the spectral properties of biological warfare agents, (2) range limitations due to atmospheric absorption, and (3) natural background interference. Over the last two years, a number of strategies and

concepts have been developed to improve the discrimination capability of standoff detection for biological materials.

2.2.2 Contamination Avoidance Modernization Strategy

The increased lethality and heightened operational tempo of future battlespaces demand responsive detection and warning capabilities in order to reduce force degradation caused by CBRN contamination. These capabilities—which encompass reconnaissance, detection, identification, and reporting—are critical for force readiness and will continue to be emphasized by the DOD community in the near and far term. ***Table 2-2*** shows the roadmap of DOD requirements for contamination avoidance, and highlights capabilities being developed and procured in the near term, and developmental programs that are planned to be available in the mid to far-term. Fielded legacy systems maintained by the Services through their operations and maintenance (O&M) accounts are not indicated in this table. While the near-term requirements primarily address service-specific needs, those in the mid to far-terms primarily address Joint Service needs.

Early detection and warning are keys to avoiding CBRN hazards. As a result, DOD is investing in RDA efforts to provide the warfighters real-time capabilities to detect, identify, quantify, and warn against all CBRN warfare hazards. Real time detection of biological agents is currently unavailable and is unlikely in the near to mid-term, though investment efforts are focused on reducing detection times. The near to mid term focus is on developing stand-alone detectors and sensors, system miniaturization, improved sensitivity and specificity, agent characterization, range, decreased false alarm rate, and decreased operation and support costs. This focus will facilitate the integration of chemical detectors into personal warfighter gear (Objective Force Warrior Program (OFW)), CBRN detectors onto various air, sea, and ground platforms, and integration of detectors into automated warning and reporting networks. ***Table A-1*** in ***Annex A*** provides an overview of current and planned RDA efforts and Service involvement. Fielded legacy systems maintained by the Services through their O&M accounts are described in the annex.

2.2.3 Contamination Avoidance Programs

Within the Joint CBRN Defense Program, Service contamination avoidance needs are addressed by fully coordinated joint projects.* ***Table 2-2*** highlights Joint programs; Service-unique programs are italicized. Program descriptions are provided in ***Annex A***. The Joint Programs are:

- Automatic Chemical Agent Detection Alarm (ACADA)
- Joint Chemical Agent Detector (JCAD)
- Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)
- Joint Service Light NBC Reconnaissance System (JSLNBCRS)
- Joint Chemical Biological Radiological Agent Water Monitor (JCBRAWM)

* Biological detection efforts are also fully coordinated joint programs and are described in section 2.3. The separation of Contamination Avoidance and Biological Defense corresponds to the JPEO organizational structure to facilitate program management and does not indicate a lack of integration.

2.2.4 T&E Infrastructure to Support Contamination Avoidance and Biological Defense

Future T&E capabilities to support contamination avoidance will provide the ability to detect and identify agents, as well as build performance correlations between simulated and actual warfare agents. Planned and program-aligned infrastructure and capabilities to support contamination avoidance programs include:

- Development of a Whole-System Live-Agent Testing (WSLAT) chamber to test biological point detection systems against actual biological agents
- Data-standardization and integration for CB detection systems
- Development of a standoff test capability for CB detectors
- Development of high-speed meteorological and test-environment monitoring capabilities
- Development of agent-to-simulant performance correlations for detection systems
- Testing of CB detection systems with nontraditional agents (NTAs)
- Real-time test-data collection capabilities
- Development and fielding of a synthetic test environment for robust testing of CB detection systems

Table 2-2 Detection Science and Technology Strategy

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Chemical Point Detection	• Surface off-gas sampling capability (ICAM) • Automatic point detection of nerve and blister agents (ACADA) • Navy-*Ship based improved automatic point detection of nerve/blister (IPDS)*	• Improved, all-agent programmable automatic point detection; portable monitor; miniature detectors for aircraft interiors; interior ship spaces; wheeled and tracked vehicles; and individual soldiers (JCAD)		• Improved surface contamination monitor • Detection of CB contamination in water (Joint Chemical Biological Radiological Agent Water Monitor, JCBRAWM)
CBRN Recon-naissance and CB Remote and Stand-off Detection	• Improved CBRN Reconnaissance Vehicle with remote/early warning and data fusion capabilities (M93A1)	• Lightweight passive stand-off detection for chemical agent vapors (JSLSCAD Increment I) • Light reconnaissance vehicle (JSLNBCRS)	• Add biological detection and identification capabilities (JSNBCRS P3I) • Integrated CBRN detection (point/standoff/identification/ sampling /IAV-NBCRV))	• Chemical Agent Stand-off Detection System detection, ranging, and mapping of chemical rains, vapors and aerosols • Wide area detection • Single, fully-integrated multifunctional NBC Recon platform with NBC Unmanned Ground Vehicle System (UGVS) capability (IAV-NBCRV) • FCS – CBRN Manned Recon and Unattended CBRN Sensors
Radiation Detection	• *Army, Marine Corps-AN/PDR-75, AN/VDR-2 RADIAC* • *Marine Corps- IM-143* • *Army-AN/PDR-77 RADIAC* • *Air Force-ADM-300* • *Navy- AN/PDQ-1 RADIAC and OA-9449/PDQ Detector Group*	• Army -*Compact, digital whole body radiation measurement (AN/UDR-13)*		• Stand-off radiation detection and measurement • Portable radiation meter

1. All programs shown are joint or multi-service, unless indicated as a Service-unique effort (italicized text).
2. Where applicable, systems which meet requirements are listed following the entry.

* continuing procurement in near term.

2.3 BIOLOGICAL DEFENSE PROGRAMS

Within the Joint CB Defense Program, Service biological detection needs are addressed by fully coordinated joint projects. Advanced development and acquisition efforts for biological detection are managed by the Joint Project Manager Biological Defense. ***Table 2-3*** highlights Joint programs. Service-unique programs are italicized. Program descriptions are provided in ***Annex B***. The Joint Programs are:

- Joint Biological Point Detection System (JBPDS)
- Joint Biological Standoff Detection System (JBSDS)
- Joint Portal Shield
- Biological Identification System (BIDS)
- Dry Filter Units (DFUs)

Table 2-3 Biological Defense Modernization Strategy

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Biological Point Detection	• Joint Biological Point Detection System (JBPDS) – Automatic point/mobile biodetection to detect and identify bio-agents; programmable • Army-*Biological Integrated Detection System (BIDS)* • Joint Portal Shield Network Sensor System	• Automated biological remote detection and early warning capabilities (JBSDS Increment I)	• Spiral Upgrade of JBPDS – increase number of agents detected and identified with increased sensitivity, lower false positive rates; with increased reliability.	• Automated, integrated detection of both biological and chemical agents in a single sensor package (Joint Modular Chemical/ Biological Detector System, JMCBDS) • JCBRAWM (See above) Program start (FY09) for Joint Modular Chem/Bio Detection System (JMCBDS) – small lightweight biodetector – networked system • Automated biological remote detection and early warning capabilities (JBSDS Increment II)

2.4 INFORMATION SYSTEMS

The Information Systems area seeks to develop the capability to use automatic collection and fusion of information from all CBRN defense assets throughout the battlespace and integrate that with other relevant battlespace information and C^4I systems. It will integrate threat information, CBRN sensor and reconnaissance data, protective posture data, environmental conditions, medical surveillance, and other data pertaining to the CBRN conditions in the battlespace. The end result of this capability is the rapid dissemination and display of operationally meaningful information to commanders and units at all levels to support decision making related to the CBRN Defense mission, such as joint force protection, restoration of operational tempo, and casualty care treatment.

Warning and reporting is a critical component of this capability. It provides the critical link between CBRN detection and CBRN protection and provides situational awareness to the commander. Warning and reporting provides the hardware and software to connect detection

systems into the overall command and control architecture. Additionally, it provides information and analysis capabilities to enhance hazard forecasting and assessment, and operational decision making. The goal of warning and reporting is to provide sufficient, accurate, and timely information to commanders at all levels through early and direct warning capabilities so they can assume appropriate protective postures and develop options to continue mission essential operations.

The Joint Warning and Reporting Network (JWARN) will provide Joint forces with a comprehensive warning and reporting capability to collect, analyze, identify, locate, report, and disseminate CBRN and Toxic Industrial Material hazard information to affected personnel. Providing this information to the warfighter affectively minimizes the effects of hostile CBRN attacks as well as accidents/incidents. JWARN will integrate with Joint/Service C4ISR systems and networks. JWARN will be interoperable with the Joint Effects Model (JEM) and the Joint Operational Effects Federation (JOEF).

The JWARN Block I effort began fielding the first version of software in FY98. The JWARN Block II effort commenced in FY01. The JWARN program achieved a Milestone B (MS B) decision in July 2003. Subsequent to MS B, a contract was awarded and the acquisition strategy was revised. The new acquisition strategy eliminated the incremental development of JWARN and combined Block II and Block III into one increment and addresses hardware and software integration onto Service designated platforms and installation at fixed sites.

An integrated warning and reporting network will enhance the overall approach used in the chemical biological defense strategy. The JWARN effort includes a JWARN Component Interface Device (JCID), which provides connectivity to CBRN sensors and detectors via wired and wireless communication. (A key challenge will be the connectivity to legacy and some development systems.) Alerts from sensor systems in the operational theater become available to various command levels with appropriate levels of resolution determined by the command decision needs. For example, a fixed facility commander can determine the appropriate level of protective posture by monitoring the direction of an ongoing attack or the effects of weather in moving contamination in a post attack situation.

Information Systems also provides tools for the warfighter to understand a specific challenge and evaluate proposed solutions. These systems provide the warfighter with a full spectrum of capabilities to automatically create warning reports and situational awareness from sensory input, and perform hazard analyses, operational effects analyses, and accurate training. Modeling and simulation capabilities are used to provide situational awareness, to provide hazard warning and prediction, and for planning or modification of operations. In the future, modeling and simulation capabilities will be used to provide operators and decision makers with the ability to analyze courses of action immediately prior to or in concert with response objectives. In addition, modeling and simulation aids in the assessment of Joint and Multi-Service doctrine, training, materiel development, and equipment design (i.e., Simulation Based Acquisition). Modeling and simulation is also used to support warfighter training and the training of battle staffs using larger conflict simulations. In the latter aspect, modeling and simulation is used to perform and support analyses of CBRN defense operations within the context of larger military operations. Analytic systems such as models are also critical components of larger systems, such as JWARN and command and control systems. These efforts also support simulation-based acquisition in the development of critical CBRN defense capabilities.

The following sections provide a summary of the Modeling and Simulation science and technology efforts, modernization strategy, and Joint Service programs, which support the Information Systems area.

2.4.1 Modeling and Simulation Science and Technology Efforts

The Modeling and Simulation science and technology efforts include four sub-areas including battlespace management, hazard environment prediction, effects on operations, and acquisition decision support tools. Efforts are continuing to provide advanced hazard assessment methodologies, to address specific environmental flow regime issues (such as high altitude and urban transport and diffusion (T&D) methodologies) and to support first principle physics, chemistry, and meteorology efforts. Information Systems technologies are addressing operational effects and processes for fixed site simulations, as well as advances in conflict simulation methodologies and distributed information systems. The technology base efforts also leverage information on weapons effects, medical, and larger DOD Modeling and Simulation communities to address source term and toxicology, interoperability and architectural issues.

2.4.1.1 Goals and Timeframes. The goals of CBRND modeling and simulation science and technology efforts are as follows:

- support the warfighter directly through existing C^4I networks and information systems,
- support the operational and national command authority with CBRND environment decision systems, and
- support DOD level theater and warfare simulation efforts.

Table 2-4 shows specific efforts supporting these goals.

Table 2-4 Modeling & Simulation Science and Technology Strategy

Near (By 2008)	Mid (By FY2013)	Far (By FY2023)
• Complete and integrate mobile forces modules into theater-level models • Complete development models for high altitude, urban, littoral and coastal environments • Continue sensor-data fusion and source term location technologies • Complete development of a sensor integration facility to test battle management tools • Transition advanced predictive capabilities to Joint Effects Model (JEM) Block II • Transition mobile force capability, chemical hazard estimation and risk assessment tools to Joint Operational Effects Federation (JOEF)	• Demonstrate and transition MESO and CBW-CFX methodologies to JEM • Demonstrate and transition STAFFS • Demonstrate and transition Joint Medical NBC Decision Support Tool to JOEF • Detection Simulation-Based Acquisition (SBA) application transitioned to Virtual Prototyping Systems (VPS) • Collective Protection SBA application to VPS • Virtual Emergency Response Training System (VERTS) transitioned to Training Simulation Capability (TSC) Block I • Demonstrate emerging advanced information system technologies	• Demonstrate advanced system architectures for JEM and JOEF • Demonstrate real-time, course-of-action decision making options technology • Demonstrate micro scale weather forecast hazard prediction capability • Demonstrate mobile forces CBD operational effects capability • Demonstrate emerging advanced info systems technologies • Decontamination SBA applications transitioned to VPS

a. Near Term. Current modeling capabilities are designed to support warfighter efforts to conduct scenario simulations prior to engagements and to train in a realistic manner. Recent advances allow CBD planning to be folded into larger conflict simulation and consequence management tools, including battlespace management, hazard environment prediction, effects on operations, and acquisition decision support tools. SBA tools will be used for detectors in conjunction with other CBD environment models to assess acquisition strategies for several Service/Joint detector and platform acquisition programs.

b. Mid Term. The next generation transport and dispersion (T&D) methodologies will provide a multi-fidelity capability, which will allow the warfighter increased flexibility and more responsiveness to threat and hazard predictions. Testing operational models with combatant commands will allow for direct user input and improvements in the fidelity of the models. We will integrate modules for the Joint Effects Model (JEM) that address high altitude intercepts, urban littoral and costal environments, and interior contamination scenarios. By building a CB sensor network test facility, we will be able to develop and test sensor data fusion tools, which will be eventually integrated with JEM and JOEF. Developing SBA tools for protection and decontamination projects will allow for the identification of critical enhancements based on the modeling and simulation of early prototypes.

c. Far Term. The far-term capabilities will include a near-real-time operational hazard prediction capability. An ongoing effort in modeling is the incorporation of specific advances in the characteristics of contamination avoidance, decontamination, medical and protection systems into models so that warfighters are able to evaluate and plan for advances. Integrated conflict simulation capabilities are also envisioned to meet theater and strategic simulation requirements.

Defense Technology Objectives (DTOs) with a modeling & simulation (M&S) or Information System focus include:

- DTO CB.43, Chemical and Biological Warfare Effects on Operations
- DTO CB.55, Chemical and Biological Hazard Environment Prediction
- DTO CB.42, Environmental Fate of Agents
- DTO CB.51, Low-level CW Agent Exposure: Effects and Countermeasures
- DTO CB.62, Hazard Prediction with Nowcasting

The objective of DTO CB.43 is to develop a general-purpose model of the operations of large fixed-site facilities [air bases, aerial ports of debarkation (APODs) and seaports of debarkation (SPODs)], with the capability to represent CBRN hazards and their operational impacts. DTO CB.55 will focus on needed methodologies for advanced real-time hazard prediction capabilities. DTO CB.42 will provide required data for accurately predicting the fate of chemical agents on surfaces of military interest. DTO CB.51 will deliver data sets on operationally relevant health effects of exposures to sublethal concentrations of chemical warfare agents. DTO CB.62 will provide the high-resolution meteorological forecasting capabilities that are only required for CBRN operational decision making processes.

2.4.1.2 Potential Payoffs and Transition Opportunities. Future information systems will enhance C4ISR systems with a level of situational awareness with significant improvements including: accurate information, knowledge, and predictions of threats, the environment, operational alternatives and effects in real time, accelerated time, or as required. This will enable commanders to control the battle, analyze the need for CBRN defense actions, verify effective deployment of CBRN defense assets and reconstitution procedures, assume the appropriate protection required to continue operations, and sustain their mission with minimal performance degradation and casualties. The key payoffs of M&S include: (1) commanders and battle staffs are better trained and able to analyze alternate courses of action with advanced simulations, (2) there is less confusion and more consistent decision making via use of a federation of analytical and real time CBD environment M&S tools, (3) CBRN defense systems and operational concepts match requirements more closely because warfighter feedback is captured earlier in the development cycle under the tenets of SBA, and (4) advanced hazard prediction and human effects modeling has dual use potential in aiding civilian responders or planners to prepare for or respond to terrorist attacks and industrial accidents. DOD anticipates three major technology transitions in the near term, including improvements in real-time hazard prediction capability for JEM, improvements in CBR operational effects modeling for JOEF, and the maturation of a CB “Sim Suite” for testing data fusion tools, which will benefit the entire JEM/JOEF/JWARN capability. In the mid-term, we plan to transition more than ten technologies, including the ability to predict the behavior of atmospheric dispersion of liquid agents, hazard prediction capabilities for more operational scenarios, measurements of coastal and littoral agent dispersion, CB sensor siting around building complexes, internal building models, models of chemical IED effects on mobile forces, and other methodologies for improving situational awareness. By 2013, the military force will have significantly improved modeling and simulation technologies to support information sharing and situational awareness of CBRN hazards in the battlespace, paralleling the net-centric future focus of the Department.

2.4.1.3 Major Technical Challenges. Major technical challenges for M&S include the following: (1) accurate agent fate data, (2) fusion with accurate and timely weather data, including high altitude and near-surface weather data, (3) modeling and validating the effects of complex and urban terrain on CBRN hazards, (4) modeling and validating high altitude threat intercept effects, (5) modeling and validating human effects and small unit behaviors in a

CBRN environment, (6) modeling and validating effects of low level and long term exposures, (7) effectively quantifying the effects that CBRN hazards have on complex fixed site operations, (8) integrating CBRN effects and operations with C^4I systems for training and operations, (9) interjecting CBRN effects into combat and materiel evaluation simulations with adequate fidelity without bringing the simulations to a standstill, and (10) developing engineering level models of CBRN defense equipment that can participate in distributed simulations to support SBA from inception to system retirement. The modeling and simulation technology goals identified in its planned approach, combined with new threat agent data and increased research into performance degradation effects of protective equipment on units, will address many of these challenges in the mid-term.

2.4.2 Information Systems Modernization Strategy

The CBRN Information Systems modernization strategy is organized into two major functions: (1) warning and reporting systems and (2) modeling and simulation (M&S) systems. ***Table 2-5*** shows the roadmap of DOD requirements for both warning and reporting and modeling and simulation, and highlights capabilities being developed and procured and the near term and developmental programs that are planned to be available in the mid to far-term. Legacy systems that are still maintained by the Services are not indicated here.

Warning and reporting systems combine hardware with information systems solely as a result of the need to create the physical means to automatically provide sensor system data to the information system and consequently to provide the resulting information in an effective manner to the human operator. Therefore, warning and reporting systems have evolved from platform based (ANBACIS and MICAD) efforts to the more generic JWARN system hosted on C4ISR systems with the capability of receiving data from or controlling all legacy and future CBRN sensors. Like M&S Systems, warning and reporting systems typically are hosted on other major hardware and software systems though they are capable of stand-alone operation.

Table 2-5 Information Systems Modernization Strategy

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Warning and Reporting Systems	• Automated, standardized warning and reporting (JWARN ID&E) • MICAD Fox vehicle system		• Integrated and automatic warning and reporting (JWARN Block II & III) • JSLNBCRS embedded JWARN system	• JCID Increment I
Hazards Analysis	• Counterforce hazard prediction (HPAC 4.4) • Passive defense hazard analysis (VLSTRACK 3.1)	• High altitude intercept analysis (PEGEM) • Urban environment analysis (MIDAS-AT) • CONUS facilities analysis (D2PC) • DOD Standard for hazard prediction and effects capability (JEM Block I)	• Increase capability to analyze high altitude intercepts and urban environments (JEM Block 2)	• Multi-fidelity hazard prediction, to move at will from global, to theater, to battle, to building, to individual scale analyses • Micro-scale event analysis (JEM Block 3
Operational Effects Analysis		• Fixed site analysis (STAFFS) • Medical resources analysis (CREST) • Mobile forces analysis (NCBR Simulator)	• Deliberate and crisis action planning decision support tools (JOEF Block I)	• Additional C41 system integration and incident management (JOEF Block 2)
Simulation Based Acquisi-tion Systems		• Navy-Ship based analysis (CWNavSim) • Point and stand-off detector systems (NCBR Simulator)	• Detection (VPS Block 1) • Biological detection and identification capabilities (VPS Block 2)	• Protection and decontamination (VPS Block 3&4)
Training Simulation Systems		• Virtual Emergency Response Training System (VERTS)	• VERTS Capability becomes Training Simulation Capability (TSC) Blocks 1 and 2 • Individual and crew training systems (TSC Block 2)	• Integrated training systems for battle staffs and commanders (TSC Block 3)

The CBD M&S program includes efforts from technology base through full-scale system development and demonstration. The Joint Effects Model (JEM) program is based upon the proven technologies of existing agent hazard assessment models and the emerging operational requirements document, which articulates the Joint Service needs. The JEM program achieved Milestone A in May 2001 and Milestone B in January 2004 along with a signed requirements documents and test & evaluation master plan.

The Joint Operational Effects Federation (JOEF) program achieved Milestone A in February 2002. JOEF is the acquisition program that addresses operational effects and planning. JOEF will use JWARN and JEM to predict or analyze the nature of the hazard area, but will take that information and use a federation of other models and simulations to meet a

specific operational commander's or other authority's needs. The combination of JWARN, JEM and JOEF will meet wide spectrum of user needs for analytical M&S systems.

Analysis and training are the keys to being prepared for and responding to a CBRN event. As a result, DOD is concentrating RDA efforts on providing its warfighters and decision makers with analytical systems to predict or forensically analyze events and courses of action for the full spectrum of CBRN threats. In the near term, efforts are focused on taking advantage of technology development in hazard assessment methodologies to provide interim accreditation for a number of analysis regimes. In addition, efforts in operational effects and SBA will be prepared to transition to full scale development programs. In the mid-term, first priority has been given to transitioning the most mature technologies to the new start JEM and JOEF programs. These will provide accredited, common use hazard information systems by the years 2006 and 2008 respectively. Largely due to the maturity of the technologies, requirements and the vision for them, the SBA and Training Systems Capability (TSC) will be addressed behind those for analysis. However, both SBA and TSC are also functionally and structurally dependent upon the analytical systems so a delay in their start is appropriate. ***Table C-1*** in ***Annex C*** provides an overview of RDA efforts and Service involvement.

The management challenge involves the coordination and consolidation of numerous previously uncoordinated RDA efforts across the Services and Agencies. This strategy, led by the JPEO through the Joint Project Manager, Information Systems (JPM IS), established in April 2003, has already resulted in the initiation of the above mentioned Joint Service RDA efforts.

2.4.3 T&E Infrastructure to Support Information Systems

Future T&E capabilities to support battlefield Information Systems will provide the ability to perform automated and integrated stimulation of systems, collection of system performance data, and processing of data to evaluate M&S systems as used within operational test/unit exercises when integrated into an overall battlefield scenario; eventually testing will be virtual simulation with or without a small actual test unit in play. The focus will be on digitizing the environment and performance of systems of systems against which to play the CBDP M&S system, with the ability to run thousands of scenarios quickly to identify major areas of focus and combinations of conditions best suited for actual live testing. Time-sequenced and aligned efforts to support RDA activities in information systems include:

- Development of high-speed ground-truth and test-environment monitoring capabilities
- Development of portable testing capabilities
- Development and implementation of improved data-fusion techniques
- Improvement of test-area data-collection capabilities
- Development of synthetic test capabilities using operational-testing stimulators
- Development and implementation of real-time test-data collection capabilities for field testing

2.5 DECONTAMINATION

When contamination cannot be avoided, personnel and equipment may need to be decontaminated to reduce, eliminate or neutralize hazards after CBRN weapons employment. Decontamination systems provide a force restoration capability for units that become contaminated. Two commercial application systems (Multipurpose Decontamination System &

Fixed Site Decontamination System) were fielded in response to five applicator Operations Need Statements (ONS) and one decontaminant ONS. Technology advances in sorbents, vapor, dispersion methodologies, coatings, catalysts, and physical removal will reduce logistics burden, manpower requirements, and lost operational capability associated with decontamination operations. The following sections detail CBRN decontamination science and technology efforts, modernization strategy, and Joint Service programs.

2.5.1 Decontamination Science and Technology Efforts

The science and technology efforts in this area include process fundamentals, solution chemistry, solid phase decontamination, and alternative processes.

2.5.1.1 Goals and Timeframes. The goal of decontamination science and technology is to develop technologies that remove, displace, or eliminate toxic materials or their effects without performance degradation to the contaminated object and that will be non-corrosive, environmentally safe, and lightweight (see ***Table 2-6***). This area includes decontamination of personnel, individual equipment, tactical combat vehicles, aircraft, ships, facilities, and fixed sites.

a. Near Term. Research has focused on the development of a peroxide-based family of decontaminants that is significantly less toxic and corrosive than currently fielded decontaminants (to include HTH and STB), yet providing superior efficacy against all known Chemical and Biological Warfare Agents and provide a single, universal decontaminant. These potential decontaminants will also be nontoxic, non-corrosive, and environmentally safe. Toward the goal, research under DTO CB.44 (Oxidative Formulation) developed and tested several candidate solutions. Work continues to develop alternate formulations that improve material compatibility and allow for use in cold climates. Alternate solution-based technologies include the development of man-portable point-of-use chlorine dioxide generation systems, impregnated solvent suspensions of reactive nanoparticles wiping system for vehicle/platform interiors and sensitive equipment.

b. Mid Term. Technologies are being explored to recycle commercial hydro fluoro ether (HFE) solvents in a field sensitive equipment decontamination process. Work continues in the development of porous polymer cartridges to effectively remove CW agents from HFE solvents and allow a closed-loop decontamination process. Work continues on gaseous chemical and biological decontamination systems that combine hot air and vaporous hydrogen peroxide for application to sensitive equipment, platform interior, and general purpose decontamination.

c. Far Term. Studies are being initiated to determine the technical potential of reactive coatings to enhance decontamination efficiency, and point-of-use generation of decontaminants such as hydrogen peroxide. Alternative decontaminants and decontamination processes that use gas, aerosols, energetic, and novel approaches will also be studied.

Table 2-6 Decontamination Science and Technology Strategy

Near (By 2008)	Mid (By FY2013)	Far (By FY2023)
• Complete development of and transition a family of peroxide-based decontaminants for general purpose application • Transition a solvent soaked wipe system to the Joint Platform Interior Decontamination (JPID) program • Transition a portable point-of-use chlorine dioxide generation system to the Joint Service Transportable Decontamination System (JSTDS) program	• Develop and transition a closed-system solvent extraction and recycling method for sensitive equipment decontamination • Develop and transition interior hot air/vaporous hydrogen peroxide • The next generation of reactive sorbent powders	• Develop new materials and coatings that self-decontaminate and enhance the performance of decontaminants and decontamination processes. • Develop and demonstrate personnel decontaminant

2.5.1.2 Potential Payoffs and Transition Opportunities. The payoff from enhanced decontaminants and decontamination systems will be new non-corrosive, non-toxic, nonflammable, and environmentally safe decontamination systems suitable for timely elimination of CBRN hazards from all materials and surfaces. This ability will allow forces to reconstitute personnel and equipment more quickly to increase combat efficiency and lessen the logistic burdens. In the future, reactive coatings may allow the continuation of combat operations without the need to disengage for decontamination. Potential uses for environmental remediation, especially those dealing with pesticide and toxic industrial chemical contamination and implications to domestic scenarios, are being exploited.

2.5.1.3 Major Technical Challenges. There are two key technical challenges associated with chemical and biological decontamination. The first is the development of decontaminants that are reactive, non-aqueous, non-corrosive, safe for use on sensitive equipment, able to decontaminate a broad spectrum of chemical and biological agents, environmentally safe, and pose no unacceptable health hazards. The second technical difficulty is the development of decontamination systems that effectively clean all surfaces and materials, while simultaneously reducing the manpower and logistics burden. Challenges to the development of decontamination T&E capabilities also lie in safety of use of the simulated agent or decontaminant, and in correlating stimulant field performance to that of the corresponding live agent.

2.5.2 Decontamination Modernization Strategy

The goal of the CBRN Decontamination program area is to provide technology to remove and detoxify contaminated material without damaging combat equipment, personnel, or the environment. Decontamination systems provide a force restoration capability for contaminated units. Existing capabilities rely upon the physical application and rinse down of decontaminants on contaminated surfaces. Existing systems are effective against a wide variety of threat agents, yet are slow and labor intensive and present logistical, environmental, material, and safety burdens. Existing systems are also inadequate for electronic equipment decontamination, deficient for large area, port, and airfield decontamination, and rely on water or bleach-based aqueous systems. To improve capabilities in this functional area, the Joint Services have placed emphasis upon new decontaminating technologies that reduce existing manpower and logistics requirements. These technologies are safer on the environment, the

warfighter, and equipment. ***Table 2-7*** shows the roadmap for modernizing decontamination systems in DOD, and highlights capabilities being developed and procured in the near term, and developmental programs that are planned to be available in the mid to far-term. Legacy systems that are still maintained by the Services are not indicated here.

A Decontamination Master Plan provides a roadmap that integrates RDA efforts with non-RDA efforts, including policy, doctrine, standards, and revised tactics, techniques and procedures. Research and development of non-corrosive, all-agent multipurpose decontaminants and decontaminating systems for combat equipment, aircraft, and personal gear remains a priority. Alternative decontamination approaches, such as sensitive equipment decontamination methods and large-scale decontamination systems attract interest across the Services. ***Table D-1*** in ***Annex D*** provides an overview of Joint Service RDA efforts and Service involvement.

2.5.3 Joint Service Decontamination Programs

The Army developed the M291 Skin Decontamination Kit as a replacement for the M258A1 Decontamination Kit for all Services, and introduced the M295 for improved personal equipment decontamination. The M295 provides the warfighter a fast and non-caustic decontamination system for personal gear. An adsorbent that is more reactive and has higher capacity of absorbing contamination was developed and completed to improve the performance of the M295 kit. The M295 kit filled with the new sorbent became available for requisition in January 2000.

Two systems and a decontaminant were fielded in response to Urgent Operational Needs. The Multi-Purpose Decontamination System, a commercial system, was fielded to address M17 shortages in meeting operational requirements. The Fixed Site Decontamination System, a modified commercial item, was fielded to address an urgent need to provide facility and terrain decontamination. The Sandia National Laboratory developed DF-200 was fielded to address the urgent need for an environmentally friendly decontaminant.

In the near- and mid-term, DOD continues to research new multi-purpose decontaminants as a replacement for obsolete Decontamination Solution 2 (DS2) and for corrosive High Test Hypochlorite (HTH) and Super Tropical Bleach (STB). New technologies, such as reactive decontaminating systems, oxidative formulations, and enhanced sorbents are being explored and may offer operational, logistical, cost, safety, and environmental advantages over current decontaminants. Present chlorine-based decontaminant solutions pose an unacceptable corrosion risk to aircraft. Current procedures require the use of fresh water and normal aircraft detergent solutions.

Ideally, new decontaminant formulations must be extremely reactive with dwell times under 15 minutes and be effective at a pH below 10.5 in order to minimize corrosion. Potential new solutions-based approaches consist of organic, aqueous and mixed organic-aqueous systems, which use catalytic and oxidative chemistries. Some promising decontaminants under consideration are organized assemblies incorporating monoethanolamine-type moieties, non-chlorine containing oxidants, such as stabilized peroxides, peroxycarboxylic acids and dioxiranes, and liquid slurries or suspensions of nanoparticles in organic solvents.

In the far-term, the Services are seeking non-aqueous decontamination systems to provide for sensitive equipment decontamination at mobile and fixed sites. Additionally, there

is interest and exploratory research in coatings, which can reduce or eliminate the necessity of manual decontamination. The ultimate goal of this coatings effort is to develop a chemically or possibly electrically reactive coating to apply on equipment when operating under high CBRN threat conditions. This coating would then provide immediate decontamination on contact with CBRN agents, thus reducing the hazard without any actions required at that time by the warfighter. A detailed description of the decontamination projects is provided in ***Annex D***.

2.5.4 Other Decontamination Programs

The Army is using Commercial-Off-The-Shelf Technology to alleviate M17 shortages until fielding of Joint Service Transportable Decontamination-Small Scale occurs. The Marine Corps has modified its existing M17 Lightweight Decontamination System so it can be operated with Military Standard Fuels. The Navy has procured and is fielding an M17 Lightweight Decontamination System that can be operated with Military Standard fuels. The M100 Sorbent Decontamination System began fielding in February 2002. This decontamination system replaces the M11/M13 DAP and associated DS2 used in immediate decontamination. This system consists of a non-toxic and non-corrosive, powder-based system that provides greater coverage than the M11 at 33% less weight.

2.5.5 T&E Infrastructure to Support Decontamination

Future T&E capabilities for decontamination systems will include the ability to quantitatively assess the operational significance of system degradation caused by decontamination operations. This is critical for both CB and non-CB systems which require NBC Contamination Survivability (NBCCS). The T&E capabilities will also be focused on providing for quantitative and operationally meaningful characterization of the efficacy of decontamination systems for hasty, operational, and thorough decontamination. A future focus is to provide a wider range of simulants for agents and possibly decontaminants for use in field testing/training. Time-sequenced and aligned efforts to support RDA activities in decontamination include:

- Development of hazard-assessment models for decontamination
- Expanded simulant-testing capabilities
- Development of capabilities to assess the effects of decontamination on battlefield performance
- Development of capabilities to test decontamination procedures under battlefield relevant conditions
- Development of decontamination test methodologies for NTAs
- Development of updated methods to assess the degradative effects of decontaminating process on equipment and systems

Table 2-7 Decontamination Modernization Strategy

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Personal Equipment Decontam-inants	• M291 Skin Decontaminating Kit • M295 Individual Equipment Decontaminating Kit	• Joint Service Personnel/Skin Decontamination System (JSPDS) Increment I	• Non-caustic, non-corrosive decontaminant for personnel and equipment	• JSPDS Increment II
Bulk Decontam-inants	• High Test Hypochlorite (HTH) • Supertropical Bleach (STB)	• Non-caustic, non-corrosive, easy to store and manufacture multipurpose decontaminants • Joint Service Transportable Decontamination System (JSTDS), Small Scale Increment I Decontaminant	• Decontaminants for fixed sites • Navy -*Less caustic capability*	• Mission tailored decontaminants • Navy -*Contamination resistant shipboard materials* • JSTDS Increment II Decontaminant (include Aircraft Decontamination)
Expedient Delivery Systems	• M100 Sorbent Decontamination System		• Auto-releasing coatings; reduces skin contact hazard & labor requirements • Hand held portable decontam-inant applicator systems for immediate and operational decontamination (Joint Portable Decontamination System Increment I)	• Self-decontaminating, auto-releasing coatings; reduces man-power and logistic requirements eliminates skin contact hazard
Deliberate Delivery Systems	• M17 Lightweight Decontamination System • M12A1 Power Driven Decontamination Apparatus • Army –*Rebuild M12A1 Power Driven Decontamination Apparatus; Replace M17 Lightweight Decontamination System* Multipurpose Decontamination System • Interim fielding of a commercial lightweight decontamination system to replace and supplement the M17 LDS Fixed Site Decontamination System • Interim fielding of a commercially developed unit to perform terrain decontamination	▪ Joint Service Transportable Decontamination System (JSTDS), Small Scale Increment I Decontaminant • High pressure water wash; improved decontaminant dispenser (increased vehicle throughput)	• Rapid large scale decontamination capability for fixed sites; reduced manpower and logistic burden (JSTDS, Large Scale Increment I) • Non-aqueous capability for electronics, avionics and other sensitive equipment	• Vehicle interior decontamination capability • Waterless decontamination capability for electronics and avionics • Sensitive equipment decontamination system for aircraft interiors • Large scale fixed location decontamination systems for use at fixed site facilities (Joint Service Stationary Decontamination System)

1. All programs shown are joint or multi-service, unless indicated as a Service-unique effort (*italicized text*).
2. Where applicable, systems that meet requirements are listed following the entry.

2.6 PROTECTION

Protection provides life sustainment and continued operational capability in the CBRN contaminated environment. The Protection Capability Area provides the capability to shield the force from harm caused by CBRN hazards by preventing or reducing individual and collective exposures and by protecting critical equipment. The protection program is aligned within two areas – individual protection and collective protection.

- ***Individual Protection.*** The primary focus of Individual Protection is to address capability gaps identified in "Respiratory & Ocular Protection," and "Percutaneous Protection." Masks and clothing are the two sub-areas within the individual protection thrust area. Protective masks with reduced respiratory stress, improved protection, compatibility with weapon sighting systems, and reduced weight and cost are being developed. Respiratory protection technology focuses primarily on air purification technologies, materials technologies for mask lens and facepieces. Protective gloves are being developed that will have greater durability, tactility, and dexterity and are flame resistant. Protective footwear will provide equal or increased durability while greatly reducing weight and volume. Percutaneous protection technology mainly focuses on the development of materials such as: engineered permeable materials that include semipermeable membranes, sorbent loaded semipermeable membranes, nanobarrier materials, and reactive materials.
- ***Collective Protection*** The collective protection program is driven by capability gaps identified as "Expeditionary Collective Protection". There are two sub-areas in collective protection—Air Purification Systems and Shelter Systems. Air purification technology seeks temporary and permanent air purification solutions for transportable and fixed site applications. Advanced vapor separation technologies, advanced aerosol/ particulate separation technologies, and filter residual life indicators are being investigated to enhance the performance of both single-pass and regenerable air purification systems. Shelter technology mainly focuses on the development of materials such as: engineered permeable materials, impermeable materials, and material treatments. Supporting technologies are being investigated to advance environmental control units, motor blower units, structural components, and test methodology. Technology improvements are being pursued to reduce power requirements and improve filtration capacity against current and future CBRN hazards. Technologies that reduce weight, volume, cost, and improve the deployability of shelters and air purification systems are also being pursued.

2.6.1 Protection Science and Technology Efforts

The science and technology efforts in this area (addressing both individual protection and collective protection) include protective clothing, protective masks, air purification, and shelters.

2.6.1.1 Individual Protection Goals and Timeframes. The goal of the individual protection area is to reduce the physiological burden associated with wearing protective equipment while maintaining, and potentially improving, the already high level of protection against CBRN warfare agents (see ***Table 2-8***). Individual Protection Equipment must also provide protection against emerging threats, such as non-traditional agents (NTAs) or toxic industrial chemicals

(TICs). To achieve these goals, key physiological performance requirements for the design and evaluation of clothing and masks are being established. New barrier and filtration materials and selectively permeable materials are being developed and evaluated to accommodate these performance requirements.

2.6.1.2 Collective Protection (CP) Goals and Timeframes. The goals of the collective protection area are to (1) reduce the weight, size and power requirements of CP systems, (2) reduce the logistical burdens associated with the maintenance of CP filters, (3) improve protection capabilities against current and emerging threat agents, including TICs, and (4) improve the deployability of transportable shelter systems (also see ***Table 2-8***). To achieve these goals, improvements to system components (including transportable shelters) are being investigated along with improvements to the current vapor and particulate filtration media. Regenerative vapor and particulate filtration materials processes are being investigated to eliminate the need for filter change and improve the capability against any battlespace CBRN hazards.

As identified in the *Defense Technology Area Plan* and the *Joint Warfighting Science and Technology Plan*, Defense Technology Objectives (DTOs) with a protection focus include:

- End-of-Service-Life Indicator (ESLI) for Mask Filters (CB.36)
- Immune Building Program (CB.40)
- Self-Detoxifying Materials for CB Protective Clothing (CB.45)
- Advanced Air Purification System Model (CB.61)

The DARPA Immune Building Program is developing technologies and methods to protect building occupants from both internal and external release of hazardous materials or CBRN threat. Collective Protection strategy will also address transportable shelter systems by investigating improved and self-decontaminating shelter materials, improved seaming processes, and improved closures and airlocks. Also the JPEO-CBD Readiness Installation Protection Program (Guardian) will incorporate CP technologies.

Table 2-8 Protection Science and Technology Strategy

Near (By 2008)	Mid (By FY2013)	Far (By FY2023)
• Selectively-permeable membranes will offer lighter weight protective garments and resistance to POL degradation for the JSLIST CB Coverall for CVC (JC3). • Transition End-of-Service Life Indicator (ESLI) for Mask Filters into Joint Service General Purpose Mask (JSGPM). • Continue to pursue efforts to reduce size/weight/ power of ColPro systems and components • Continue to expand air purification scope of protection (TIC/TIM & NTA) • Complete clothing aerosol protection efforts for transition into Joint Service Lightweight Integrated Suit Technology (JSLIST). • Continue to pursue efforts to reduce physiological loads (thermal and respiratory) • Integrate 6.1 projects (Breathable Butyl Rubber and Polymeric Nanocomposites) into program	• Selectively-permeable membranes will offer lighter weight protective garments and enhanced aerosol protection for the Joint Protective Aircrew Ensemble (JPACE). • Exploit advances in material sciences to revolutionize sorbents and seals and enable new mask concepts. • Air purification technology efforts will provide enhanced protection and reduced flow resistance for the Army's Future Combat System (FCS), Joint Collective Protection Equipment (JCPE), and Joint Expeditionary Collective Protection (JECP) via either single pass, regenerative filtration or advanced air purification approaches. • CB shelter technology will provide integrated advanced shelter materials and components that enhance the protection provided while reducing the weight, cube, and cost of transportable shelters. These efforts will address requirements of the JCPE and JECP.	• Percutaneous protection efforts will focus on technologies applicable to a CB duty uniform to provide self-decontamination, reduce garment thermal load, and extend the useful life of garments. • Respiratory protection efforts will provide a higher level of protection against a broader spectrum of threats (including high priority TICs), and a mask end-of-service-life indicator for the Next Generation General Purpose Mask and the Next Generation Aircrew Mask. • Air purification technology efforts will provide nontraditional (non-adsorbent based or non-single pass) air purification to meet user requirements for future collective protection systems. • CB shelter technology efforts will provide technologies for universal shelters with CB protection or ability to adapt existing shelters to meet future collective protection systems requirements.

2.6.1.3 <u>Overview of DARPA Protection Programs</u>. This thrust focuses on destroying or neutralizing pathogens and toxins before they enter the body. Projects in the area of decontamination and neutralization include the Self-Decontaminating Surfaces program that seeks to explore, identify, and develop creative new material technologies for the ultimate purpose of providing a surface treatment that is biocidal and exhibits self-cleaning/renewal behavior. The approach will involve innovative ways to incorporate biocides into various surface treatments that will be used with mechanisms of self cleaning that explore the use of hierarchical surface morphology.

In addition, under DTO CB.40, Immune Building Program, DARPA is developing technologies and systems to allow military buildings to actively respond to attacks by agents of chemical or biological warfare so as to (1) protect human occupants from the lethal effects of the agent, (2) restore the building to function quickly after the attack, and (3) preserve forensic evidence about the attack. The program focus is on the challenging problem of protection from covert agent release inside buildings. Enabling buildings to respond actively, in real time, to the presence of threat agents will not only greatly reduce the effectiveness of such attacks, but will also make the buildings less attractive as targets. The program has developed a systems approach to protection of military buildings from attack by aerosolized CWA/BWA. This

approach employs sensors to determine the presence of contaminant in the building, active HVAC strategies to minimize the spread of the contaminant, and advanced neutralization and filtration technologies to render it inactive. The program is developing and evaluating systems components and architectures in controlled tests to produce optimized protection architectures. These systems are transitioning to a demonstration in a functioning military building. This will embody the first operational "immune" building. The lessons learned from the program are being incorporated into a software-based toolkit with advanced simulation and design data tools to permit the transfer of this knowledge and techniques across a wide spectrum of building types and to potential users.

2.6.2 Collective Protection Science and Technology Efforts

2.6.2.1 Collective Protection (CP) Goals. The goals of the collective protection area are to (1) reduce the weight, size and power requirements of CP systems, (2) reduce the logistical burdens associated with the maintenance of CP filters, (3) improve protection capabilities against current and emerging threat agents, including TICs, and (4) improve the deployability of transportable shelter systems (see ***Table 2-9***). To achieve these goals, improvements to system components (including transportable shelters) are being investigated along with improvements to the current vapor and particulate filtration media. Regenerative vapor and particulate filtration materials processes are being investigated to eliminate the need for filter change and improve the capability against any battlespace CBRN hazards. The primary effort for investigating adsorbents for both single-pass and regenerative filtration applications is articulated in DTO CB.08 Adsorbents for Protection Applications. Additionally, DTO CB.40, DARPA's Immune Building Program is developing technologies and methods to protect building occupants from both internal and external release of hazardous materials or CBRN threat. Collective Protection strategy will also address transportable shelter systems by investigating improved and self-decontaminating shelter materials, improved seaming processes, and improved closures and airlocks. Also a new DOD-JPEO Readiness Installation Protection Program (GUARDIAN) will incorporate CP technologies.

2.6.2.2 Potential Payoffs and Transition Opportunities. Individual and collective protection investments will result in (1) improved respiratory and percutaneous (skin) protection with reduced physiological and psychological burden to the individual warfighter, (2) improved air purification systems and technologies for collective protection shelter applications, (3) extended operation in a CBRN contaminated environment, (4) improved capability against current and emerging threats, and (5) reduced logistics burden associated with weight, volume, power, and consumables.

2.6.2.3 Major Technical Challenges. The greatest warfighter need is to provide protection against new and emerging threats such as non-traditional agents (NTA) and TICs/TIMs while allowing warfighters to successfully execute and complete their mission. This challenge applies across the board for Respiratory & Ocular Protection, Percutaneous Protection, and Expeditionary Collective Protection. Gaps exist in protective equipment (masks, suits, and filters) that resists the penetration of liquid, vapor, aerosol, and dusty agents under the range of expected battlefield and system conditions, including duration of wear, use, storage, exposure to battlefield contaminants, climatic environments, and system integrity (maintain mask seal, intact closures and interfaces). Materials are needed that can resist these agents while reducing the physiological burden on the wearer and maintaining vision, mobility, and flame resistance (as required). Technical solutions are needed to extend wear and shelf-life in order to minimize

negative impacts on logistics systems (store, ship, transport, maintain, provision, and dispose), including packaged size and volume, number of sizes, storage shelf life, and decontaminability. Technical solutions are also needed to extend the duration of protection in a CB environment and increase the amount of agent that these protective ensembles can endure before failure. Integrating CBRN protection into future weapon systems necessitates tradeoffs between performance requirements and limitations of materials and designs. Integral respiratory protection requires tradeoffs between physiological performance parameters such as pulmonary function, field of regard, speech intelligibility and anthropometric sizing against constraints such as cost, size/weight, protection time, and interfacing with other equipment. Residual life/end-of-service life indicators must exhibit sensitivity to a broad range of threats while being environmentally stable and low cost. CBRN protective clothing development requires balancing the physiological and psychological burden imposed upon the warfighter with maximum obtainable CBRN hazard protection. Reactive materials for clothing and shelter applications must be stable, broad spectrum, and fast acting. Significant advancements have been made in improving the weight/bulk and power requirements of personal cooling systems, but further work in this area is needed. Air purification and shelter systems require tradeoffs with respect to performance, user requirements, size, weight and power constraints, as well as longer life. Threats such as TICs increase the need for additional protection and make the challenge of improving physiological performance, size, and weight constraints more difficult. Consequently, threat versus design tradeoffs become essential as well as tailoring of equipment to meet the threat. Maintaining toxic free areas for mobile, transportable and fixed sites will require new materials/processes with emphasis on systems development. New sealing processes and closures as well as developing improved airlock designs are critical to collective protection.

2.6.3 Protection Modernization Strategy

Forces cannot always avoid CBRN hazards. Therefore, individuals and warfighting units must be provided materiel to protect them from the effects of these lethal agents. Protection must be effective against all known threats with minimal degradation to the performance of personnel, weapons, or equipment. Protective measures allow our forces to maintain combat superiority in CBRN contaminated environments. A summary of protection modernization capabilities is provided in ***Table 2-9***, which highlights current and planned developmental programs that will provide new or enhanced capabilities in the near through far-term, as well as capabilities that are being procured or are currently fielded.

The goal of the protection RDA area is to provide equipment that allows U.S. forces to operate in a CBRN contaminated environment with minimal degradation of the warfighters' performance. Near-, mid-, and far-term objectives are to reduce physiological and logistical burdens while maintaining/improving current protection levels.

Protective masks and filters will be improved to reduce breathing resistance, thus enhancing ability to perform mission tasks. Mask systems will require increased CBRN survivability and compatibility with combat or personal equipment. Future respiratory systems, such as the Joint Service Aircrew Mask (JSAM) and Joint Service General Purpose Mask (JSGPM), will require enhanced compatibility with life support equipment and tactical systems. They will also require the capability to protect against non-traditional agents (NTAs) and TICs, as well as traditional CBRN warfare agents. In the future, the focus will be on integrated respiratory protective ensembles, which offer optimal compatibility with personal, tactical, and

crew support systems. Key technologies for future mask systems include mask filter service life indicator, advanced materials, improved adsorbents, and improved models and test technologies for protection assessment.

Future protective clothing ensembles for U.S. forces will require reductions in bulk and weight without any loss of protection or durability. As an evolutionary program the JSLIST intends to meet these future requirements by introducing evolutionary technologies such as the JSLIST Block 2 glove upgrade (JB2GU) and Alternative Footwear Solutions/Integrated Footwear System (AFS/IFS) into JSLIST chemical protective ensemble solutions as those technologies mature. These technology insertions, which will include enhanced performance, will be accomplished as JSLIST RDT&E Joint Service projects.

Collective protection equipment (CPE) development efforts are focused on CBRN protection systems at the crew, unit, and platform level. New CPE systems will be smaller, lighter, less costly, and more easily supported logistically. New systems are required to provide clean environments for critical operations (*i.e.*, where individual protective equipment (IPE) otherwise places an unacceptable burden upon the warfighter in performing duties) and for essential rest and relief. Modernization efforts will concentrate on: (1) improvements to current vapor and particulate filtration media to extend filter life and to offer improved performance against current and/or emerging threats, (2) advanced air purification (vapor and particulate) technologies, integrated with environmental control, to greatly reduce the logistical burden and offer greatly improved performance against current and postulated threats, (3) increased application of collective protection systems onto mobile and transportable platforms and in fixed facilities within the Joint Services, (4) improved transportable shelter system with integrated power/environmental control/filtration, (5) improvements to current collective protection systems to reduce weight, volume, and power requirements, and (6) standardization of filters within the Joint Services to address storage and procurement concerns. Efforts are in place to support major weapons systems developments, such as the U.S. Army's Future Combat System, Bradley, Breacher, Heavy Assault Bridge, Future Scout and Cavalry System, the USMC Expeditionary Fighting Vehicle (EFV) (formerly the Advanced Amphibious Assault Vehicle), Assault Breacher Vehicle (ABV), U.S. Navy Littoral Combat Ship and other advanced weapons platforms.

2.6.4 Joint Service Protection Programs

Joint programs are shown in ***Table 2-9***; Service-unique programs are italicized. A detailed description of Joint IPE and CPE programs is provided in ***Annex D***.

Individual Protection

Individual Protection is comprised of technologies in the following categories: Surface Protection Ensembles, Aviation Protection Ensembles, Surface Respiratory Protection, Aviation Respiratory Protection, and Universal "Common" Individual Protective Equipment.

Surface Protection Ensembles. Future protective clothing ensembles for Warfighters will require reductions in bulk and weight without any loss of protection or durability. The Joint Chemical Ensemble (JCE) intends to meet these future requirements by inserting revolutionary technologies into chemical protective ensemble solutions as those technologies mature. These technology insertions, which will include enhanced performance, will be

accomplished as JCE RDT&E projects. JCE is expected to replace the JSLIST in 2008 as the new RDT&E protective suit effort.

The JSLIST Alternative Source Qualification (JASQ) is a congressionally mandated government-industry partnering effort to seek additional sources for JSLIST materials. JASQ candidates that successfully complete all testing requirements will be considered for inclusion on an Approved Materials List (AML). In addition, two Industry Initiated Demonstration Products (IIDP) using semi-permeable membranes are being tested in order to determine the research and development potential and for possible consideration in next-generation suit technology.

The Joint Project Manager for Individual Protection (JPM IP) is pursuing an Alternative Footwear Solution (AFS) designed to provide a common CBRN protective footwear that will meet the requirements of the Joint Services. CBRN protective footwear is a system, with legacy footwear, such as the Green Vinyl Overboot/Black Vinyl Overboot (GVO/BVO) and Chemical Protective Footwear Covers (CPFC), Multipurpose Overboot (MULO), and an improved shipboard boot the ACTON Lightweight Overboot (ALO) are available in sufficient quantities. The AFS program, when fielded, will replace legacy CBRN protective footwear across the Joint Services.

The Integrated Footwear System (IFS), formerly Multipurpose Protective Sock (MPS), is part of the JSLIST ensemble. IFS will fulfill the JSLIST and Joint Service Protective Aircrew Ensemble (JPACE) requirement for a launderable CB protective sock for wear under service footwear. IFS may also be a key component of future JSLIST Alternative Footwear Solutions, to include investigation of a CB resistant combat boot that when worn in combination with a protective sock could provide the required CB footwear protection for the Warfighter. Individuals who cannot complete their missions while wearing protective vinyl overboots will wear IFS in conjunction with their service foot wear.

The JSLIST Block 2 Glove Upgrade (JB2GU) will provide hand protection against liquid, vapor, and aerosol CBRN agents, semi-permeable or selectively permeable to prevent excessive moisture buildup and improve user comfort. It will be flame resistant and its performance will not be degraded by exposure to petroleum, oils, and lubricants (POL) or field contaminants. The JB2GU system will meet all service requirements for NBC protective gloves as stated in both JSLIST and Joint Protective Air Crew Ensemble (JPACE) ORDs. The Block 2 Glove effort will improve upon the Block 1 Glove by incorporating more robust testing and provides a glove solution that satisfies a broader set of user requirements, i.e., JSLIST ORD requirements for ground and shipboard use and JPACE requirements for aviation use. The JB2GU will be designed to achieve a fully integrated interface with the sleeves of JSLIST and JPACE NBC suits and will be compatible with the MOPP exchange/dirty doffing and doctrinal decontamination tactics, techniques, and procedures used for those ensembles.

The JSLIST Chemical/Biological Coverall for CVC (JC3) will be a lightweight CB protective garment worn in place of or over the current CVC suits in a CB environment. It will resist ignition and will provide thermal protection to allow emergency egress. Using a selectively permeable material (SPM) the JC3 will not be degraded by exposure to POLs present in the operational environment. The JC3 will be compatible with protective masks and mask accessories, headgear, gloves/mittens, footwear, and other CVC ancillary equipment.

Aviation Protection Ensembles. The Joint Protective Aircrew Ensemble (JPACE) is a CBRN and fire resistant protective clothing ensemble in development and is intended for use by all USN, USMC, USAF, USA, and USSOCOM aviators and aircrew for all fixed wing and rotary wing requirements. JPACE will provide aviators with a modern capability that replaces the impregnated undergarment and CWU-66/77P, using proven JSLIST technology. The Marine Corps has formally established a requirement for their Combat Vehicle Crewman to use the JPACE. The Army is also establishing a requirement for Combat Vehicle Crewmen to use this garment. As noted above, the JC3 is being developed under JSLIST to provide a CB protective coverall that is resistant to degradation. JPACE will increase the protection provided over existing garments while reducing heat stress and system weight. JPACE will fully integrate with the Joint Service Aircrew Mask (JSAM), legacy masks, JSLIST Glove Upgrades, MULO, or the CBRN overboot. The JPACE will utilize a block upgrade acquisition approach. Block 1 will provide chemical protection from all liquid, particle, vapor and aerosol CBRN agents, provide CBRN protection over a 16 hours mission and be flame retardant. Block 2 will address the Rotor wash Protection Key Performance Parameter (KPP) requirement.

Surface Respiratory Protection. Currently there is a DTO to develop a low cost End-of-Service-Life Indicator (ESLI) for use in CBRN protective mask filters that will indicate to the user that a mask filter has been contaminated and has a limited if any remaining service life.

The Joint Service General Purpose Mask (JSGPM) will be a lightweight protective mask incorporating state-of-the-art technology to protect all forces from future threats. Key requirements include: 24 hour CBRN protection, improved fit, vision requirements, lower breathing resistance and reduced weight and bulk. The mask components will be designed to minimize the impact on the wearer's performance and maximize the ability to interface with future Service equipment and protective clothing.

The Block I Joint Service Chemical Environment Survivability Mask (JSCESM) will provide commanders at all levels with greater options for protection, especially in Operations Other Than War (OOTW). It will provide a compact, lightweight, disposable, emergency mask for use in Chemical Warfare Agent (CWA)situations confronting the warfighter while operating in low CWA threat conditions and for medical care providers and patients in instances when using the standard service mask is not practical. It is envisioned that warfighters will use Block II JSCESM in special operations or in non-combat roles and will carry the JSCESM during deployment when a CWA threat is possible, but unlikely. This mask is intended to be a one size fits all and provide limited protection based on agent concentrations for approximately 6 hours.

Aviation Respiratory Protection. The Joint Service Aircrew Mask (JSAM) will provide aircrew members with individual head-eye-respiratory protection against CBRN warfare agents and, for high performance aircraft, will provide aircrew protection under high rates of acceleration and possible GLOC (G-force induced loss of consciousness). JSAM will be compatible with current and planned CBRN ensembles and existing life support equipment, provide flame and thermal protection, and reduce heat stress imposed by existing CBRN protective masks. JSAM will have two variants—one for rotary wing and one for fixed wing applications—and will replace all existing Service aircrew CBRN respirators.

The Army is fielding the M48 protective mask to replace the M43 series masks. The M48 is for Apache pilots. It provides a lightweight motor blower unit, uses a standard battery, and provides increased protective capability.

In the near-term, the Army is replacing the M43 mask for the general aviator (non-Apache applications) with the Aircrew Protective Mask, M45. The M45 is lighter and less expensive than the M43 and features CBRN protection without the aid of force ventilated air.

Universal "Common" Individual Protective Equipment. The Joint Service Mask Leakage Tester (JSMLT) is a portable device that will be used to perform preventive maintenance checks and services, and is capable of determining serviceability, proper fit, and identifying defective components of current and future CBRN negative pressure protective masks. This system will provide an expeditionary capability currently not available to the Joint Services that will quantitatively and qualitatively test protective mask for defects and fit by measuring the performance of the mask against known standards. The capability will be provided at the unit or maintenance section level.

Collective Protection (CP)

The Services currently use the M20A1 Simplified Collective Protection Equipment (SCPE) to provide collective protection to existing structures. Environmental control is also being added to selected applications. The M20A1 SCPE provides resistance to liquid and vapor agents and allows expansion of protection area and has been fielded. The new joint program Collectively Protected Field Hospital (CPFH) was established to manage the CBD activities of the services collectively protected deployable field hospitals; the Army's Chemically Protected Deployable Medical System (CP DEPMEDS), the Air Force's Collectively Protected Expeditionary Medical Support (CP EMEDS) and the Navy's Chemically Protected Expeditionary Medical Facility (CP EMF) programs. The CPFH will integrate environmentally controlled collective protection into already fielded Army, Air Force and Navy field hospitals in order to sustain medical operations in a CBRN contaminated environment for 72 hours.

CP DEPMEDS integrated chemical protection into existing Tent Extendable Modular Personnel (TEMPER)-based medical tents and shelters through the addition of M28 CPE, chemically protected heaters and air conditioners, and alarms. CP DEPMEDS also includes CBRN protected water distribution and latrine systems.

The CP EMEDS is an effort to insert environmentally controlled collective protection into currently fielded hospital shelters. The role of CP EMEDS, as part of the Air Force Theater Hospital, is to provide individual bed-down and theater-level medical services for deployed forces or select population groups within the entire spectrum of military operations. CP EMEDS are modular packages, tailored to meet theater requirements, by providing a flexible hospitalization capability. The CP EMEDS +25 has the capability to provide 24-hour sick call, 25 inpatient beds, and emergency medical care to a population at risk of 3,000–5,000. The CP EMEDS provides a contamination free environment where medical treatment can be rendered to personnel without the encumbrance of individual protective equipment.

The CP EMF will integrate environmentally controlled collective protection into the Navy's Expeditionary Medical Facility Fleet Hospital configuration. Fleet Hospitals are first and foremost land-based hospitals, medically and surgically intensive. Transportable and designed for sustained operations of 60 days or greater, Fleet Hospitals are deployable in a

variety of operational scenarios. The Fleet Hospital can be mobilized in two primary formations – a 500-bed hospital or a 20-to-116 bed Expeditionary Medical Facility (EMF). The EMF maybe utilizing a new style of deployable medical unit, the BASE-X Expedition Shelter and will require the integration of the M28 CPE.

The Chemically and Biologically Protected Shelter (CBPS) is a highly mobile, rapidly deployable shelter system designed to be used for Level I and II divisional and non-divisional forward area medical treatment facilities. The system is self contained/self-sustaining. It is permanently integrated with a M1113 High Mobility Multipurpose Wheeled Vehicle (HMMWV) Expanded Capacity with a Lightweight Multipurpose Shelter. The vehicle tows a trailer and generator set. The vehicle transports a CBRN protected airbeam supported soft shelter, self-contained environmental support and power generation system, a crew of four and gear, and medical equipment. The CBPS presently is in production. Using feedback from the warfighter, as a result of reliability concerns during Operation Iraqi Freedom, an Engineering Change has been developed to eliminate the hydraulic sub-system and replace it with a more reliable self-powered (electrical) environment control system. Design modifications will be incorporated into the current and future procurement of CBPS systems. To increase the reliability and to maintain configuration control, the existing fleet of CBPS systems will be retrofitted with the self-powered (electrical) environment control system, replacing the hydraulic sub-system.

The Collective Protection Technology Readiness Evaluation (CP TRE) was funded in FY05 and FY06 by the Joint Science and Technology Office for Chemical and Biological Technologies (JSTO CBT). The office of the Joint Project Manager for Collective Protection (JPM-CP) is executing the TRE, which consists of four separate focus areas, each having unique testing requirements and in most cases requires different subject matter experts to manage the technical assessments. These focus areas include air purification processes, CB barrier material and quick CP erect technologies, CP support equipment, and whole CP systems. The CP TRE will present mature, applicable collective protection (CP) technologies to the JPM-CP. The JPM-CP will in turn, use the TRE findings to transition the best CP technologies to the warfighter. A number of the acquisition programs that will benefit from the CP TRE include Joint Expeditionary Collective Protection (JECP), Joint Collective Protection Equipment (JCPE), Marine Corps Expeditionary Fighting Vehicle (EFV), Army Future Combat System (FCS) and Navy Littoral Combat Ship (LCS).

Other near to mid-term collective protection efforts, such as the Joint Collective Protection Equipment (JCPE) will use the latest technologies in air purification, environmental controls, and power generation to improve and/or standardize current collective protection equipment so that it is lighter, more efficient, more affordable and less logistically burdensome. The Joint Expeditionary Collective Protection system (JECP) will be the next generation lightweight, modular, easily transportable, self-supporting collective protection system that will provide relief from psychological and physiological stresses during sustained operations in a contaminated environment. Additionally, redesign and concept tradeoff assistance regarding advanced filtration technologies, such as Pressure Swing Adsorption (PSA) and Catalytic Oxidation (CatOx) has been provided to the USMC EFV and U.S. Army advanced vehicle efforts. The USAF is currently undergoing a major upgrade to their mobile and fixed site collective protection capabilities.

2.6.5 Other Protection Programs

Programs supporting requirements of a single service are shown in ***Table 2-9*** as italicized entries. A detailed description of IPE and CPE projects is presented in ***Annex D***.

Surface Protection Ensembles

The Army has approved fielding of the Self-Contained Toxic Environment Protective Outfit (STEPO). STEPO provides OSHA level A protection for Army Chemical Activity/Depot (CA/D), Explosive Ordnance Disposal (EOD), and Technical Escort Unit (TEU) personnel. The Army has also developed an Improved Toxicological Agent Protective (ITAP) ensemble that provides level B or C protection for short term operations in Immediately Dangerous to Life and Health (IDLH) toxic chemical environments (up to one hour), emergency life saving response functions, routine Chemical Activity operations, and initial entry and monitoring activities. The ITAP ensemble incorporates improvements in material and design. It includes a one-hour supplied air bottle system, which can be switched to a filtered air respirator when operators exit the area of high contamination. A Personal Ice Cooling System (PICS) has been developed for use with both the ITAP and STEPO.

Collective Protection

The Navy includes the Collective Protection System (CPS) on selected spaces on new construction ships. Currently the DDG-51, LHD-1 and LPD-17 ship classes are being built with CPS. The Navy also has the capability to backfit CPS on ships already in Service. The ship CPS Backfit program continues to backfit selected spaces critical to amphibious ships with CPS. These spaces include hospital areas, command and control areas, and rest and relief areas.

2.6.6 T&E Infrastructure to Support Collective and Individual Protection

Future T&E capabilities for Protection will provide the ability to relate data to casualty estimation by providing a wider range of threat representation in the testing and system M&S relating component to system to battlefield performance and agent to simulant. Time-sequenced and aligned efforts to support RDA activities in individual and collective-protection programs include:

- Improved chamber testing capabilities to allow testing with CB agents
- Expanded capability to test advanced protective materials
- Development of hazard-assessment models and situational-analysis methods
- Development of capabilities to test next-generation materials for protection against toxic industrial materials (TICs) which are related to hazard estimates
- Develop next-generation materials test which provides expanded threat and operational conditions and quantitative data relevant to toxicological values

Table 2-9 Protection Modernization Strategy

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Surface Protection Ensembles	• CB Protective Overgarment Saratoga • Chemical Protective Undergarment (CPU) • Modified CPU (mCPU) • Joint Service Lightweight Integrated Suit Technology (JSLIST)—Overgarment • Battledress Overgarment (BDO) • *Self-Contained Toxic Environment Protective Outfit (STEPO) – Army* • *EOD Ensemble – Army* • *Improved Toxicological Agent Protective (ITAP) – Army* • Joint Firefighter Integrated Response Ensemble (JFIRE) • Suit Contamination Avoidance Liquid Protective (SCALP) • 7, 14, and 25 mm Butyl Rubber Gloves • Black and Green Vinyl Overboot • Chemical Protective Footwear Cover SARATOGA	• Advanced protective suit technology; lighter, improved agent protection; reduced heat stress integrated with all respiratory systems. - Improved foot protection - Improved hand protection	• Improved cutaneous protection • Service Life Indicator • Army –*Improved protection for short term use for special purposes (ITAP)* • Textile treatments for improved protection against bio threats	• Integrated multiple threat modular protection (chemical, biological, environmental, and flame) • Self-detoxifying clothing • Indication when protection is no longer required
Aviation Protection	• CWU-66/77P Aircrew Chemical Protective Suit • Aircrew Cape		• Improved protection for aviators (JPACE)	
Surface Respiratory	• M40/M42 Protective Mask • MCU-2A/P Protective Mask • MCU-2/P Protective Mask • M45 Land Warrior Protective Mask • Voice amplification; laser/ballistic eye protection; improved decontaminability, improved comfort (M40A1/M42A2)	• Lightweight CB Masks for low threat environments (JSCESM) • New mask systems for general purpose masks (JSGPM); reduced physiological and psychological burden, improved comfort, enhance optical and communications, improved compatibility		• Advanced Integrated Individual Soldier Protection system (Future Soldier System) • Improved multiple agent protection • Indication when protection is no longer required

1. All programs shown are joint or multi-service, unless indicated as a Service-unique effort (italicized text).
2. Where applicable, systems that meet requirements are listed following the entry.

* Continuing procurement in the near-term

Table 2-9 Protection Modernization Strategy

(continued)

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Aviation Respiratory Protection	• MBU-19/P Aircrew Eye/Respiratory Protection (AERP) • M48 Aircraft Mask • CB Respiratory System (A/P22P-14(V)) • M45 Aircrew Protective Mask (ACPM)	• Army - *Aircrew mask compatible with Apache helicopter systems with a significantly lighter motor/blower unit (M48)* • Army -*Improved compatibility with aviation sighting/night vision systems; reduced logistics burden using non-blower systems, selected for Land Warrior (M45)* • New mask systems for general purpose and aviation masks (JSGPM, JSAM)		
Universal "Common" IPE	• Protection Assessment Test System (PATS) • Voice Communication Adapter	• Improved mask leakage tester Joint Service Mask Leakage Tester (JSMLT)	• End-of-Service-Life Indicator for Mask Filters • Improved/innovate material and aerosol test procedures/fixtures and models	
Collective Protection	• Transportable Collective Protection Systems (TCPS) • M20A1 Simplified CP Equipment (SCPE) • M28 CP Equipment (CPE) • CB Protective Shelter (CBPS) (Medical) • CP DEPMEDS • CP EMEDS • Marine Corps Collective Protection System *(Medium General Purpose Tent System)* • Collective Protection for Small Shelter System (CP-SSS) • Shipboard Toxic Free Areas (Collective Protection System Backfit)	• Rapid insertion of technology improvements into existing equipment (JCPE) • Marine Corps -*Protection for all Expeditionary Fighting Vehicles* • Army – *CBRN protection for tactical Medical units (CBPS).* • Army - *Collective protection for advanced vehicle concepts.* • Air Force - *Procure and field additional CP- SSS to meet rest/relief requirements.* • Navy – *Develop collective protection capability for Expeditionary Medical Facility (CP-EMF)* • Navy - *Backfit ships with contamination free protected zones - (Collective Protection System Backfit)*	• Improved filters to extend filter life, reduce maintenance and reduce logistical burden • Reduced logistics burden, improved protection against current and future threats • Improved current collective protection filters and equipment (JCPE) • Joint Expeditionary Collective Protection initial increment capabilities • Lighter, more mobile, easier setup, more affordable shelters • Improved technologies from DARPA's Immune Building Program • Navy - *Field CP-EMF*	• JECP follow-on increments • Regenerable/advanced protective filtration for vehicles/vans/shelters

1. All programs shown are joint or multi-service, unless indicated as a Service-unique effort (italicized text).
2. Where applicable, systems that meet requirements are listed following the entry.

* Continuing procurement in the near-term

2.7 MEDICAL DEFENSE

2.7.1 Introduction

Along with individual and collective protection, medical systems forms the third area associated with the CB defense principle of protection. Medical systems include all pharmaceuticals, biologics, and devices that preserve combat effectiveness by timely identification, diagnosis, and provision of medical countermeasures in response to Joint Service chemical, biological, radiological and nuclear defense requirements. Technology advances are being pursued in the creation and manufacturing of vaccines and pharmaceuticals that prevent the lethal or incapacitating effects of chemical and biological agents. Therapies that improve survival and facilitate return to duty are being developed. Also technologies are being evaluated for the development of rapid portable diagnostics that will facilitate a quick medical response for exposed warfighters.

Within the CBDP, medical CB defense research, development, and acquisition (RDA) programs are organized according to capability areas. Within the JSTO-CBD, these capabilities are managed by senior managers for pretreatments, therapeutics, diagnostics, and emerging threats. For advanced development and procurement programs, JPEO-CBD manages these capabilities under the Joint Project Manager for CB Medical Systems (JPM-CBMS). The JPM-CBMS is comprised of a headquarters and support element and two Joint Product Management Offices: the Joint Vaccine Acquisition Program (JVAP) and the Medical Identification and Treatment Systems (MITS). (Medical radiological defense research is described in section 2.7.7 below.) ***Table 2-10*** provides a summary of the programs in the planned modernization strategy through the far term, highlighting capabilities being developed and procured in the near term, as well as developmental programs that are planned to be available in the mid to far-term.

The medical CB defense RDA program has the following goals:

- Provide individual level medical protection and prevention to preserve fighting strength.
- Maintain technological capabilities to meet present requirements and counter future threats.
- Provide medical management of CB casualties to enhance survivability, and expedite and maximize return to duty.
- Sustain basic research that provides the knowledge upon which innovative diagnostics, prophylaxes, and therapies are developed.

DOD medical CB defense research and development programs have provided numerous products to protect and treat service members. Assessment methodologies enable threat evaluation and injury prediction. Medical prophylaxis and treatment strategies reduce performance decrements, injuries, and deaths of military personnel in the field, thus enabling them to accomplish their missions, reducing the need for medical resources, and decreasing the probability of long-term health effects.

Specific initiatives programmed to improve CB defense medical readiness include:

- Development and implementation of a biological defense immunization policy for U.S. forces and other-than-U.S. forces.

- Increased focus of medical technology based research toward the development of antivirals, antibiotics, and toxin therapeutics.
- Continued cooperation and consultation with the U.S. Food and Drug Administration (FDA) for application of the new Animal Rule[1], which allows consideration of efficacy data derived from animal studies as surrogates for large-scale human efficacy trials to license drugs and biological products that cannot be ethically tested for efficacy in humans.
- Enhanced medical diagnostic capability for diseases/injuries caused by all chemical and biological threat agents, including species and strain identification.
- Studies to elucidate the toxicity and mechanism of action of non-traditional agents, and to determine the effectiveness of current medical countermeasures.
- Studies to evaluate the effects of exposure to low levels of chemical warfare agents (CWAs).
- Exploratory and advanced studies to develop effective preventive, assessment and treatment strategies to mitigate injuries from the spectrum of ionization radiation energies and qualities produced by either nuclear or radiological devices.
- Effective procedures for the use of the best available medical countermeasures under the new FDA Emergency Use Authorization authority enacted by section 1603 of the National Defense Authorization Act for Fiscal Year 2004.

Since FY01, there has been an ongoing effort to transition medical research efforts from the DARPA program to joint medical biological defense research within the CBDP technology base for exploitation and further development. This effort was funded by an initiative called the DARPA Transition Initiative Fund (DTIF), which ended in FY05. Technology base reviews of DARPA-funded programs in Biological Warfare Defense led to selection of several DARPA research efforts in the Unconventional Pathogen Countermeasures and Tissue-Based Biosensors programs for transition to joint medical biological defense research efforts within the CBDP technology base. The selected programs included:

- Research to develop broad-spectrum vaccines by molecular breeding (gene shuffling) strategies; focused on cross-protection against pathogenic equine encephalitis viruses.
- A novel class of antimicrobial drugs that bind RNA targets involved in the disease process.
- High-level plant-based expression system for vaccine antigens and humanized monoclonal antibodies for biological threat agents.
- *In vivo* countermeasures against biological toxin threats of the superantigen family (e.g., staphylococcal enterotoxin B) using a peptide or peptidomimetic antagonist.
- Small-molecule antibiotics that target the cell-cycle regulated methyltransferase (CcrM) DNA methyltransferase enzyme.
- Investigation using *in silico* screening methods of structurally diverse small-molecule inhibitors of the zinc endopeptidase of botulinum neurotoxin serotype A.
- Development of nonspecific immunomodulatory agents using a synthetic lipid A analog (aminoalkyl glucosaminide phosphate).

[1] 21 CFR Parts 314 and 601, Food and Drug Administration, "New Drug and Biological Drug Products; Evidence Needed to Demonstrate Effectiveness of New Drugs When Human Efficacy Studies Are Not Ethical or Feasible." *Federal Register*: May 31, 2002 (Volume 67, Number 105), Rules and Regulations, Pages 37988-37998.

The results of the DTIF are currently being reviewed, and lessons learned will be applied to ongoing efforts to transition the most promising DARPA programs in medical biological and chemical defense to the CBDP medical S&T program. In 2005 DTRA (JSTO-CBD) and DARPA signed a memorandum of agreement to facilitate transfer of promising technologies and research, and committing both parties to development of technology transfer standards and procedures.

2.7.2 Reducing Reliance on the Use of Animals as Subjects of Research

Joint medical chemical and biological defense research efforts continue to utilize alternative methods and resources intended to reduce, refine, or replace the use of animals in research. This is consistent with DOD policy, and is required of all DOD laboratories which conduct research using animal subjects. When possible, research programs employ computerized molecular modeling, simulation-based predictions, *in vitro* cell cultures, cell-free reaction systems, and other *in vitro* models to replace the use of animals. Statisticians evaluate all research proposals that use animals to ensure that the minimum number of animals required to obtain scientific validity are used. Animals lower on the phylogenetic scale (or the least sentient species) are used if the selection will permit attainment of the scientific objective. Additionally, a veterinarian with expertise in laboratory animal medicine reviews all procedures that might cause pain or distress in laboratory animals to determine the procedural modifications, analgesics and/or anesthetic regimens that could be incorporated to minimize pain or distress. Detailed protocols are comprehensively reviewed and approved by Institutional Animal Care and Use Committees before experiments are initiated. For medical CB research conducted at DOD laboratories, protocols* that specify the use of non-human primates undergo further scrutiny by a headquarters-level animal review office. *The Care and Use of Laboratory Animals in DOD Programs* states "A headquarters-level administrative review of all NHP protocols will be conducted at the appropriate DOD component oversight office by a veterinarian trained or experienced in laboratory animal medicine and science to ensure conformance with all applicable Federal regulations and policies." The Joint Science & Technology Office for Chemical and Biological Defense (JSTO-CBD) is establishing a review process and organization that will address animal use for activities outside of DOD laboratories. Policies and procedures of the Association for the Assessment and Accreditation of Laboratory Animal Care – International are rigorously enforced and followed. DOD policy requires that animal use be conducted in full compliance with the Animal Welfare Act and that animals are to be used in research only when scientifically acceptable alternatives are not available.

* Army Regulation 40–33 (SECNAVINST 3900.38C, AFMAN 40–401(I), DARPAINST 18, USUHSINST 3203.

Table 2-10 Medical Chemical and Biological Defense Programs Modernization Strategy

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Pretreatments	• Licensed SERPACWA (Skin Exposure Reduction Paste against Chemical Warfare Agents) • SNAPP (Soman nerve agent pretreatment pyridostigmine)	• Transition Increment I bioscavenger to DHHS for advanced development • Transition Increment II Bioscavenger nerve agent prophylaxis • Procurement of improved smallpox vaccine from DHHS/BioShield • Continue advanced development of plague, botulinum neurotoxins, and Venezuelan equine encephalitis vaccines	• Develop Increment II Bioscavenger • Vesicant agent prophylaxis candidate • Development of recombinant botulinum neurotoxin vaccine (A/B) • Potential reduced dose schedule for Anthrax Vaccine Adsorbed (AVA)	• Licensed nerve agent "bioscavenger" (human butyrylcholinesterase) pretreatment • Development of Increment III nerve agent catalytic bioscavenger pretreatment • Licensed improved SERPACWA (aTSP) • Licensed vesicant agent prophylaxis • Licensed vaccines for VEE (virus subtypes IA/B), botulinum neurotoxins (A, B), plague, and anthrax (NGAV) • Licensed filovirus vaccines (Marburg and Ebola) • Multiagent vaccines against multiple BW threats • Alternative delivery methods for vaccines and immunogens
Therapeutics	• Licensed antibiotic for exposure to anthrax (ciprofloxacin, doxycycline, Penicillin G Procaine) • Licensed Reactive Skin Decontamination Lotion (RSDL) • Licensed ATNAA (Antidote Treatment Nerve Agent Autoinjector)	• Procurement of vaccinia immune globulin for smallpox vaccine complications from DHHS • Demonstration of immuno-therapies for filoviruses, bacteria, and toxins • Development of siRNA and asRNA as therapeutics against filovirus • Transition improved oxime to advanced development	• Transition of candidate therapeutic products directed against exposure to bacteria, viruses, and toxins. • Therapeutic candidates for vesicant agent exposure • Skin/wound decontamination product candidate (Joint Service Personnel Decontamination System) • Licensed advanced (improved) anticonvulsant	• Licensed next generation oxime • Licensed therapeutic for vesicant exposure • License skin/wound decontamination product • License therapeutics against bacteria, viruses, and toxins • Licensed broad spectrum antibiotics, antivirals, and toxin therapeutics • Licensed broad spectrum immunomodulator for biodefense against multiple threat agents including anthrax and plague • Licensed immunotherapeutics for filoviruses, bacterial, toxins • Licensed siRNA/asRNA therapeutics for filoviruses
Diagnostics	• FDA approved Joint Biological Agent Identification and Detection System (JBAIDS), Block I assay to detect anthrax in blood and blood cultures	• New assays to identify chemical agent exposure • Fielding of JBAIDS (Joint Biological Agent Identification and Diagnostic System) Block I (capability to perform nucleic acid-based analysis on a ruggedized, portable device) • Submission of additional JBAIDS, Block I assays for FDA approval • Assay development support for JBAIDS, Block II (adds a toxin detection capability)	• Biomarkers of exposure for low levels of chemical warfare agents • Improved and new assays to identify chemical agent exposure • Continue assay development support for JBAIDS, Block II with a focus in gaining FDA approval	• Licensed chemical exposure medical diagnostic devices • JBAIDS Block III (integrated hand held device combining sample processing, nucleic acid detection and immunodiagnostics)

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Emerging Threats	• Provide critical reagents, assays, and sampling kits necessary to the operation of all DOD biological detection systems. (Critical Reagents Program)		• Labeling of FDA-approved pretreatments and therapeutics against novel threat agents • Rapid resequencing and other technologies to detect and identify genetically modified and emerging biological agents	• Broad spectrum pretreatments, vaccines, and therapeutics against emerging threat agents

2.7.3 Pretreatments Science and Technology Efforts

2.7.3.1 Goals and Timeframes. The goal of the pretreatments capability area is to conduct basic research in order to develop lead candidate vaccines and chemical pretreatments and protectants that can be administered before exposure to provide both specific and broad-spectrum protection against validated chemical or biological agents. Categories of threat agents addressed in this capability area include nerve agents, viruses, bacteria and toxins. Robust and broadly-effective pretreatments are essential components in the layered, system-of-systems approach to force health protection, conserving warfighter operational flexibility and reducing the logistical burdens of sustaining forces in chemical or biological environments. Emphasis is placed on technologies and approaches leading to the next generation of biodefense vaccines, including multi-agent vaccines, molecular vaccines, new vaccine platforms and adjuvants, and alternate (needle-free) delivery methods. There are four sub-areas within the Pretreatments capability area.

- *Multiagent Vaccine Development*: This subarea's objective is development of vaccines directed at multiple pathogens. Multiagent vaccines will greatly reduce the logistical burden and cost associated with use of biodefense vaccines.
- *Vaccine Research Support*: Studies in this area use systems biology tools (proteomics, genomics, bioinformatics) to provide new insights into pathogen genetics, virulence factors, host-parasite interactions, pathogenic mechanisms, and host immunity. These studies will result in identification of new candidate vaccine targets that will be employed in development of advanced or next-generation molecular and multiagent vaccines. Studies in this area currently focus upon bacterial, viral, and toxin pathogens.
- *Vaccine Technology Development*: The goal of this thrust area is two-fold. The first objective is to explore technologies and validate the effectiveness of candidate vaccine platforms, including engineered viruses, recombinant or fusion proteins, molecular vaccines, and new adjuvants, that will be applicable to development of next-generation multi-agent biodefense vaccines. Developed under the subthrust area heading of Molecular Vaccines, these vaccine platforms should permit insertion of new immunogenic cassettes, facilitating rapid development of vaccines effective against new threat agents (genetically engineered threats or emerging infectious diseases). The second subthrust area is Molecular Immunology. The objective of this subthrust area is to understand, at the molecular level, the events that induce and maintain rapid and effective protective immunity, and to exploit that understanding in the rational design of the next-generation biodefense vaccines. Additionally, results from this research may permit augmentation or enchancement of innate immunity, which could provide non-specific and broad-spectrum protection against biothreat agents.
- *CWA Pretreatments*: This portfolio addresses the requirement for effective pretreatments against chemical warfare agents. One objective is to field a bioscavenger, an advanced pretreatment that is effective against classic and non-traditional agents based on physiological scavengers such as the human butyrylcholinesterase (BuChE) or carboxylesterase (CaE) enzymes. Ideally, the prophylaxis would not require any follow-on treatment, and would have no adverse side effects. These naturally occurring enzymes, as well as acetylcholinesterase, are targets for nerve agents. Through bioengineering efforts, human BuChE and CaE have been mutated to forms that are not only less susceptible to inhibition by the nerve agents, but have the added capability to catalyze nerve agent breakdown. A plasma-derived human butyrylcholinesterase enzyme

(pBuChE) has passed Milestone A, and will be developed through Phase I clinical trials by DOD and transitioned to DHHS for potential licensure. S&T emphasis in this area is on developing recombinant and catalytic bioscavengers that will protect against both organophosphate nerve agents and novel threat agents.

Current prophylactic measures do not adequately address the full spectrum of chemical and biological weapon (CBW) threats. In the chemical pretreatments subarea, Soman Nerve Agent Pretreatment Pyridostigmine (SNAPP) has recently been approved under the very first demonstration of the Food and Drug Administration (FDA)'s Animal Efficacy Rule, and a barrier skin paste, SERPACWA, has been approved and fielded for protection against percutaneous exposure to chemical warfare agents. In biological pretreatments, two licensed vaccines exist for protection against biological warfare (BW) agents (anthrax and smallpox). In addition, a univalent plague vaccine and an improved anthrax vaccine have transitioned to advanced development. Finally, a number of legacy and newly developed univalent vaccines are either in Investigational New Drug (IND) status or ready to transition, pending decision by the acquisition authority. Until approved by FDA, use of pretreatments in IND status (as well as other products in IND status) are limited in accordance with procedures defined in Department of Defense Directive (DODD) 6200.2, S*ubject: Use of Investigational New Drugs for Force Health Protection*, dated August 1, 2000, which establishes policy and assigns responsibility for compliance with 10 USC 1170, Executive Order 13139, and applicable FDA regulations for the use of INDs for force health protection.

- In the chemical pretreatments capability area, near-term accomplishments include the transition of the nerve agent bioscavenger Increment I (plasma-derived human butyrylcholinesterase) pretreatment to DHHS for advanced development and FDA licensure. This is a stoichiometric bioscavenger, meaning that one molecule of bioscavenger binds and neutralizes one molecule of nerve agent. Mid-term opportunities include the development of Increment II Bioscavenger. Long-term targets include the licensure of Increment II Bioscavenger, and ultimately development of a catalytic bioscavenger pretreatment that enhances efficacy by degrading multiple molecules of nerve agents *in vivo.*
- In the biological pretreatments area both advanced anthrax vaccine and plague vaccine candidates have transitioned to advance development. Near-term biological pretreatments include continued advanced development of bacterial (plague), viral (Venezuelan equine encephalitis (VEE)), and toxin (botulinum toxins serotypes A and B) vaccines. The program will also seek approval of a reduced dosing schedule for the current anthrax vaccine. Mid-term opportunities include development of staphylococcal toxin vaccine candidates (SEA/B), advanced development of filovirus (Ebola and Marburg) vaccines and botulinum and ricin toxin vaccines. Long-term targets include licensure of all near-term and mid-term vaccine candidates in advanced development. Additional basic research leading to new vaccine approaches for the intracellular bacterial threats (Tularemia, Brucella, Burkholderia) is needed, potentially focusing on the critical host-pathogen interface within the cell. Furthermore, the program has concluded a DTO evaluating several alternatives to hypodermic needles for administration of multiagent and recombinant protein vaccines. The results of this reseach will be applied to formulation of new biodefense vaccines, could greatly reduce the medical logistics burden and improve user compliance. Another thrust is to identify effective adjuvants to

reduce the time and vaccine dose required for development of effective protective immunity (see ***Table 2-11***). Finally, a DTO was approved in FY05, Multiagent (Molecular) Vaccines for Biowarfare and Genetically Engineered agents, which will fund advanced research in this area.

Table 2-11 Pretreatments Science and Technology Strategy

Near (By 2008)	Mid (By FY2013)	Far (By FY2023)
• Transitioned Bioscavenger Increment I to DHHS for advanced development • Transition plague and anthrax vaccines to advanced development • VEE vaccine transition to advanced development	• Develop Bioscavenger Increment II • Advanced development of filovirus and ricin toxin vaccines	• Licensure of Increment II Bioscavenger • Development of catalytic bioscavenger(Increment III) • Licensure of near- and mid-term candidate vaccines

2.7.3.2 Potential Payoffs and Transition Opportunities. Investment in pretreatments that provide protection against chemical and biological agents will yield significant gains in force health protection capability while preserving maximal operational flexibility in chemical and biological environments. Effective pretreatments will dramatically reduce medical requirements by reducing the medical resources required to treat CBW casualties among populations that receive these pretreatments, freeing medical assets for other types of battlefield casualties. Further, vaccines and chemical pretreatments currently in the pipeline and under development will provide protection against a wider range of threat agents than is currently possible. Multiagent vaccines will potentially provide protection against multiple agents simultaneously. Effective medical prophylaxes ultimately serve a counterproliferation function by denying an adversary an operational advantage in developing or employing such weapons.

2.7.3.3 Overview of DARPA Programs. Among the vaccine-oriented projects, efforts are underway to develop superior protection against threat agents. The Rapid Vaccine Assessment (RVA) Program aims to develop reliable methodologies that will accelerate the science and technology base necessary to achieve 3-D tissue engineering and to define the spatial and temporal requirements necessary to expand its applicability. This program brings together a combination of science and engineering communities to achieve its goals. The ability to fabricate functional, 3-D *ex vivo* immune constructs is limited by current methodologies and materials.

The RVA Program focuses on both engineering products and biological control of differentiating cells leading to a functional immune system. The program is developing a 3-D conformal printing system with both additive and subtractive features capable of printing cells, scaffolds, and differentiation factors; new scaffolds that control the release of growth and trophic factors both spatially and temporally; and a new bioreactor system and instrumentation that will allow multiple cell constructs to interact and communicate in an *in vitro* environment. Specialized imaging methods will allow investigators to directly observe cellular activities in real time without disrupting the system. The biology is focused on understanding the fundamental differentiation pathways needed to repeatedly produce appropriate T and B cell responses in culture. Novel methods of antigen presentation and controlled immune responses are emerging, providing greater insight into vaccinology and immunity. The long-term effect will be reduced development times and costs with improved vaccine efficacy directed at human infectious diseases and a dramatic reduction in reliance on the currently used rodent models.

2.7.3.4 Major Technical Challenges. Major technical challenges in the medical pretreatments capability area include defining appropriate *in vitro* and *in vivo* model systems for investigative purposes, determining mechanisms of action of the threat agents as well as their countermeasures, identifying appropriate immunogenic protective antigens for vaccine targets, delineating pharmacokinetics and pharmacodynamics of pretreatments for chemical agents, stimulating immune responses to small molecules, developing new and effective adjuvants, selecting vector systems for recombinant protein vaccines, evaluating preliminary safety and efficacy data, determining dose and route of administration, and evaluating process/scale-up potential. The development of acceptable surrogate markers of effectiveness is essential to obtain FDA licensure of medical CBD pretreatments, because challenging humans with CBW threat agents to establish vaccine protective efficacy both is unethical and prohibited.

2.7.4 Therapeutics Science and Technology Efforts

2.7.4.1 Goals and Timeframes. The goal of the Therapeutics capability area is to develop lead candidate medical treatments and pharmaceuticals that, when administered after exposure to a chemical or biological agent, mitigate or curtail the effects of that exposure and sustain forces operating in a CBW hazard area. To meet this requirement, medical chemical and biological defense research and development is directly tied to warfighter capability requirements. Categories of threat agents addressed in this capability area include blister, nerve, respiratory and blood agents, toxic industrial chemicals and materials, viruses, bacteria, toxins, novel chemical threat agents, and genetically modified biological agents. Robust and broadly-effective therapeutics are essential components in the layered, system-of-systems approach to force health protection, conserving warfighter operational flexibility and sustaining operational effectiveness of forces operating in a CBW environment. Emphasis is placed on technologies and approaches leading to next-generation biodefense therapeutics, including treatments and pharmaceuticals effective against specific agents and broad spectrum therapeutics effective against entire classes of biological or chemical agents. All subareas within the Therapeutics capability area will depend on the development of validated animal models and surrogate indicators of human efficacy (necessary preconditions for FDA approval). There are four broad subareas within the Therapeutics capability area.

- *Bacterial Therapeutics*: Studies in this thrust area are intended to elucidate the underlying genetics of and molecular basis for bacterial virulence; host-parasite interactions; pathogenic mechanisms; and mechanisms of resistance, recovery and repair. These studies will result in identification of new therapeutic targets to be employed in development of advanced or next-generation treatments for bacterial infection and disease. In addition, drugs and therapeutics that are already FDA-approved for other indications are being evaluated for efficacy against CBW agents.
- *Viral Therapeutics*: Studies in this thrust area are intended to elucidate the underlying genetics of and molecular basis for viral virulence; host-parasite interactions; pathogenic mechanisms; and mechanisms of resistance, recovery and repair. These studies will result in identification of new molecular therapeutic targets that will be employed in development of advanced or next-generation treatments for viral infection and disease. In addition, drugs and therapeutics that are already FDA-approved for other indications are being evaluated for efficacy against CBW agents (bacteria, viruses, toxins, chemical warfare agents).

- *Toxin Therapeutics*: Studies in this thrust area are intended to elucidate the underlying genetics of and molecular basis for virulence; toxin-receptor binding; biochemical activities of toxins and of events cascading from those activities; and mechanisms of resistance, recovery and repair. These studies will result in identification of new molecular therapeutic targets to be employed in development of advanced or robust next-generation treatments for intoxication by biological toxins.
- *Chemical Agent Therapeutics*: Studies in this thrust area are intended to elucidate the underlying mechanisms of chemical agent-induced injury (vesicants, nerve agents, non-traditional agents); toxin, subcellular and molecular target interactions; biochemical activities of chemical agents and events cascading from those activities; and mechanisms of resistance, recovery and repair. These studies will result in identification of new therapeutic targets that will be employed in development of advanced or next-generation treatments for intoxication by CWA.

Current therapeutic measures do not adequately address the full spectrum of CBW threats. In the chemical therapeutics subarea, an improved oxime has transitioned to advanced development, and will be part of the Improved Nerve Agent Treatment System (INATS) being developed by the JPEO-CBD. In the biological therapeutics subarea, gentamicin is being evaluated for approval as a treatment for plague. In addition, a number of therapeutic candidates are in IND status, or undergoing revision of labeling indications for approved use against threat agents, pending decision of the acquisition authority. Until approved by FDA, use of therapeutics in IND status (as well as other products in IND status) are limited in accordance with procedures defined in Department of Defense Directive (DODD) 6200.2, *Use of Investigational New Drugs for Force Health Protection*, dated August 1, 2000, which establishes policy and assigns responsibility for compliance with 10 USC 1170, Executive Order 13139, and applicable FDA regulations for the use of INDs for force health protection.

- Mid-term aims for chemical casualty treatment include licensure of an advanced (improved) anticonvulsant for protection from the effects of nerve agent exposure, advanced development of vesicant agent therapeutics (including ocular therapeutics), skin and wound decontamination products, and next-generation oxime candidates for treating exposure to traditional nerve agents and non-traditional agents (NTA), with licensure projected in the mid-term. Long-term objectives include receptor-targeted therapeutics and protection from CW agent-induced brain trauma and exposure to low-level CW agents, and therapeutics for blister agents (see ***Table 2-12***, below).
- Near-term goals for biological casualty treatment include transition to advanced development of the antimicrobial and antiviral compounds currently being developed against validated biological threat agents; this transition will address the need to prevent casualties induced by biological threats. Long-term targets include licensure of broad-spectrum antibacterial, antiviral, and antitoxin therapies. Development of immune modulators for biodefense against multiple threat agents, including plague, anthrax, and smallpox are also far-term targets. For toxin threats, therapeutics target biochemical intervention points in the host's response, such as the recovery of botulinum intoxicated nerve cells, or down-modulation of the toxic shock pathway elicited by the Staphylococcal enterotoxins (see ***Table 2-12***).

Table 2-12 Therapeutics Science and Technology Strategy

Near (By 2008)	Mid (By FY2013)	Far (By FY2023)
• Advanced development of oxime candidates	• Licensure of advanced anticonvulsant • Licensure of advanced vesicant therapeutics, including next-generation oxime candidates and skin and wound decontamination products • Advanced development of a ricin and botulinum toxin small molecule therapy	• Licensure of a smallpox therapeutic • Licensure of novel therapies using anti-sense or similar strategies • Development of receptor-targeted therapeutics • Advanced therapeutics for blister agents • Licensure of broad-spectrum antibiotics and other therapeutics • Development of immune modulators against multiple threat agents

2.7.4.2 Potential Payoffs and Transition Opportunities. The direct payoff from investment in the Therapeutics area is the mitigation of illness or injury following exposure to CBW agents. Coupled with diagnostic capabilities that unambiguously demonstrate exposure to CBW agents at pre-symptomatic time points, effective therapeutics will lead to rapid return to duty, and are critical capabilities for sustaining the force in chemical and biological environments. Additionally, treatment in the pre-symptomatic phase greatly reduces strains on both deployed and receiving medical assets, reducing the logistical support requirements for casualty care. Finally, effective medical treatments serve a counterproliferation function by denying an adversary an operational advantage in developing or employing such weapons. Effective therapy will also depend on a rapid, point of care medical diagnostics capability to augment clinicians' evaluations of etiology.

2.7.4.3 Overview of DARPA Programs. DARPA is pursuing several approaches to develop therapeutics for biological warfare defense. DARPA has an effort underway to create a set of design and synthesis processes that will enable the specification of a desired function, and be able to rapidly synthesize a protein that performs the function. To achieve this goal, significant advances must be made in the understanding of several problems including the relationship of sequence to physical structure to biological function and the definition of reusable components of proteins leading to the equivalent of a periodic table for proteins. In addition, the research will also involve exploiting the redundancy in amino acid coding and the use of artificial amino acids. Today what is considered protein design is in reality the redesign of an existing protein. The Protein Design Processes (PDP) Program changes the paradigm by beginning with an understanding of the binding and chemical reaction that is to be expressed; designing an active site that is compatible with the initial, transition, and final state chemistry; and then embedding the resulting structure in a scaffold. To accomplish this, DARPA is investing in the development of new tools in diverse areas such as topology, optimization, the calculation of *ab initio* potentials, synthetic chemistry, and informatics leading to the ability to design proteins to order. At the end of this program, researchers expect to be able to design a new complex protein, within 24 hours that will inactivate a pathogenic organism.

2.7.4.4 Major Technical Challenges. Major technical challenges in the medical therapeutics capability area include defining appropriate *in vitro* and *in vivo* model systems for investigative purposes, determining mechanisms of action of the threat agents as well as their countermeasures, understanding the pharmacokinetics of therapeutics for chemical agents, expression systems for recombinant products, and detailed modeling of agent-host interactions at the molecular level to facilitate development of small molecule and quick-turn therapeutics. The

development of acceptable surrogate markers of effectiveness is essential to obtaining FDA licensure of medical CBW therapeutics and pretreatments, because challenging humans with CBW threat agents to establish efficacy is both unethical and illegal. DTRA is preparing for an expanded role in facilitating transition of effective therapeutic discoveries to advanced product development, meeting the expanding complexities of obtaining licensed indications from the FDA under the animal rule. Challenges to licensure of therapeutics will also include the ability to understand potential adverse effects in subpopulations or the genetics underlying the disease and response to treatment.

2.7.5 Diagnostics Science and Technology Efforts

2.7.5.1 Goals and Timeframes. Early, sensitive, and specific diagnostic testing is an essential component in a layered, system-of-systems approach to force health protection, conserving warfighter operational flexibility and sustaining operational effectiveness for forces operating in a CBW environment. Medical CB diagnostics research is focused on developing assays and evaluating technologies that meet FDA standards for clinical testing. Specifically, the goal is to employ FDA approved systems to (1) identify and confirm individual exposure to BW agents and (2) quickly verify exposure to CW agents or to identify subclinical indicators that may result from low level chemical exposure. Identification and confirmation of exposure to CBW threat agents should be accomplished as soon as possible after exposure and ideally before symptoms develop in order to allow early initiation of the appropriate countermeasure and rapid return to duty. This capability area evaluates both new and existing technologies in order to discover, identify and monitor biomarkers of infection and/or exposure. Diagnostics research is tied directly to warfighter requirements and is developed with the end user in mind. Fielded systems should be easy to operate, inexpensive to use and sustain, and highly specific and sensitive. Research in this capability area supports diagnostic systems used in the military reference laboratories, deployable medical facilities and on the battlefield.

Medical diagnostics deals with diagnosis of infection by or exposure to bacterial, viral, or toxin agents (biological diagnostics) or of exposure to nerve, vesicants, respiratory and blood agents (chemical diagnostics). Collaboration with other government agencies is encouraged. The biological diagnostics portfolio is subdivided into four sub areas and has one ongoing Defense Technology Objective (DTO):

- *Technology Assessment*. This sub-thrust area investigates promising new technologies and conducts evaluations to determine their military usefulness. Evaluations are limited to mature technologies. Current areas of interest include DNA microarrays, multiplexed assays, whole genome amplification and mass-spectral/bioinformatic approaches. This sub-thrust area directly supports the Joint Biological Agent Identification and Diagnostic System (JBAIDS), Blocks I, II and III.
- *Assay Development*. This sub-thrust area develops immunodiagnostic (antibody-based) and nucleic acid-based diagnostic assays for multiple platforms meeting specific technical requirements and for new and existing technologies. Current areas of interest include using recombinant techniques, mass spectrometry and proteomics to design new assays and developing improved sample preparation methods. This sub-thrust area directly supports the JBAIDS Blocks I and II.
- *Identification of Novel Agents*. This sub-thrust area aims to identify novel agent/host-specific markers that could serve as useful diagnostic targets. Areas of emphasis include *in vitro* and *in vivo* modeling, identification of early, intermediate and late markers of

infection/exposure in both the host and the agent, agent biology (molecular epidemiology, genomics, proteomics) and the development of methods supporting the identification of genetically engineered threats.

- *Test and Evaluation (T&E).* This sub-thrust area leverages work performed in the other sub-thrust areas by employing animal model systems for diagnostic assay validation testing and testing platforms and assays under field conditions. T&E results are used in CONOPS development.
- *DTO CB.56 Methodology to Facilitate Development of Biological Warfare Threat Agent Detection and Medical Diagnostic Systems*. This DTO seeks to develop a standardized testing package for all assays and reagents produced through the biological diagnostics program. The testing package will be prepared for all new and previously transitioned assays. These packages will be used by the Advanced Developer to pursue FDA approval.

The Chemical Diagnostics area seeks to develop screening procedures and definitive analytical methods testing biomedical sample for individual exposure to CWAs (see ***Table 2-13***, below).

Table 2-13 Diagnostics Science and Technology Strategy

Near (By 2008)	Mid (By FY2013)	Far (By FY2023)
• Develop quantitative fluoride reactivation procedure for blood diagnostics • Continuing support for JBAIDS Blocks I and II • Develop cholinesterase diagnostic method for organophosphate detection • Mine existing data from novel agent identification subtask area to initiate assay development targeting novel markers indicating BW exposure	• Develop assays targeting novel markers indicating BW or CW exposure • Evaluate and recommend technologies suitable for JBAIDS Block III, an integrated hand-held diagnostic device incorporating sample preparation, BWA and toxin detection into one instrument	• Using a systems biology approach (proteomics, genomics, bioinformatics); identify new and very early (presymptomatic) markers of exposure that will serve as the basis of the next generation of CBW medical diagnostics. (e.g., signature activation of early response genes of the host, as well as unique pathogen or toxin markers)

2.7.5.2 Potential Payoffs and Transition Opportunities. Deployment of these systems is critical to mitigating illness or injury following exposure to CBW agents. Early and definitive diagnosis permits prompt and effective therapy and rapid return to duty, and is a critical component in sustaining forces in a CBW environment. Coupled with effective medical countermeasures, an enhanced diagnostic capability deters the use of CBW by denying adversaries an operational advantage in using such weapons.

2.7.5.3 Major Technical Challenges. Major technical challenges in the Diagnostics capability include developing appropriate sample processing methods for complex biological matrices, and identifying pre-symptomatic host responses (early biomarkers) and translating that information into diagnostic assays to detect CBWA exposure. The program continues to meet the challenges of developing new and more sensitive assays for threat agents and of evaluating/determining the applicability of new technologies to diagnostics in a warfighting environment.

2.7.6 Emerging Threats/Special Projects Science and Technology Efforts

2.7.6.1 Goals and Timeframes. Emerging Threats and Special Projects addresses requirements for medical countermeasures and diagnostic tests directed against genetically modified threat agents, novel chemical threat agents, and acute or chronic exposure to low-level chemical warfare agents. In addition, this capability area seeks to support development and application of systems biology tools (genomics, proteomics, and bioinformatics) that address not only emerging threats, but also the other capability areas in the Medical S&T program. Work conducted in this area will be guided by all applicable agreements, conventions and treaties and is performed to provide defensive capability only.

- *Genetically Engineered Threats*: The goal of this bioinformatics-intensive subarea is to assemble and integrate databases of protein domains responsible for lethality, delivery into human cells, evasion of the immune system, and therapeutic resistance. This information will then be applied to develop effective countermeasures against both novel and genetically modified BW threats. A new DTO was approved in FY05 to support this area of research, Rapid Detection, Threat Assessment and Attribution of Genetically Engineered Biothreat Organisms using Microarray-Based Resequencing Technologies. This capability will permit DOD laboratories to unambiguously identify biothreat agents within hours, rather than days or weeks, and will cost less than 1% of traditional nucleic acid sequencing methods. In FY06 and FY07 this thrust area will become part of a new bio-medical S&T initiative, the transformational Medical Technologies initiative.
- *Low-Level CWA Exposure-Effects and Countermeasures*: This thrust area, supporting both medical and physical S&T areas, is supported by both DTO and non-DTO S&T research. The goals are to explore systemic toxicity of low dose exposure(s) to CWA, with specific emphasis on biochemical, toxicological, and behavioral effects, and to determine the efficacy of extant medical countermeasures on these effects. In addition, basic research efforts aim to identify biomarkers for low-level CWA exposure, and to identify novel neurotoxic and immunological effects. In FY06 this thrust area will become part of the Therapeutics capability area.
- *Non-Traditional Nerve Agents*: The major goals of this thrust are to make significant gains in our understanding of important NTAs, and to survey existing countermeasures to determine their effectiveness against these agents. The longer term goal is to develop new approaches, based on greater understanding of a wide variety of NTAs, for creating new medical countermeasures to the broad array of novel threat agents (not all of which act via inhibition of acetylcholinesterase). Approaches include establishment of *in vitro* electrophysiological preparations to delineate mechanisms of action of biological regulators and to suggest approaches for pharmacologic intervention; development of 3-D models of NTA-receptor binding as an aid in drug discovery of new anticonvulsants; and development of a toxicogenomic database for the toxic effects of NTAs to aid in characterization of candidate drugs and in preparation of technical packages for FDA submission. In FY06 this thrust area will become part of the Therapeutics capability area.

Currently available medical countermeasures and diagnostics do not adequately address all validated threat agents. Even greater capability gaps exist concerning new and emerging threats. With regard to novel chemical threat agents, the investment strategy balances research that promises to bring additional capability to the warfighter in the short-term with the basic research necessary to develop revolutionary and broad-spectrum countermeasures in the longer

term. Short-term efforts currently involve surveying existing medical countermeasures to determine their effectiveness against these agents. The critical need in the mid-term is to expand our understanding of broader classes of NTAs: what they are, what they do, and how they interact with the host to cause injury and/or death. Once this fundamental knowledge is developed the longer-term work can begin to develop new specific and/or broad-spectrum countermeasures and diagnostics (see ***Table 2-14***).

Table 2-14 Emerging Threats Science and Technology Strategy

Near (By 2008)	Mid (By FY2013)	Far (By FY2023)
• Survey existing medical countermeasures (e.g., SERPACWA, bioscavenger, oximes, etc.) for efficacy against novel agents • Focus on understanding biology of spore germination and on the structure of inhibitors of the process • Develop commander's guide for operational risk management (ORM) regarding exposure to low level chemical threat agents	• Expand understanding of broad classes of NTAs to determine means of activity • Develop rational designs for BWA countermeasures • Discover and characterize genetic elements of pathogenicity and virulence • Advanced development of exisiting medical countermeasures shown efficacious against NTA.	• Develop new specific and broad-spectrum countermeasures to and diagnostics for NTAs • Transition best candidate pretreatments, diagnostics, and therapeutics to advanced developer

Engineered biological threat agents will also be addressed in stages. Near-term studies will focus on greater understanding of the biology of spore germination and on the structure of inhibitors of that process. Bacterial spores are relatively easily weaponized, so even non-pathogenic spore-forming bacteria are tempting targets for genetic engineering and creation of novel pathogens. These studies will support rational design of BW threat agent countermeasures using X-ray crystallographic techniques, computational chemistry, and the methods of systems biology (proteomics, genomics, and bioinformatics). The Emerging Threats program will also initiate a broad array of studies to discover and characterize the genetic elements of pathogenicity and virulence. Additionally, the program will transition the most promising DARPA-developed candidate pretreatments, therapeutics, and diagnostics into the S&T base and/or to the advanced developer. A DTO approved in FY05 will fund research developing a DOD capability to rapidly and economically determine a pathogen's genomic sequence. This will permit identification of engineered modifications to naturally occurring organisms. Further, coupled with biogeographic databases, the genomic sequence will permit identification of the most likely origin of the parent organism from which the biothreat agent was produced.

In common with the Therapeutic and Pretreatments capability areas, Emerging Threats must invest to develop animal models to assess toxicity of agents and effectiveness of proposed pretreatments or treatments (e.g., percutaneous NTAs and efficacy of barrier creams, decontamination and pharmacological intervention). Appropriate animal models, and valid surrogate markers for clinical efficacy, are required for FDA approval of medical countermeasures against new and emerging threats (see ***Table 2-14***).

2.7.6.2 <u>Potential Payoffs and Transition Opportunities.</u> The direct payoff from the Emerging Threats capability investment is the prevention and/or mitigation of illness or injury following exposure to new, emerging and genetically modified CBW agents. Rapid and accurate detection,

identification, and diagnosis serve both clinical and forensic needs, and provide the warfighter with information critical for situational awareness in the CBW environment.

2.7.6.3 Major Technical Challenges. Major technical challenges in the Emerging Threats capability area include defining appropriate *in vitro* and *in vivo* model systems for investigative purposes, determining mechanisms of action of the threat agents as well as their countermeasures, understanding the pharmacokinetics of therapeutics for chemical agents, expression systems for recombinant products, and detailed modeling of agent-host interactions at the molecular level to facilitate development of small molecule and quick-turn therapeutics. The development of acceptable surrogate markers of effectiveness is essential to obtaining FDA licensure of medical CBW therapeutics and pretreatments, because challenging humans with CBW threat agents to establish efficacy is both unethical and illegal. Challenges to licensure of therapeutics will also include the ability to understand potential adverse effects in subpopulations or the underlying genetics.

2.7.7 Medical Radiological Defense Program

The mission of the Medical Radiological Defense Program (MRDP) is to conduct research in the field of radiobiology and related matters essential to the support of DOD and the Military Services. Currently, the Armed Forces Radiobiology Research Institute (AFRRI) is the primary repository of defense radiobiology expertise. AFRRI is funded through the Defense Health Program, which is overseen by the Assistant Secretary of Defense for Health Affairs, ASD(HA). A comprehensive strategy and program for medical radiological defense is under development by ASD(HA). In FY06, the Chemical Biological Defense Program (CBDP) initiated a medical radiological defense science and technology effort, which is managed by JSTO-CBD.

2.8 CB DEFENSE HOMELAND SECURITY PROGRAMS

This section reflects the incorporation of programs currently managed by JPEO-CBD (specifically by the Joint Project Manager Guardian) and DTRA to address CBRN Defense Homeland Security. Specifically, this section provides descriptions of efforts and plans related to the following: (1) Installation Protection Program,(IPP) and Army Emergency First Responder Program (AEFRP), as well as, (2) National Guard Bureau Weapons of Mass Destruction Civil Support Teams (NGB WMD-CST) and U.S. Army Reserve (USAR) Reconnaissance and Decontamination Companies.

The CBRN Defense Homeland Security and Force Protection area seeks to provide urgently needed defensive capabilities to those DOD organizations, forces and installations responsible for supporting the execution of critical military missions or responding to CBRN events that affect these missions and personnel. The programs that constitute this thrust differ from the other CBRN defense areas in two ways: 1) They address the need for integrated families of fully developed CBRN systems and 2) they meet the needs of both the military and civilian CBRN response personnel. A flexible acquisition approach is required to provide a comprehensive, integrated CBRN detection protection and response capabilities to 55 National Guard Bureau Weapons of Mass Destruction Civil Support Teams (NGB WMD-CSTs), USAR Reconaissance and Decontamination elements and to installations as large as the Norfolk Naval Base and FT Hood, with disparate and unique mission requirements. The CBRN capabilities provided to these organizations and installations provide commanders and both military and civilian first responders with an enhanced ability to prepare for, rapidly respond to, make more

timely and informed decisions about and more effectively manage the consequences of a CBRN event. The PM IPP and PM WMD-CSS program offices are structured using a spiral acquisition strategy to expedite procurement and fielding of emerging capabilities. At this time, all of these efforts are focused on effectively fielding Government and Commercial-Off-the-Shelf technologies and products (GOTS/COTS) to meet the urgent needs of the Warfighter and the installation commander. However, the spiral nature of these efforts lends itself to upgrading and improving equipment and procedures on a continual basis. These programs expect to take advantage of improvements in technology as it happens within the supporting product areas. At the same time, improvements in analytical capabilities will impact the Simulation Based Acquisition tools and processes so that optimized use can be made of available resources.

2.8.1 CBRN Defense Homeland Security and Force Protection Science and Technology Efforts

The CBRN Defense Homeland Security area leverages Science and Technology (S&T) efforts of the other product areas. Where unmet requirements are identified and where S&T is required to meet cost objectives, the CBRN Defense Homeland Security area will work with the CBRN S&T community, the JPEO-CBD and the associated product area JPM to prioritize investments and integrate requirements. This strategy of supporting sub-system S&T will meet the vast majority of the area requirements.

2.8.1.1 Goals and Timeframes. The goals of CBRN defense homeland security are to support the establishment and equipping of 55 WMD-CSTs, and provide CBRN Defensive capabilities to DOD Installations during FY05 – FY11. All equipment for the 55 teams has been purchased. The last team will be operational in 2nd Qtr FY06. The Installation Protection Program is in the process of being reshaped based on the results of the QDR and a decrement of $535M in procurement funds. OSD and the Joint Staff will study the installation CBRN requirements and obtain approval of the reshaped program NLT June 2006. Meanwhile, the focus of the FY05 and FY06 IPP will be providing critical first responder capabilities, mass warning notification and incidence management systems to key military installations

2.8.1.2 Major Technical Challenges. Technical challenges are based upon the production nature of the programs. Major technical challenges include the following: (1) Providing affordable real time biological event identification and warning at the time of the event vice relying on more costly and time consuming detecting to treat, (2) Low cost, self-configuring communications for sensor networks, (3) Expeditious transition of emerging COTS capabilities, and (4) Comprehensive CBRN Simulation Based Analysis and Decision Support System. The first two challenges are high on the DOD priority lists and being pursued by many sources. The third challenge may require particular attention from the JPEO-CBD and CBRN S&T communities to provide resources to readily evaluate COTS products against the Urgent Requirements Capabilities Document (UCRD). Lastly, Simulation Based Analysis and decision Support System tools are currently fragmented across multiple system areas and a fully integrated Analysis and Decision Support System will require development.

2.8.2 CBRN Defense Homeland Security Modernization Strategy

DOD efforts for CBRN Defense Homeland Security and Force Protection rely upon the integration of capabilities provided by the six operationally oriented commodity areas: contamination avoidance, individual protection, information systems, collective protection, decontamination, and medical systems. As these commodity areas complete development of

emerging capabilities, each product or system will be evaluated for its applicability to meeting the needs of the ongoing CBRN Defense Homeland Security efforts. Some potential contributions from other CBRN RDT&E programs are shown based upon their projected schedules in ***Table 2-15***.

Table 2-15 Homeland Security Modernization Strategy

	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Civil Support Systems	• Provide the Analytical Laboratory System (ALS) Block I and the Unified Command Suite Increment 1 to 55 NGB WMD-CSTs • Improved CBRN transport and storage capability to 25 USAR Decontamination Companies • COTS modernization of individual protection and CBR survey and monitoring equipment	• The testing and fielding the ALS Block II and the next generation UCS I	• Autonomous robotic CBRN survey and analysis capability

2.8.3 Installation Protection Program (IPP)

The JPEO-CBD/JPM Guardian IPP constitutes the DOD's effort to field a full spectrum of NBC installation protection capabilities designed as a family-of-systems to military installations and DOD-owned or leased facilities. The JPM Guardian plans to procure Government and Commercial-Off-The-Shelf (GOTS/COTS) systems designed to meet the operational requirements as identified in the Urgent Requirements Capabilities Document (URCD), October 14, 2003.

The ATSD(NCB) in October 2005 directed the JPEO to suspend fielding the IPP and initiate a study to examine potential FY07–11 programmatic changes to the IPP to improve military response to a national catastrophic CBRN incident. This study will be completed during 2006. In order to maximize the benefit of all available FY04-06 funding to the installations a change in the IPP's scope was developed. This adjustment, identified as "IPP Lite", focuses on an installation's ability to perform CBRN emergency response. This proposal was approved by the ATSD (NCB) and JPEO on October 18, 2005. The IPP Lite program will begin immediately while ATSD (NCB) conducts the defining study for the future program (Revised IPP).

The systems included in the IPP Lite are derived from the approved IPP Family of Systems (FoS) baseline equipment list. The major components include:

- First Responder CBRN Equipment Set - This equipment is derived from the original IPP FoS list that the Services viewed, staffed and approved. The IPP Lite equipment set consists of: Individual Protective Equipment (IPE), sampling collection equipment, detection and survey equipment, decontamination equipment, medical and training references.
- Warning and Mass Notification System Upgrade - The IPP FoS included both "big" and "little" voice capabilities because of the importance of immediately alerting personnel during a CBRN event. Under this same rationale, the IPP Lite will include elements of these capabilities by upgrading the existing installation's equipment. The external "big" voice mass notification system is a loudspeaker system that will cover critical mission and essential operation areas. "Big" voice systems will not cover non-critical mission

areas, residential, recreational and field training areas. The “little” voice internal warning system is a “reverse 911” telephonic system used to alert all base personnel and residents when an incident occurs.

- CBRN Decision Support Tool (DST) – The IPP IMS included a Decision Support System (DSS) which provided connectivity between fixed sensors and the Installation’s decision makers at a central location. IPP "Lite" does not have fixed, alarming sensors; therefore, the program does not include a DSS. IMS will consist of: CoBRA Pen Tablets with a wireless capability, a computer workstation located at the Installation’s Operations Center (OC) and has a Software Suite to Support Incident Management and Response Operations, and will be SPAWAR Certified.
- Medical – The program will coordinate with OSD(HA) and the Service OTSGs to facilitate medical surveillance monitoring at each installation.

The IPP is designed to fill a critical gap in an installation’s ability to react to a CBRN incident. This program will provide DOD prioritized installations with an integrated CBRN protection and response capability to reduce casualties, maintain critical missions, and effectively restore essential operations. JPM Guardian has an assigned mission to:

- Provide an effective CBRN detection, identification, warning, and protection system for each installation protection.
- Provide a CBRN capability that will allow for rapid restoration of critical installation operations.
- Protect DOD civilians, contractors, and other persons working or living on U.S. military installations and facilities from a WMD event.

The program is structured using a spiral acquisition strategy to expedite procurement and fielding. Technical risk will be reduced by focusing on mature GOTS/COTS technologies and products. This family of systems package will be fielded as a single, integrated system designed to meet the specific needs of the installation. The design will stress flexibility and the capability for future technology insertion.

2.8.4 Coordination with related CBRN Defense Homeland Security and Force Protection Programs

At the highest levels, these programs are coordinated by participation of the Services, Joint Staff and OSD staff elements in the Overarching Integrated Product Teams (OIPTs). At the operational level, coordination is accomplished by a near-continuous dialog between the Program management and the Services and installations. Joint, Service and Federal Agency IPTs have also been established for key functions within the IPP Program. Coordination has included the following Programs and Initiatives within DOD: Immune Building Program (DARPA); UNWD (DTRA/DOE); BioNet (DOD/DHS); the CBDP S&T Program (DTRA); CASPOD ACTDs (DTRA); The Defense of Cities Study (DOE).

2.9 CHEMICAL AND BIOLOGICAL TEST AND EVALUATION ACTIVITIES

This section provides a description of test and evaluation activities, including infrastructure and related capabilities that support multiple efforts throughout the CBDP. This section provides a summary of execution plans for the $444 million that was budgeted and programmed for FY06–11 period.

The development of CB defense equipment and medical countermeasures requires adequate T&E facilities. This annex provides an analysis of the existing and planned non-medical T&E infrastructure to meet the requirements of current and future CB defense research and development programs. This document also identifies facilities that support animal testing for CBDP T&E requirements.

2.9.1 Overview

Current T&E facilities are not adequate in terms of either capacity or capability to meet the T&E needs of the CB Defense Program. The dynamic nature of the expanding CB threat has exceeded the capability of our current infrastructure, which has a limited ability to test and evaluate equipment against evolving threats. Additionally, state-of-the-art technology and analytical methods are lacking or inadequate in some areas. Critical improvements to threat representation of current and projected threats will begin this year (FY06). In FY04, the CBDP aligned the T&E requirements with the appropriate Science & Technology and/or acquisition development programs. This alignment formed the basis of the Enhanced Planning Process (EPP), which was approved in 1QFY05. The approved EPP resulted in a $444 million increase to support the T&E infrastructure beginning in FY06 and continuing through FY11.

The JPEO-CBD established the Product Director, Test Equipment, Strategy, and Support (PD TESS) in 2QFY05 to execute $135 million of the $444 million allocated to 6.4 (Advanced Component Development and Prototype) and 6.5 (System Development and Demonstration) efforts. PD TESS is also chartered to coordinate efforts with the $100 M allocated to JSTO-CBD for the execution of 6.3 (Advanced technology Development) test methodology efforts. $209 M will be used to support the CBDP Major Range and Test Facility Base (MRTFB) in accordance with Public Law 107-314, Section 232. PD TESS is also chartered to support the Deputy Undersecretary of the Army-Operations Research [DUSA(OR)] in matters of test infrastructure development. This overall increase in T&E infrastructure will support the expansion of existing capabilities as well as development of new capabilities for the execution of 6.3 test methodology efforts.

In 3QFY05, PD TESS and DUSA(OR) hosted the Test Capability Requirements Meeting with participation from the Joint Project Managers, JPEO-CBD, Capability Area Program Officers, the Joint Requirements Office, Service combat developers, operational test agencies, developmental testers, and evaluators. This meeting resulted in a consolidated list of T&E requirements which were then distributed to all participants and the T&E community. The consolidated list formed the baseline for relating T&E capability to requirements. A data call was then conducted by PD TESS to determine current service T&E capabilities to establish test capability needs based on material test requirements. This effort forms the basis of the FY06-FY11 T&E Investment Plan.

2.9.2 Description of existing T&E Facilities

Following is a description of existing facilities for research, development, test and evaluation.

a. Medical research facilities. These facilities primarily provide research data, including animal testing with chemical and biological agents to demonstrate the safety and efficacy of medical products.

   i. *U.S. Army Medical Research Institute of Infectious Disease (USAMRIID)*: USAMRIID investigates infectious diseases that require special containment and provides a critical capability to infectious disease research as the only DOD laboratory equipped to study highly hazardous viruses at Biosafety Level 4 (BSL-4). The Institute also operates a reference laboratory for definitive identification of biological threat agents and diagnosis of the diseases they produce.

   ii. *U.S. Army Medical Research Institute of Chemical Defense (USAMRICD)*: USAMRICD provides extensive, world-renowned research capabilities to support the identification, development, and fielding of medical countermeasures against chemical and toxin agents.

   iii. *Navy Medical Research Center (NMRC)*: The Biological Defense Directorate at NMRC provides rapid and confirmatory diagnosis of infectious diseases through analysis of a wide variety of clinical materials. The directorate explores basic and applied microbiological, immunological and related scientific research methodologies for the development of medical diagnostics. Research personnel have designed, developed, and tested a broad variety of methodologies that have allowed for swift and accurate disease diagnosis essential for substantive medical protection and readiness. In addition, researchers have been instrumental in the advancement and refinement of confirmatory diagnostic methods utilizing polymerase chain reaction (PCR) methodologies in tandem with innovative, state of the art biosensor technologies.

   iv. Other Government and extramural facilities exist outside of the Department, but which are leveraged by the CBDP, including the National Institute of Allergies and Infectious Diseases (NIAID) and the Centers for Disease Control and Prevention (CDC). Medical testing is conducted in compliance with the rules, regulations, and requirements established by the Food and Drug Administration (21 CFR).

b. Non-medical Research & Development (R&D) and T&E Facilities.

   i. *U.S. Army Edgewood Chemical Biological Center (ECBC)*: ECBC facilities consist of BSL-3 and live chemical agent and simulant aerosol particulate bench chambers; CB protective filter and mask testing with live agents and simulants; Small animal live agent testing; Limited field simulant and interferent testing; Two Hazardous Material Explosion Facilities (16,000 cu ft) for testing military unique chemical material and industrial material, which can use one pound of explosives when combined with chemical material, and five pounds of explosives without chemical material; Aerosol simulant chambers and the Aerodynamic Research Laboratory, comprising approximately 11,000 ft^2 of experimental aerodynamic facilities that include four wind tunnels for component and materials tests; 5 mph Breeze Tunnel, which primarily supports early R&D phases (research on acute and sub-acute

toxicity effects of chemical warfare agent surety materials, terrestrial environmental fate and effects, and effects of chemicals of military interest on varying species of the aquatic ecosystem).

ii. *U.S. Army Dugway Proving Ground (DPG)*: DPG is the DOD Major Range and Test Facility Base (MRTFB) range for CB defense. DPG facilities consist of: Combined Chemical Test Facility (CCTF) (35,000 sq ft) with 35 test suites supporting live chemical agent liquid, vapor, and aerosol testing; Life Sciences Test Facility (LSTF) with multiple live biological agent test chambers at the BSL-3 level with aerosolization capability, comprising 32,000 sq ft of which 3,500 sq ft is BSL-3 lab space; Materiel Test Facility (MTF) with three environmentally controlled, vehicle-size live chemical agent chambers, the largest of which is 30 x 50 x 50 ft; test grids, and instrumentation for chemical and biological simulant field and chamber tests; Ambient Breeze Tunnel for biological stimulant system tests. DPG will have the initial capability for transportable instrumentation to support simulant tests and operational tests in off-site environments.

iii. *Air Force Operational Test & Evaluation Center (AFOTEC)*: Utilizes BSL-1 lab for simulants at Eglin Air Force Base (AFB). Eglin AFB facilities consist of: simulant vapor challenge test chambers, several test ranges, and an outdoor decontamination pad for use with chemical simulants. Air Force Research Lab (AFRL) facilities consist of: BSL-3 lab and chemical simulant test chambers.

iv. *Naval Surface Warfare Center (NSWC), Dahlgren*: Dahlgren: Test Center for Ship Systems CB T&E. BSL-3, TIC/TIM, biotoxin and chemical agent simulant test capabilities; materials T&E laboratory for small scale component, small and large coupon test samples—fully equipped for dynamic mechanical materials test methodology; corrosion laboratory; large coupon dynamic environmental test chambers; ship wash-down decontamination test facility with simulant; small-weapons post-decontamination functionality testing range; small scale component and material decontamination tests using simulants; collective protection development systems for development and simulant testing of airlocks and filter assemblies;

v. *U.S. Navy Operational Test & Evaluation Force* and the *Marine Corps Operational Test & Evaluation Agency*: These facilities provide limited capability to support CBDP field tests.

vi. Other Government/International and extramural facilities exist outside of the CBDP that are leveraged to the fullest extent possible on a case by case basis, including: Nevada Test Site (outdoor field tests), Defense Research and Development Center (DRDC) in Suffield, Canada, and Porton Down in the United Kingdom (chamber and field tests); Battelle Memorial Institute, Geomet, Southern Research Institute, Arvin/Calspan, Environmental Technologies Group, ITT Research Institute, Midwest Research Institute, and Truetech also have small-scale agent and simulant test capabilities. Other R&D facilities include Los Alamos National Lab (research on biological and radiological defensive systems), MIT Lincoln Labs (laser technology research for defensive biological systems), and Research Triangle Institute (R&D of chemical and biological defense systems).

2.9.2.1 Analysis of T&E Facilities' Capacity. The test facilities possessed by and accessible to the CBDP are not currently adequate in terms of capacity, given the expanding requirements to test whole systems; and are not adequate to fully test and evaluate CBDP material development products. Component, and simulant capabilities exist. T&E shortfalls lie in the full systems and platform test chambers and supporting instrumentation and fixtures. These test fixtures must be able to introduce and adequately control live chemical and biological agent challenges and provide a range of environmental and challenge conditions to simulate evolving threats, while performing end-to-end systems operations of CBD equipment. Shortfalls in instrumentation and methodology to support multiple and diverse concurrent natural environmental, full systems operational tests also exist. Specifically, tests for full systems decontamination capabilities, moving platform biological and chemical long range detectors, and full scale battlefield hazard mitigation of protective ensembles do not currently exist.

Requirements for CBDP-related T&E capabilities for which funding has not been programmed have been frequently identified over the past decade, resulting in a rolling backlog of unimproved or unavailable test facilities, thus resulting in limited capabilities. Funding in FY06 is in place to begin addressing this. To address the most serious deficiencies, DOT&E, through the Central Test and Evaluation Investment Program (CTEIP), has initiated and funded the Contamination Avoidance Detector Test Suite (CADTS). This multi-year project, scheduled to complete in FY07, provides the most immediate needs for testing contamination avoidance equipment. Among the capabilities included in the test suite are: Joint Ambient Breeze Tunnel (JABT) scheduled for completion in FY07, Active Standoff Facility (ASC) scheduled to complete in FY07, and a near real-time Polymerase Chain Reaction (PCR) referee system scheduled to be completed in FY06.

The T&E infrastructure in terms of intellectual capital/personnel resources required to support the CBDP is currently not adequate; however, the coordinated efforts in submitting the FY06 CBDP budget have resulted in establishing the funding to provide for these resources. As required by Public Law 103-160, Section 1703, all CBDP T&E funds are provided through a defense-wide account, thus the Services may not independently support the T&E infrastructure through Service research, development, test and evaluation (RDT&E) accounts. Other than the individual direct test programs, much of the current Operational Test Agency (OTA) infrastructure that supports the CBDP has limited or no funding from each Service, thus hampering the ability to perform early T&E methodology planning and continuous evaluation. The OTA intellectual infrastructure is critical for the advanced planning and development of versatile test capabilities which are adequate to address the diversity of threat and scenario types expected to be encountered.

2.9.2.2 Analysis of Versatility. CBDP T&E capabilities are not sufficiently versatile to provide full decision support to address current threats with operational realism, nor to address evolving threats.

For the DOD T&E facilities that support the CBDP, there has not been an integrated approach to ensure documentation, validation, and repeatability of test procedures in many cases; no basis or mechanism to standardize procedures among labs; and no advanced planning nor investment for evolving threats and testing of diverse battlespace conditions and missions. This has resulted in specific compartmentalized test capabilities and a lack of versatility. Additionally,

correlations of agents and simulants required to support assessment of system performance against live agents based on testing with simulants have not been established.

In the past, acquisition program offices have sponsored expedited test capabilities (either in government or commercial facilities) in order to meet immediate urgent needs. This has often resulted in test systems with limited versatility that were only suitable for very specific testing applications, as well divergent, non-standardized and non-sustainable tests.

In FY06, investments will be initiated to obtain:

- advanced T&E capabilities to test CB defense equipment against Non Traditional agents and new collective and individual protection technologies,
- comprehensive modeling and simulation to establish T&E parameters and expand systems analyses,
- live chemical and biological agent full system test chambers,
- expanded simulant range capabilities,
- T&E capabilities to address decontamination efficacy and systems performance post-decontamination operations, and
- T&E capabilities for advanced battlespace management (*Shape*) information systems.

2.9.3 Integrated Approach to Plan for T&E Infrastructure

Funding has been identified to develop and sustain test infrastructure and methodology to support identified community shortfalls. This funding will allow the following CBDP T&E objectives to be met:

- Establish single integrated approach to planning joint service test and evaluation capability and methodology needs.
- Streamline the Test and Evaluation Management Plan approval and issue resolution process.
- Establish a fully integrated test and evaluation investment strategy.
- Establish common set of test processes and standards for conducting joint test and evaluation activities.
- Identify test and evaluation capability gaps and intellectual infrastructure required for chemical and biological defense needs.
- Develop new test procedures and capabilities to increase the breadth, depth, and capacity of the CBDP T&E infrastructure to address evolutionary threats and expanded operational environments.

The T&E infrastructure requirements have been synchronized with technology transition and acquisition programs' T&E requirements. A key focus is to develop models and analytical methods necessary to provide commanders guidance for effective CBD operations and equipment use. A critical element of the developmental T&E work required across all functional areas is the correlation of agents and simulants performance tailored to each type of CBD technology. Work to increase critical operational test capabilities (outdoor stimulant testing) is planned as well.

2.9.4 Integrated Approach for T&E Processes

In addition to the synchronization of the S&T, acquisition, and T&E infrastructure budget planning, process improvements have been made to establish integrated T&E approaches. As an

example of the status of the T&E integration, AFOTEC conducted field testing of the biological detection systems as a Multi-Service Operational Test & Evaluation (MOT&E), which involved all OTAs including DPG support, and completed an integrated MOT&E report. In several programs, a single Evaluation Report was completed reflecting results of all Services' evaluations. These efforts by AFOTEC, the U.S. Navy Operational T&E Force, the Army Test & Evaluation Command (ATEC), and the Marine Corps Operations T&E Agency (MCOTEA) reflect the spirit of the joint integrated T&E infrastructure approach and indicate a sound direction in establishing a common set of processes and procedures for joint CBDP T&E.

2.9.5 Specific T&E Requirements

Planned T&E capabilities improvements include advanced ground-truth sampling systems, threat-representative chemical and biological challenge dissemination and characterization, aerosol and surface sampling methods, and hazard analysis models relating test data to actual toxicological data. The following is a description of activities and capabilities to be developed starting in FY06 to address the full scope of T&E requirements.

2.9.5.1 Whole System Live Agent Testing. The Deputy Under Secretary of the Army Operations Research (DUSA(OR)) and the Director, Operational Test & evaluation (DOT&E) have identified the requirement to conduct Whole System Live Agent Testing (WSLAT) of biological agent point detection systems with live biological agent aerosols. Currently, active agent testing is conducted only at the subcomponent level, due to size constraints associated with existing aerosol containment chambers. Whole system testing is currently conducted solely with a single biological agent simulant. Simulants have not been validated for many types of biological agents. While the current approaches have met minimal requirements to test and field detectors, execution of WSLAT is required to provide data sufficient for system evaluation. Initial efforts in 04 to 05 will be to further characterize and relate component performance among agents and various types of simulants, to validate additional simulants, and to establish an M&S whole system analysis process. Based on currently planned funding, the WSLAT test is scheduled to be completed in FY07.

2.9.5.2 Field Trials. More than thirty years have passed since outdoor live agent chemical tests were banned in the U.S. and the last outdoor test with live chemical agent was performed, so much of the infrastructure for field testing of chemical detectors no longer exists or is seriously outdated. The currently budgeted improvements in T&E infrastructure will greatly improve both developmental and operational field testing of full systems, with better simulated representation of threats and characterization of system response.

2.9.5.3 Live Agent T&E Capability. A test chamber and validated methods adequate to perform live CB agent testing of active standoff CB detectors is a critical need of the CBDP program. Work with actual agents is necessary for both development and testing to establish the library of algorithms for the system to detect CB agents, and to test the efficiency of detection. An active system test chamber for chemical agents is currently being defined and will be timed to support standoff acquisition programs along with a military construction project in FY08. There are technical risks associated with the safe implementation of a large scale live agent capability for standoff detection that could delay testing and limit the ability for full system testing.

2.9.5.4 Emerging Threats. For all functional areas, test methods are required to address emerging threats, including Non-Traditional Agents (NTAs), Toxic Industrial Materials (TIMs), and dusty agents. The CBDP will fund a dedicated NTA chamber, along with the studies needed

to provide data to safely operate it, and specific test fixtures tailored to each type of test. The CBDP will develop and validate advanced technology tests to address Toxic Industrial Materials effects on protective materials and systems.

2.9.5.5 Decontamination Testing. The testing of decontaminants and decontamination systems is hampered by the lack of any acceptable simulants for field testing and training and lack of agent-simulant correlations. Due to the unique qualities of chemicals and biologics, even within the same family, no two chemicals or biologics act the same when exposed to the same decontaminant or environment. Decontamination is a physical process that will always be dependent upon the exact chemical or biologic present. Testing is currently conducted with small components or panels of hardware in test chambers. The CBDP will provide updated decontamination system test methods which address decontamination system efficacy, as well as system degradation from decontamination processes. The decontamination pad used at Dugway Proving Ground was contaminated in the 1980s with C8 Emulsion decontaminant. The area is a Solid Waste Management Unit regulated under RCRA. This limits the type and quantity of testing that can be done there. This pad has been replaced with an environmentally sound system that will collect all run-off.

2.9.5.6 Simulants and Agent Characteristics. Agent/simulant correlations are a cross-commodity testing need in the CBDP. Also in this category are analysis procedures and agent simulation correlation methods for NTAs, aerosol chemical agents, and TIMs (chemical, biological, and radiological).

2.9.5.7 Individual Protection T&E Investment Strategy. Fixtures containing new sample cells that will more accurately sample the air behind the protective material, provide dynamic subsystem tests, and enable tests to characterize the effects of high winds on system protection are technologically feasible and have been designed, but require funding to develop and validate. A critical requirement exists for a whole system live agent CB ensemble test supported by modeling to allow integration of toxicological data into valid estimates of casualty predictions. Whole ensemble testing is currently conducted with one simulant that has been determined to be safe for human use. Methodology studies are needed to characterize physical properties affecting protection and to understand the interactions among variables that affect protection in order to link all the tests in an analysis and model to predict hazard levels in order to optimize CB ensemble design and deployment. Correlation between simulant penetration and leakage and that of either chemical or biological agents and direct relation of penetration and leakage data to toxicological data are key tenets in the strategy to evaluate IP and CP systems. For both individual and collective protection equipment testing, fixtures used to test swatches of material for leakage against chemical agents are outdated and were not designed to represent field wear conditions.

2.9.5.8 Collective Protection T&E Investment Strategy. In pursuing Force Protection for Warfighters, Collective Protection against CBRN threats is critical to sustaining battlefield momentum. T&E infrastructure and capability to support timely acquisition of systems designed to sustain the fight is a critical requirement. Current gaps have been identified, which impact safety and battlefield protection for individual platforms, crews, and units. Aligning technology development and system acquisition programs is the framework within which the T&E methodologies and capabilities will be developed to meet the T&E needs. The T&E investment strategy for Collective Protection will focus on Upgrading test fixtures and instrumentation and standardize test procedures to evaluate COLPRO systems and components to include air

purification systems and novel closures. Improvements will include several sites (ECBC, Eglin, Dahlgren, DPG). The test procedures across facilities will be standardized to allow comparability of data. Upgraded test facilities are required to test advanced technologies in COLPRO which require different test set-ups, instrumentation, measurement of different parameters, and new analysis methods.

2.9.5.9 Information Systems T&E Investment Strategy. Automatic collection and fusion of information from all CBRN Battlefield assets and integration with other relevant information is critical. Gaps exists in our ability to test the integration of threat information, CBRN sensor and reconnaissance data, protective posture data, environmental conditions, medical surveillance, and collection of other data pertaining to CBRN conditions. The T&E investment strategy for Information Systems will focus on acquiring test Grid and Safari Instrumentation, Stimulant/ Stimulator development, real time Data standardization, integration, fusion, visualization, and Test area data network.

Spectroradiometer. Test equipment purchase (for use as a referee system) to fully characterize simulant cloud releases in a field environment for standoff and point detection systems at DPG. Linked to accepted Edgewood Chemical Biological Center (ECBC) S&T proposal.

Simulators & Stimulators. Design and build detection system simulants and stimulators to facilitate hardware-in-the-loop in a field environment. Validate simulators and stimulators. Gap addressed: These T&E capabilities are critical to support operational testing of Shape and Sense systems in a wide range of environments. These capabilities will allow activation of detection systems to simulate threat scenarios without simulant dissemination, and will provide simulated detector inputs to fully characterize detector network systems. These capabilities support detector network tests, testing during operational exercises, tests of Battlespace Management/Information and Reconnaissance Systems.

2.9.5.10 Biological Standoff Detection T&E Investment. For operations against a threat with biological weapons capability detection and identification are critical to insure that forces can assume the optimal protective posture so that they can continue to sustain operations and rapidly decontaminate affected areas, equipment, and personnel. The T&E investment strategy for Biological Standoff systems will focus on acquiring:

(a) Design and build a live agent Biological Detection Standoff capability at DPG. Test techniques, methodologies, dissemination hardware, and referee instrumentation will be developed and validated during this effort. Develop standardized Test Operation Procedures. Gap addressed: This T&E capability is critical to allow system evaluation of all biological stand-off detection systems in realistic threat conditions. Standoff detection test facilities have space, line of sight, and hardware differences from point detection facilities that will tend to drive higher the cost per test. However, this does not preclude point detectors from testing in the same facility.

(b) The T&E strategy will also upgrade DPG Active Standoff Chamber (ASC) & Joint Ambient Breeze Tunnel (JABT) simulant Standoff Chambers. It will procure test instrumentation and fully characterize simulant cloud characteristics in the ASC and JABT standoff chambers. Develop standardized Test Operation Procedures. This T&E capability is critical to allow full system evaluation of all chemical and biological standoff detection

systems and point detection systems, by allowing testing of production representative systems in realistic threat conditions.

2.9.5.11 Chemical Standoff Detection T&E Investment. For operations against a threat with chemical weapons capability detection and identification are critical to insure that forces can assume the optimal protective posture so that they can continue to sustain operations and rapidly decontaminate affected areas, equipment, and personnel. The T&E investment strategy for chemical standoff systems will focus on acquiring: Spectroradiometer, ASC/JABT, Synthetic Test Environment, Test Grid and Safari Instrumentation, Stimulant/stimulator development, NTA facility, CB standoff chamber Test Facility, and CB Field Simulant Challenge Test Capability.

The T&E investment strategy for chemical point systems will focus on acquiring: Synthetic Test Environment, Test Grid and Safari Instrumentation, Stimulant/stimulator development, Dynamic Test Chamber, NTA facility, and improved and expanded CB Field Simulant Challenge Test Capability.

2.9.5.12 Updating T&E Infrastructure. Test infrastructure for other CBDP systems in development meet minimal testing requirements, but in most cases are either outdated, incapable of a high degree of reproducibility or precision, under funded, or otherwise inadequate to meet schedule or quality requirements for operational evaluations or commanders' guidance. Most testing currently performed is neither as operationally relevant, nor based on as realistic threat scenarios as the warfighters require.

The development of all CBDP materiel—from detectors, individual protective gear, and decontaminants—require test validation against actual chemical warfare agents (CWAs) in systems validated with animal models. Inhalation exposures are the most likely exposure route for volatile CWAs and a likely route for weaponized agents. Such exposures, to either vapor or aerosol forms of CWA, require specialized equipment found in few areas of the world and expert personnel to supervise and run the exposure trials. At a minimum, expertise is required in inhalation toxicology, analytical chemistry and respiratory physiology. An inhalation agent testing capability has been firmly established at ECBC in accordance with all DOD safety, surety, security and Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) requirements and in compliance with Good Laboratory Practices (GLP) in the new state of the art Life Sciences Research facility.

This current state of the art research facility is under funded in terms of its maintenance, routine replacement, and capacity to meet current increased needs. Lack of continued maintenance funds could deteriorate these capabilities. As with overall T&E infrastructure, sustainment and instrumentation costs have been passed to CBDP research programs that are not adequately budgeted for these expenses.

Animal Test Research that supports the CBDP requires work with chemical surety materials and will require an increase in scope to support specific hazard definition and protective ensemble performance. Simulant research cannot accurately predict biomedical outcomes of chemical warfare agents. By Federal Law chemical surety materials, including dilute agents, must be under DOD/Department of the Army control. The animal research test facilities at the U.S. Army ECBC and USAMRIID must be augmented to meet these requirements.

For CB defense medical countermeasures, ***Annex F*** provides a detailed description of technical barriers for the various prophylaxes, therapeutics, and diagnostics, and outlines T&E needs to be overcome to ensure development of FDA licensed medical products.

2.9.6 Actions Needed to Meet Testing Requirements

This section supplements section 2.9.4 above. The following is a list of specific T&E capabilities which will be initiated in FY06. These shortfalls primarily comprise needs for tests that do not presently exist, but also include tests that require improvement in order to provide data adequate for evaluator, decision maker, and Combatant Commander information needs. In addition, continued identification and development of CBDP T&E intellectual and capabilities infrastructure is required as a significant investment of the CBDP. T&E needs below are organized according to the Joint Enabling Concept/functional area they support, that is, Sense, Shape, Shield, and Sustain.

2.9.6.1 SHIELD: Individual/Collective Protective Equipment (IPE/CPE)

- Next-generation materials agent test to provide toxicologically relevant data under wide variety of threat conditions and types of materials.
- Tests to address NTAs, TIMs, and dusty agents.
- Development of modeling and analysis methods to characterize system protection in terms of toxicological hazard levels to give commanders guidance for effective CB ensemble use.
- Whole system live agent testing of CB protective ensembles.
- Next Generation Man-in-Simulant Test (MIST): Provide near real-time sampling technology for material and system tests to better characterize CB performance and provide operationally useful information regarding effects of changing battlefield conditions and warfighter movement. The current test capacity and challenge types for system testing of CB ensembles needs to be improved to meet the rising test demands of new RDA Plan systems, including liquid challenges and expanded processing capability. Increase the test aerosol CB simulant challenges beyond the present capability of 1-2 subjects per trial. Current IPE systems being tested require a larger chamber and increased test capacity. Also, a larger and more controlled range of particle sizes will be available to better simulate a range of dusty CB agents.
- Obtain CB ensemble subsystem tests with live agents (CB gloves, footwear, and masks) to include testing of CB masks with biological challenges and with a wider range of helmets and respiratory conditions.

2.9.6.2 SENSE: CB Standoff Detection.

- Implementation of the National Academy of Science (NAS) test requirements that require environmental modeling be used to augment live-agent testing, as outlined in Review of Testing and Evaluation Methodology for Biological Point Detectors, Final Report, The National Academies Press, Washington, D.C., 2004.
- Better characterized threats for realistic threat scenarios for developmental and operational tests. This needs to include the ability to establish the relationship between lab agent performance and field simulant performance.

- Provide additional ground truth instrumentation, including augmenting the ability to exploit future advances in imaging spectrometer and Raman light detection and ranging (LIDAR) technologies.
- Provide for improved data collection, archiving, and automated processing of trial results to enable test schedules to proceed and for test conditions to be adjusted as necessary to account for previous trial data. This significantly improves the ability to characterize system performance over a wider and better-defined set of operational conditions and greatly lessens lost data and repeated trials required.

2.9.6.3 SENSE: Chemical Point Detection

- Provide technological improvements that reduce cost, improve test schedules and efficiency, and minimize test performance impacts.
- Relocate detector test fixtures from the current Materiel Test Facility (MTF) chamber, which is required to test new systems.
- Correlate chamber agent performance with field simulant performance with additional detectors, decontaminants, and protective materials that establish ground truth data comparing agent and simulant under comparable conditions.
- Full characterization of the chemical agents of varying grade or quality, interferent, and development and documentation of more effective test methods for non-traditional agents.
- Improved and accelerated development of referee systems, sampling and analysis, validation testing, and Test Operating Procedures. Final studies on uniform dissemination and reproducibility of dusty challenge materials also will be accelerated and completed.
- Building upgrades (test fixture mechanical systems, safety systems, controls, and data systems) need to be funded, which will result in shorter and less expensive tests and more efficient test operations at reduced direct cost to customers.

2.9.6.4 SENSE: Biological Point Detection

- Purchase equipment for modular BSL-3 laboratory space to support WSLAT.
- Projects that validate and expand current Polymerase Chain Reaction (PCR) technologies, characterize interferent challenges, develop improved chamber bioaerosol dissemination methods, develop encapsulated simulants, and develop robust simulants.

2.9.6.5 SUSTAIN: Decontamination

- Support full-system, end-to-end decontamination procedure development and demonstration, including means to determine success of decontamination, characterization of decontamination chemistry and mechanisms, and agent-simulant correlation for use in field testing and training and to support NBC Contamination Survivability testing of critical non-NBC systems.
- Accepted methods for measuring chemical agent vapor and contact hazards, and determining decontaminability of RDA systems exposed to agents of biological origin.
- Tests, models, and standard methods to reliably characterize degradation of system function as a result of decontamination processes.

2.9.6.6 Sustainment of Existing Infrastructure

- Prepare sustainment plans and finance sustainment for existing CBDP laboratories, test facilities, chambers and outdoor test grids.

- Includes sustainment plans and funding for new test capabilities developed under the CTEIP or Modernization Programs.
- Fund all Direct Test Support requirements at Dugway Proving Ground.

2.9.6.7 New T&E Technologies Examples of requirements and test conditions for which test technology must be developed and validated include: unique agent challenge profiles, jet aircraft flight conditions, and simulated effective respiratory rates in CB mask protection agent tests; and expanded environmental and agent challenge conditions for individual protection materials and systems. Test technology will also provide agent (lab) and simulant (lab and field) challenge generation and control, agent-simulant correlations, and near real-time measurements of CBD systems responses. Provide mobile, deployable test capabilities to perform field simulant testing in multiple natural environments to ensure that CBD systems are effective, suitable, and survivable across the range of environments in which they will be deployed.

Capabilities to enable testers to provide evaluators and unit commanders specific information about how to properly use the CBD systems tested to mitigate risks in the CB environment, and also to provide system developers the information required to adequately develop and mature the systems. Test infrastructure will be adequate to ensure that data are available to certify that critical CBD systems are ready for operational tests and to identify any potential vulnerabilities.

Establish the test methods, instrumentation, and Test Operating Procedures (TOPs) required to meet evaluator data requirements for lab CB agent testing and outdoor simulant testing in multiple environments. Validation trials will be conducted on initial general capabilities to support finalization of the TOPs.

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Chapter 3

Chemical and Biological Defense Logistics Status

3.1 INTRODUCTION

The overall readiness of the Armed Forces to operate in a chemical or biological warfare environment is dependent on many factors. This chapter focuses on the overall availability of chemical and biological defense equipment to the total force, or logistical readiness, as one measure of overall readiness. This chapter does not address operational readiness directly. Operational readiness is highly dependent on the training and equipping of specific units and the nature of the specific operation. Such information is both time dependent and generally classified.

This report provides a current logistics status, as well as problems during the past year in Chemical and Biological Defense Program (CBDP) programs and outlines the continuous improvements of the logistics state within the CBDP. The keys to improving the logistical readiness status of the Department of Defense's chemical and biological (CB) defense equipment, while also supporting the Global War On Terror (GWOT), are threefold. First is to continue and to improve upon a number of important Business Process Improvements (BPIs) which are addressed in this report. Equally important is taking the BPIs and institutionalizing them across the Joint Program Executive Office for CB Defense (JPEO-CBD). Second is to enhance the JPEO-CBD's decision support tools and communications through logistics information technology solutions which will also be addressed in the body of this report. Third is to have visibility of the CBD industrial base status not only within DOD, but also understand the Homeland Defense (HD)/Homeland Security (HS) implications for overwhelming the industrial base in the event of a CB attack on the homeland. There are applicable lessons learned already from the Hurricane Katrina response concerning expectations of DOD, regardless whether it is or is not the Lead Federal Agency (LFA), which will directly affect the CBD industrial base in the event of a CB attack in the United States.

Operations in support of the Global War on Terror continue to place high demand on equipment. The Services and industrial base have responded and met all challenges. In fact our supply levels, visibility, accessibility and overall management have made significant improvements. Additional challenges remain as the operational tempo continues, with the reorganization and the approved strength increase of the Army; and with equipment modernization efforts by all Services.

The DOD CB Defense Program jointly manages the research, development, and procurement of major CB defense equipment end items, certain expendable items, and selected vaccines. These items are funded through defense-wide funding accounts. Replenishment of consumable (Class II) CBRN defense items is managed by the Services and DLA.[1] The

[1] Not included in the category of CB defense equipment is equipment maintained by emergency responders typically for HazMat response that may have a CB capability but is not intended for deployment or use in

existence of defense-wide (rather than Service-specific) research, development, and acquisition funding accounts has ensured the joint integration of CBRN defense programs. However, no defense-wide (that is, joint) operations and sustainment funding mechanism exists for the sustainment of CB defense items, including replenishment and replacement of consumables.[2] Because of this, the *joint* CB defense community is limited to tracking the status of the Services' defense logistics readiness and sustainment programs and making recommendations on funding issues.

The 2001 Quadrennial Defense Review presented a force planning construct (referred to as the 1-4-2-1 force planning construct). Current Joint CBRN defense materiel requirements are based on supporting the 1-4-2-1 construct and are the basis of data in this report. The Joint Requirements Office for Chemical, Biological, Radiological and Nuclear Defense (JRO-CBRND) developed requirements to support the 1-4-2-1 construct during the 2005 Combating Weapons of Mass Destruction (CbtWMD) Enhanced Planning Process (EPP).

For consumable items, the *Joint Chemical and Biological Defense Expendable Equipment Combat Consumption* (E2C2) study was developed to model the consumption rates of assets on the battlefield. In 2005 the E2C2 study modeled one combat scenario. In the future, this model will be revised to incorporate stakeholder recommendations and changing planning constructs.[*]

The findings in this chapter are based on a data call conducted by the Program Analysis and Integration Office (PAIO) and the Joint Program Executive Office for CB Defense (JPEO-CBD) as well as data from the FY06 *Joint Service CBRN Defense Logistics Support Plan* (JLSP). Until the E2C2 and follow-on studies are complete, the DOD does not have a joint modeling basis for consumables requirements determination. For this reason, the numerical requirements listed in ***Annex H*** are draft, and readiness risks are discussed in terms of general inventory trends, historical patterns, and the health of the industrial base.

3.2 CBRN DEFENSE LOGISTICS MANAGEMENT

The Services, JRO-CBRN Defense, the DLA, and the JPEO-CBD work in concert for the coordination and integration of joint CBRN defense logistics. The most challenging part of the joint acquisition process is joint sustainment. Understanding the operational environment is crucial to properly fielding and sustaining CBD items. Coordinating limited resources, gaining total visibility of CBD materiel, and ensuring that homeland defense requirements are considered, requires information sharing at unprecedented levels among all stakeholders. Unique commodity characteristics, such as the difference between a pharmaceutical product, a

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warfare theaters. Most of this equipment is considered consumable and is procured either locally (installation level), through higher headquarters, or through special programs. Interoperability with local communities is key to the procurement of these capabilities.

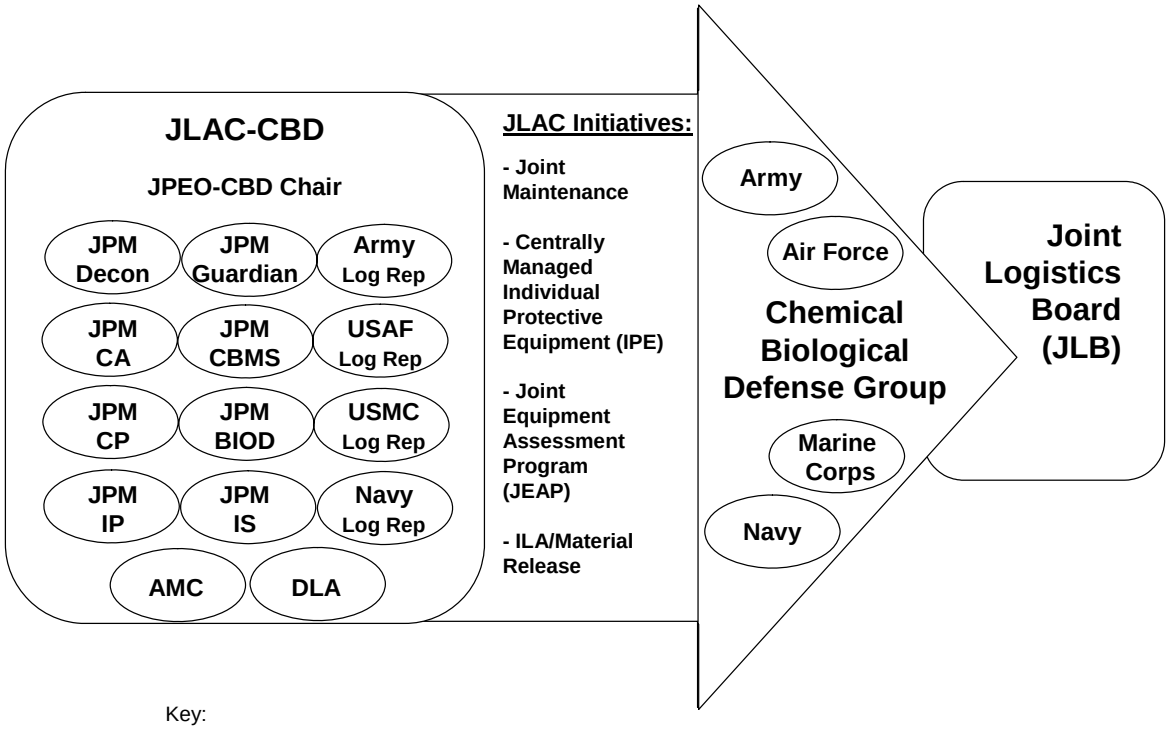
[2] An exception is the Joint Vaccine Acquisition Program (JVAP).

[*] In the Quadrennial Defense Review (QDR), published February 6, 2006, the Department refined the Force Planning Construct. This refined force planning construct for wartime will serve as the basis for future analysis of needed CBRN defense capabilities and forces. The full implications of the new force planning guidance on Joint CBRN defense requirements have not been determined at this time, but it will require an update of the analyses provided by the 2005 Enhanced Planning Process (EPP) and the E2C2 studies. For example, the Services are updating doctrine, tactics, techniques, and procedures for domestic response to terrorist incidents involving WMD. Additionally, the Department will consider higher level of contributions from interagency partners and from international allies and partners.

textile product, and a complex chemical or biodetection device, dictate a decision-making model which accounts for a diverse range of factors.

The 2005 report identified significant on-going initiatives by the Joint Services to better manage and account for Individual Protective Equipment. Many of these initiatives have significantly improved the DOD's ability to maintain asset visibility and accountability of these assets. For example, the Navy's CBRD Total Asset Visibility Management System (CBRD TAVMS), the Marine Corps' Strategic Logistics Asset Management (SLAM) project, the Air Force's and the Army's Mobility Inventory Control and Accounting System (MICAS) increase the Services' oversight ability. Further, by interfacing with the Joint Acquisition CBRN Knowledge System (JACKS), these initiatives support Joint logistics visibility. These efforts are critical to supporting efforts to re-set and reconstitute equipment for units returning from operations in Iraq and Afghanistan, and are discussed further in Section 3.2.2.

The JPEO-CBD is addressing the challenge of implementing Joint Total Life Cycle Systems Management through the Joint Logistics Advisory Committee (JLAC-CBD), which is composed of senior logisticians from the JPEO-CBD, Services, DLA, and other supporting activities (see ***Figure 3-1***).



Key:
AMC – Army Materiel Command
BIOD – Biological Defense
CA – Contamination Avoidance
CBMS – Chemical Biological Medical Systems
CP – Collective Protection
DLA – Defense Logistics Agency
ILA – Independent Logistics Assessments
IP – Individual Protection
IS – Information Systems
JPM – Joint Project Manager
Log Rep – Service Logistics Representatives, e.g., USMC Logistics Command (LOGCOM)

Figure 3-1 JLAC-CBD Participants and Initiatives/Joint Logistics Board

The main purpose of the JLAC-CBD is to recommend Service-wide Business Process Improvements that address best practices for total life cycle management (TLCM). The JLAC-CBD focuses on Joint Sustainment processes which:

- Increase availability, reliability, and maintainability to the warfighter
- Avoid duplication of efforts, potential excess, and unbalanced capacity for Depot / Contractor Logistics Support (CLS)
- Maintain configuration control and address supportability issues including Diminishing Manufacturing Sources and Material Suppliers (DMSMS)
- Maximize Economies of Scale
- Reduce Life Cycle Costs
- Maintain Asset Visibility

The JLB is the decision-making forum that will be utilized, in coordination with the Services, to implement those Joint Total Life Cycle Systems Management processes and initiatives. Decisions involving the Joint Services are staffed and vetted through the "External" Joint Services Chemical Biological Defense Group (CBDG). The CBDG has a pending charter from the JLB to address Joint CB Defense sustainment challenges where the Services have the responsibility for life cycle sustainment.

3.2.1 War Reserve Requirements and Planning

Increased requirements for CBRN defense equipment in wartime have mandated a greater emphasis on the need to plan for sustainment stocks while relying on industry to quickly surge production for these sustainment stocks. As currently planned, (see ***Figure 3-2***) the Services (except for the Navy) retain "starter stocks" of CBRN defense equipment to support immediate deployments and initial operations. The length of time that these stocks will last each unit depends on the Service's doctrine. Air Force units deploy with 30 days of CBRN defense consumables. Army divisions use a planning figure of 45 days. The Marine Corps Marine Expeditionary Units (MEUs) use a planning figure of 15 days and the Marine Expeditionary Forces (MEFs) use 60 days. Navy shore units use 60 days as the basis for their plans. Navy ships stock CBRN material to Allowance Equipage Lists (AEL) which are 115% or 215% of the ship's manning level, depending on the equipment type.

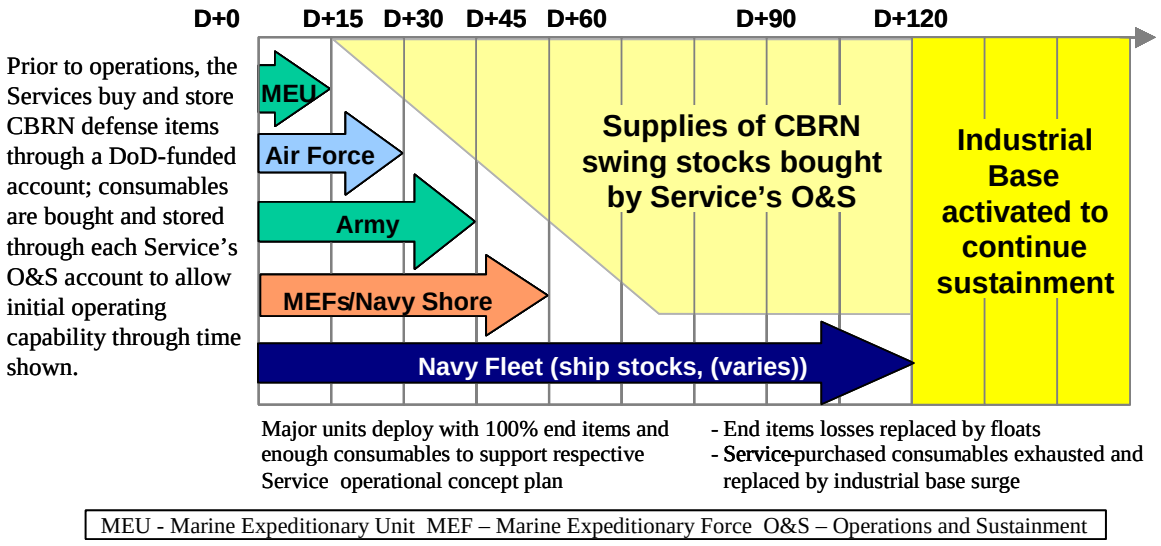


Figure 3-2 War Reserve Requirements and Planning

For CBRN defensive materiel, and particularly in the case of individual protective equipment (IPE), the days of supply represent a minimum stockage position based on current investment guidelines for such materiel. In most cases, the Services (except for the Navy) will first redistribute any available uncommitted assets to provide sustainment before sourcing elsewhere. Once these starter stocks are depleted, the military force (except for the Navy) turns to the DOD CBRN defense item managers for "swing stocks," also known as "sustainment stocks." The industrial base is also relied upon to surge production for sustainment. In general this assumption is valid; however, certain items may have long lead-time components.

DLA and the Army Materiel Command (AMC) are the item managers, or National Inventory Control Points (NICP), for the vast majority of CBRN defense items in all four Services. They are responsible for industrial base development, and storage of wholesale peacetime and sustainment wartime stocks. They buy (process procurement actions) and, if requested, store CBRN defense materiel (swing stocks) for the Services. However, the Services must provide funding to DLA and AMC for the procurements.

AMC and HQDA G4 are responsible for managing all aspects of the Army's War Reserve and APS requirements. They are responsible for industrial base development, and storage of wholesale peacetime and sustainment wartime Army stocks. They buy (process procurement actions) and, if requested, store Army CBRN defense material (swing stocks).

DLA and AMC depots primarily store Army-owned sustainment stocks, although the Air Force, Marine Corps, and Navy may provide funds to store their sustainment stocks. All Services are responsible for individually programming and funding sustainment stocks to provide the required support to their supporting force structure. Because of a lack of visibility of CBRN defense items, unclear wartime requirements, scarce Operations and Sustainment funds, and low priorities given to CBRN defense stocks, the current quantity of DLA and AMC CBRN defense war reserves have been reduced and may not support sustainment requirements for the entire DOD force. These numbers are reflected in the tables of ***Annex H.***

The Joint Materiel Prioritization Allocation Board (JMPAB) CB Defense Subgroup will resolve critical issues related to joint logistical and sustainment issues for the CBDP. The completion of the analysis of the E2C2 study and the impact of the Quadrennial Defense Review on the force planning construct will permit the Services and DLA to more accurately assess their readiness and sustainment status.

3.2.2 CBRN Business Process Improvements.

The Services, DLA, and the JPEO-CBD continue to improve business processes using a number of organizational, procedural, and information system initiatives. These efforts are, in some instances, solely CBD-related, in other instances they capitalize on business process improvements occurring in other parts of the DOD. While DOD has made significant business transformation progress by standardizing the identification of capability needs through the Joint Capabilities Integration and Development System (JCIDS) and improvements in the DOD acquisition process, operations and sustainment have just begun to focus on Joint strategy for total life cycle management.

3.2.2.1 Joint Materiel Fielding Process. The JLAC-CBD is evaluating areas in which the current multi-Service materiel fielding and equipment maintenance concepts could be changed from individual Service-based structures to a truly joint structure to standardize and streamline common requirements and procedures. This effort will focus on DOD and Service Independent Logistics Assessments (ILA), Material Fielding Requirements (MFR), and equipment maintenance. The Chemical Biological Medical Systems (CBMS) Joint Project Management Office (JPMO) achieved an early success in this area with the Joint Biological Agent Identification and Diagnostic System (JBAIDS). JBAIDS will use a single medical logistics provider, the U.S. Army Medical Materiel Agency (USAMMA), to kit and field the JBAIDS and its associated support equipment to all Services. USAMMA will manage configuration control and, with the JBAIDS Product Manager, will co-chair the JBAIDS Logistics Integrated Process Team (IPT). The JBAIDS IPT also achieved Service consensus on the use of a single depot-level maintenance strategy—contractor logistics support via the original equipment manufacturer.

3.2.2.2 Individual Protection Equipment Strategic Inventory Manager (IPE SIM).In an effort to better perform its responsibilities as the Total Life Cycle Systems Manager, the JPMO-IP is examining various alternatives to the current Service management of IPE. The goal of this Performance Based Logistics (PBL) initiative is to identify business processes which may streamline the supply chain through further standardization and integration of DOD inventory management under a single organization. Possible outcomes of such initiative could alleviate Service competition for limited stocks, improve stock rotation and utilization, and it is also expected to improved life cycle inventory and industrial base management for the improvement of readiness and support to the warfighter. The initiative is investigating the feasibility of the following alternatives:

(1) Continue to improve current Service management initiatives (Baseline);

(2) Designate a single service manager to manage operational IPE (sets 3 and 4) on behalf of the other services;

(3) Assign to DLA. DLA could be designated to procure, store and manage operational IPE inventories in support of the military services. This would leverage DLA's mission to provide

logistics support to the warfighter and its world-wide state-of the art distribution and storage system; and,

(4) Assign inventory management to JPMO-IP with either DLA or 3PL providing the storage capability. This alternative would have a joint office manage operational IPE.

This feasibility study will address issues identified by the Government Accountability Office. ***Figure 3-3*** illustrates how the concept may be enabled by on going DOD and Service asset visibility and total life cycle management initiatives including those associated with Automated Identification Technology (AIT)/Radio Frequency Identification Device (RFID)/Unique Identifier Device (UID), the Joint Acquisition CBRN Knowledge System (JACKS), the DOD/FDA Shelf Life Extension Program (SLEP), and JPEO-CBD Joint Total Asset Visibility Reporting Warehouse (JTAVRW).

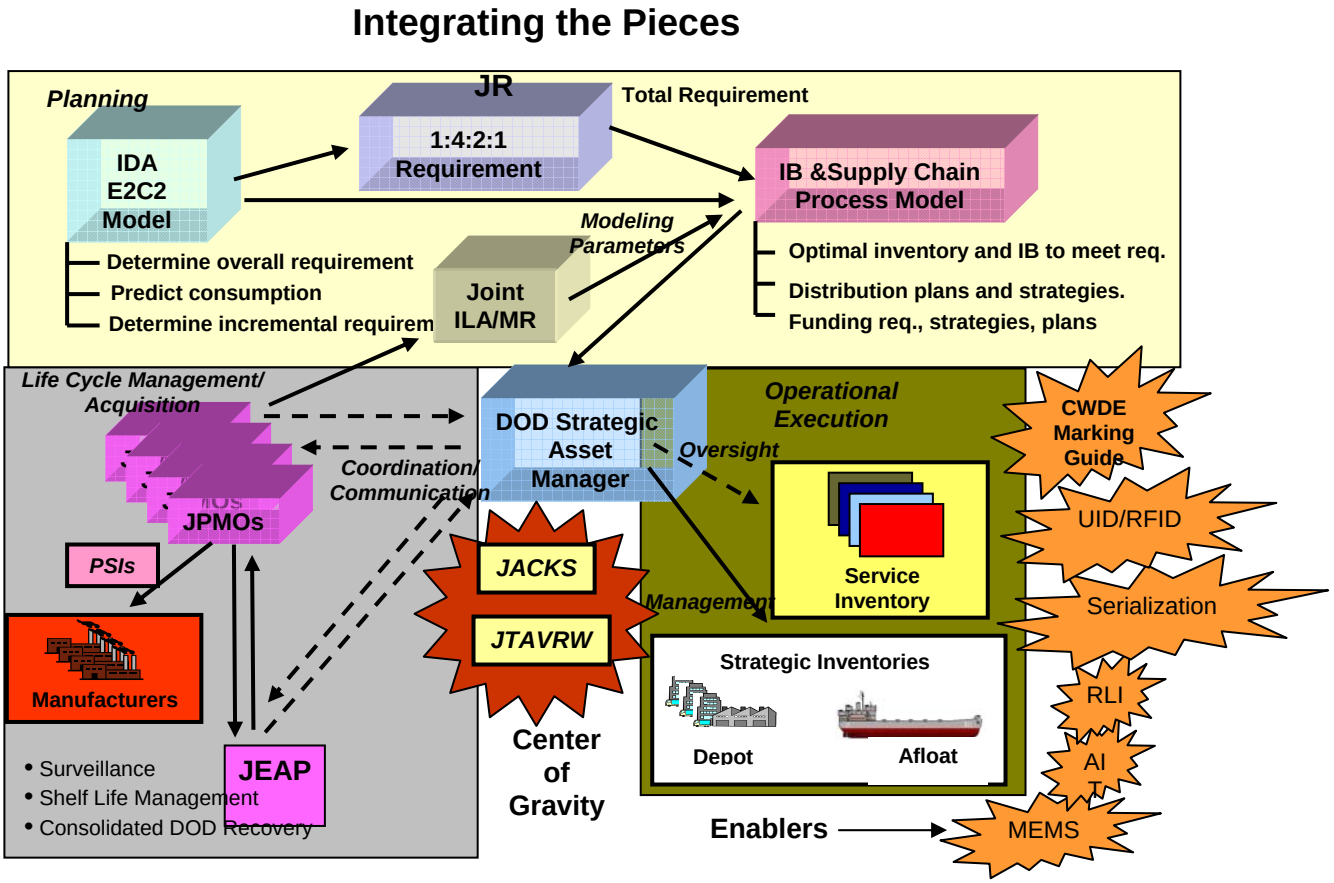


Figure 3-3 Integrating Warfighter requirements with TLCSM processes

3.2.2.3 <u>Joint Equipment Assessment Program (JEAP)</u>. The Joint Equipment Assessment Program (JEAP) is a centrally managed program at the Marine Corps Logistics Base (MCLB), Albany Georgia. It is composed of Joint Equipment Assessment Units (JEAUs) that work with all Services in conducting assessments of NBCD equipment. The JEAP supports DLA, Defense Supply Center Philadelphia (DSCP), Defense Reutilization and Marketing Service (DRMS), and all Services.

The responsibilities of the JEAP include:

- Manage shelf-life of DOD CBRN assets, not including Class VIII items (Medical Materials (excluding Pharmaceuticals)),
- Manage and execute toxic agent shelf-life extension testing of CBRN Defense assets, minus Class VIII assets
- Maintain and manage set-asides for shelf-life extension testing, as well as samples for lot produced during acquisition or follow on contractual buys, and pull samples from each wholesales DLA Defense Distribution Center (DDC) warehouse worldwide
- Conduct random cyclic evaluations of CBRN Defense assets at selected DLA depots annually
- Support operational requirements for the Navy's CBRN Defense assets, Readiness Improvement Program (RIP)
- Manage accountability of CBRN clothing assets turned in to the Defense Reutilization and Marketing Service (DRMS)
- Conduct Production Lot Level testing of CBRN Defense assets
- Monitor the Internet for unauthorized sales of CBD equipment

Shelf life extensions have resulted in prolonging the service life of millions of dollars of inventory annually. JEAP has also established a Memorandum of Agreement (MOA) with the Defense Reutilization and Marketing Service (DRMS) to segregate CBRN items turned in to Defense Reutilization and Marketing Offices (DRMO) suitable for issue as "Training Only". The JEAP indelibly marks them and fills requests for training items submitted by various authorized DOD agencies, presenting additional cost savings.

3.2.2.4 Joint Logistics Advisory Council (JLAC) Maintenance Integrated Product Team (IPT). The JLAC Maintenance IPT was created to investigate areas in which the current multi-Service maintenance concept could be changed to a joint structure in order to more effectively use scarce Government resources. The IPT decided to focus on contamination avoidance issues in exploring ways to better provide repair service to the Warfighter. Currently, each of the military services has its own requirements and processes to ensure that: (1) the acquisition products can be effectively supported during the acquisition process, (2) that it can be adequately supported throughout its service life, and (3) govern the process of deploying and transferring systems or equipment from the acquisition organization to the user. These individual service approaches do not support the Joint acquisition of chemical defense equipment (CDE). These separate approaches have redundancies resulting in unnecessary expenditures of resources. The scope of this effort will focus on DOD and Service Independent Logistics Assessments (ILA) and Material Fielding Requirements (MFR) processes that pertain to CDE. The objective of this effort is to develop a Joint Pre-Milestone Logistics and Supportability Assessment for CDE that will standardize and streamline common requirements and procedures to create a single set of Joint ILA and MFR requirements and procedures to be followed by all services as approved by the JPEO-CBD. This is done in coordination with the Joint MFR processes described in section 3.2.2.1 above.

3.2.2.5 Unique Identification (UID). JPEO-CBD is developing a Capstone Implementation Plan for Unique Identification (UID) of Tangible Property and Property in the Possession of Contractors in response to the requirements of the Acting Under Secretary of Defense, Acquisition, Technology and Logistics Memorandum: *Policy for Unique Identification of*

Tangible Items dated July 29, 2003. This Capstone Implementation Plan outlines the CBD commodity wide approach and provides guidance along with measurable objectives necessary to implement UID by the end of calendar year 2010. The plan maximizes the utilization of AIT to enable automated data collection of items marked with a Unique Item Identifier, providing globally unique and unambiguous identification of assets from Government acceptance to item termination.

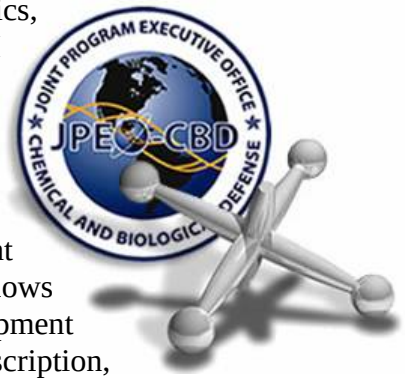
One of the DOD goals in adopting this technology is to achieve a higher degree of interoperability with commercial partners in the supply chain. UID and RFID will be integrated into all acquisition and asset management processes that meet the requirement criteria. UID and RFID shall be included as mandatory elements in the formal acquisition documentation for all programs.

3.2.3 CBRN Decision Support and Logistics Information Technology Tools

The ability to understand the issues and provide solutions for the Joint CBD program depends on key information at specific points of the program's life cycle. Collecting, analyzing, and acting upon this information is critical to the implementation of the Business Process Improvements discussed earlier in this chapter. The JPEO-CBD is taking significant steps in this critical area which will be discussed in detail on this section.

Major information technology initiatives already established include the JACKS, JTAVRW system, Joint Equipment Assessment Program (JEAP), AIT, the DOD/FDA SLEP, and Service specific inventory management programs. The Government Accountability Office (GAO) report 04-334 titled: "Chemical and Biological Defense DOD Needs to Reduce Protective Ensemble Operational Risk," recommended, *"...implement a joint, integrated inventory management system that will allow the Department to develop better data, including the number, location, and serviceability of ensemble components."* DOD concurred with the recommendation and directed the JPEO-CBD to implement a solution which resulted in the JPEO-CBD developing and implementing the JTAVRW.

3.2.3.1 Joint Acquisition Knowledge System (JACKS). JACKS provides an all-service single entry point to CBRN Defense equipment characteristics, capabilities, and acquisition information, minus Class VIII assets. JACKS is not a database system but rather a "portal" to access reliable and timely data harvested from other official logistics and capabilities systems. JACKS, as are all the information technology tools described here, is a secure site.



JACKS provided authorized users access to CBRN equipment advisory messages, training links, and contact information. It allows the user to search and display information about CBRN equipment including name, part number, and/or category, NSN/NIIN, description, cage locations and service specific management instructions as well as packaging, freight, and other critical logistics details. JACKS does not contain medical shelf life information, however, as the Food and Drug Administration (FDA) imposes its own stringent requirements on medical materiel management. Medical shelf life data can be obtained through the Shelf Life Extension Program (SLEP) system (see section 3.2.3.3).

3.2.3.2 Joint Total Asset Visibility Reporting Warehouse (JTAVRW). Currently, each Service maintains its own specific CBD inventory and tracking systems. JTAVRW is the joint repository of an initial inventory and tracking for eleven Chemical Defense Equipment Go-to-War items (CDE GTW) outlined in ***Table 3-1***, and will expand to include additional items in the future.

Table 3-1 CDE Go-to-War Items in JTAVRW

IPE	AF	Army	Navy	USMC	DLA
M291 Skin Decontamination Kit	X	X	X	X	X
M295 Decontamination Kit	X	X	X	n/a	X
M256A1 Chem Agent Detector Kit	n/a	X	X	X	X
M8 Detection Paper	X	X	X	X	X
M9 Detection Paper	X	X	X	X	X
M40/M45 Hoods	MCU2/P	X	X	X	X
C2A1 Filter Canister	X	X	X	X	X
Helmet Cover	n/a	X	n/a	n/a	X
Gloves	X	X	X	X	X
Boots	X	X	X	X	X
Overgarments	X	X	X	X	X

JTAVRW is a web-based capability to automatically accept inventory data from each independent Service system to support the requirement for CBD asset visibility across DOD and to provide information to reports such as this and the Joint Logistics Support Plan. The process and responsibilities for collecting, maintaining and managing the data in the JTAVRW are currently being established through the JLAC-CBD. Access to the data available is controlled by each Service. ***Figure 3-4*** represents the JTAVRW architecture.

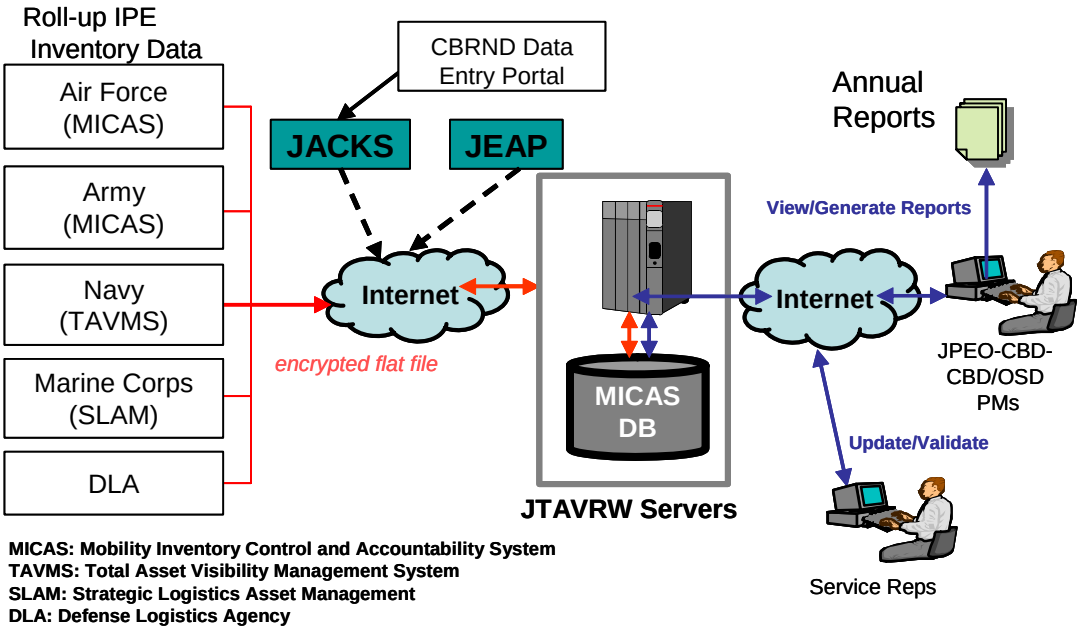


Figure 3-4 JTAVRW Architecture

3.2.3.3 <u>DOD/FDA Shelf Life Extension Program (SLEP)</u>. The DOD/FDA Shelf Life Extension Program was established in 1986 between the Services and the FDA. The program has now expanded to include the Strategic National stockpile and the VA Emergency Preparedness Stockpile. The program is limited to stockpiles of Class VIII materiel that have been stored in accordance with the manufacturer's specifications. The Defense Medical Standardization Board (DMSB) administers the program and is the interface between the participants and the FDA. The program is limited to CBRN medical materiel plus two anti-malaria medications. The participants in the program have an average cost avoidance of buying new materiel of $75.00 for each dollar spent on testing. The program is web based and all Services provide their on-hand inventories of CBRN materiel by lot number into the system. ***Figure 3-5*** illustrates its architecture.

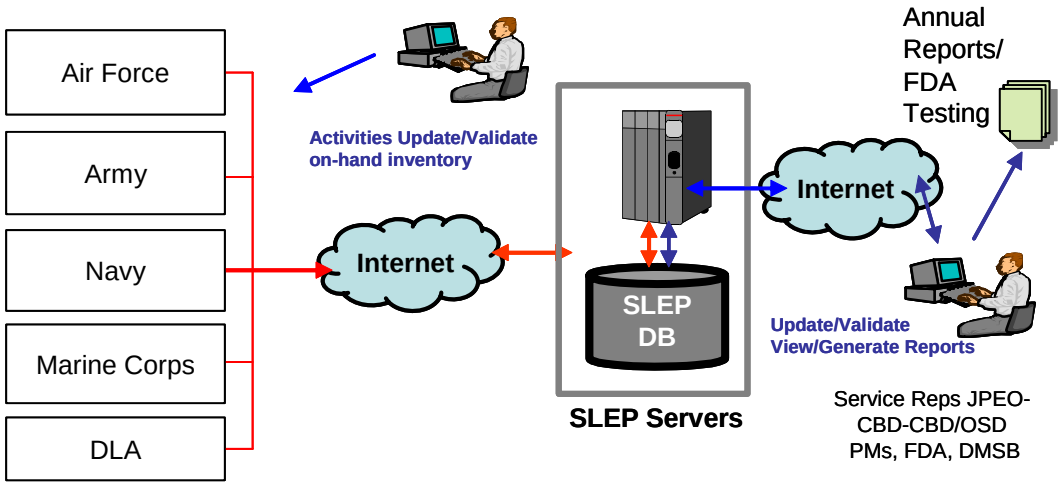


Figure 3-5 DOD/FDA Shelf Life Extension Program Architecture

3.2.3.4 Service Initiatives. The ***Army*** has improved its visibility through an initiative to standardize individual issue of eleven critical CBRN defense items across all major commands. Unit Status Reporting was implemented for units to report on-hand stocks vs. requirements on a monthly basis. In addition, plans are in place for consumable chemical defense equipment for all forces other than Force Package I and other early deploying units to be consolidated and centrally stored at Bluegrass Army Depot. This execution plan is managed by HQ AMC and will enable better visibility and rotation of CBRN defense consumable items. The Air Force has a similar program that consolidates stocks of CBRN defense items for deployment in support of contingency operations. These initiatives have also reduced surveillance costs and improved overall management of CBRN defense stocks.

The ***Marine Corps*** has been leading a Joint IPE Surveillance Technical Working Group, whose initiatives have been increasing cooperative efforts in surveillance and shelf life programs. The Marine Corps' Strategic Logistics Asset Management (SLAM) project geographically centralizes the Marine Corps' CBRN equipment in Consolidated Storage Facilities in which the stored equipment is managed by the NBC Defense Systems Manager who has total asset visibility through a web-based system

The ***Air Force*** has also deployed the Mobility Inventory Control and Accounting System (MICAS) and is similarly realizing the benefits of its comprehensive shelf life management system. MICAS is also being adopted by the Army.

The ***Navy*** is progressing well in standing up a web-based CBRD Total Asset Visibility Management System (CBRD TAVMS). CBRD Total Asset Visibility Management System currently provides rollup reports to JTAV Reporting Warehouse quarterly and supports the Navy's centralized CBD equipment management approach. Ashore and afloat installations and upgrades to the web-based unit level asset management system are ongoing. Navy anticipates all users will use the web version for next year's CBD inventory reporting. All individual protective equipment items are bar-coded using DOD mandated UID bar-coding technology. The majority of this equipment is kitted to the individual sailors and the barcode technology facilitates data capture and asset tracking using the web-based or browser-based (standalone) versions of CBRD TAVMS currently in place.

3.2.3.5 Industrial Base Decision Support Tool (IBDST). Another major JPEO-CBD initiative is the Industrial Base Decision Support Tool (IBDST), which will provide the user the capability to analyze the production base that supports the procurement of CB defense assets. The decision support tool being developed will provide an analytical overview of the capability of the Industrial Base to meet force construct requirements and identify potential chokepoints and problem production areas. The IBDST is based on a successful Commercial-Off-The Shelf (COTS) industrial base model used in the ammunition commodity area. This tool is described in more detail in section 3.7.4.

3.3 QUANTITIES, CHARACTERISTICS, AND CAPABILITIES

The results of the data collection efforts are compiled in ***Tables H-1*** through ***H-5*** in ***Annex H***, CBRN Defense Logistics Readiness Data. Tables are included for each of the four Services and the DLA.

3.4 LOGISTICS STATUS

During collection of FY05 data, information on the inventory status of more than 150 CBRN defense equipment items was compiled. The quantities discussed here and provided in ***Annex H*** should be viewed as a snapshot of inventory as of 30 September 2005. Inventory data are also complicated because once certain equipment items are issued, although in possession of a deployed warfighter, they are considered expended and are not counted as on-hand inventory.

CBRN defense items such as spare parts and sub-components were considered a subset of the primary item, and were not reviewed separately. Batteries for critical systems are listed for informational purposes. Inventory tracking for batteries is difficult because of a lack of visibility and because they typically have other applications. Trainers were not included, since they do not reflect wartime service requirements. Characteristics and capabilities of selected CBRN defense items are discussed in detail in ***Annexes A–G*** of this report.

The risk assessments associated with on-hand inventory of critical items compared with their requirements are normally performed according to the accepted methodology defined in the "RISK ASSESSMENT" box.

RISK ASSESSMENT

Low –	Services have at least 85 percent of wartime requirement on-hand to support requirements
Moderate –	Services have between 70 to 84 percent of wartime requirement on-hand to support requirements
High –	Services have less than 70 percent of wartime requirement on-hand to support requirements

Risk assessments are not provided at this time pending the validation of requirements. However, some general observations are highlighted as follows:

- Fabric (carbon beads) for JSLIST suits previously had been identified as a long lead item. This is no longer the case as the Department has made significant progress both in inventory levels and increasing the number of suppliers in certain critical components of the ensemble. There are now three sources of carbon beads that can supply all projected demands by the cut and sew industrial base. With twice the carbon bead capacity now available compared to 2003, this eliminated the carbon bead availability issue and although just beginning, we now also have a limited domestic source of the carbon beads. Multiple suppliers fully mitigate the risk of foreign supply interruption and the ability of the industrial base to execute surge plans. Full-scale production for the carbon bead domestic source is expected to be available in the January through March 2006 (production ramp up period).
- The Air Force is relying on the CWU 66/77P to provide a protective aircrew ensemble. It replaces the now obsolete Chemical Protective Undercoverall. Continued planned procurements should mitigate risks in the short term. The Air Force will continue to use the CWU66/77P until Increment II of the Joint Protective Aircrew Ensemble (JPACE), is fielded in FY12.

- The collective protection (COLPRO) area continues to be assessed as high risk, in part due to the continued emphasis on contamination avoidance and individual protection, which overshadows this area. The logistics burdens and costs associated with fielded COLPRO systems have precluded widespread fielding. As the procurement cycle in contamination avoidance and individual protection matures, and less logistics intensive COLPRO is developed, the risk assessment of COLPRO systems will lessen.
- The stores of DS2 held at Seneca Depot were declared obsolete in 2004 so the Services now rely on other bulk decontaminants and applicators, such as Sorbent Decon and Calcium Hypochlorite, while follow-on decontamination solutions are being developed.
- The status of M291 Skin Decontaminating Kit has improved. Present inventory and planned procurements along with improved organic manufacturing capabilities should keep this risk low. Production of M295 Individual Equipment Decon Kit has improved. Reactive Skin Decon Lotion (RSDL) is scheduled to replace the M291 kit for immediate skin decontamination with a FY10 IOC. Three packets of RSDL will perform the same mission as six packets (one kit) of M291s.
- Medical chemical defense materiel remains generally in low risk. Shortages of 2-PAM autoinjectors will be eliminated through fielding of the Antidote Treatment Nerve Agent Autoinjector (ATNAA). The MARK 1 kit (one atropine and one 2-PAM autoinjector) is being phased out over the next five years. It is being replaced with one autoinjector, ATNAA, which contains both the atropine and 2-pam chloride.
- To meet JVAP requirements, the prime systems contractor (DynPort Vaccine Company) and its subcontractors have retrieved data, files, microbial stocks, and experimental lots of biological defense vaccines produced over the last 10–30 years from government laboratories and contractors in order to conduct an assessment of the suitability of these products for contingency/emergency use. A thorough and ongoing review of this information in the light of current FDA requirements for use under a contingency/ emergency use scenario has been completed. Recommended expanded testing and maintenance requirements are now being evaluated for implementation in order to make these products available for contingency/emergency use to reduce the risk of not meeting wartime requirements. This risk of not meeting wartime requirements is still high but with expanded testing and maintenance over the next year could be reduced to a low to moderate risk.

In general, the Services continue to exhibit shortages in certain critical areas. Shortages exist for CB agent detection systems, collective protection shelters and their respective filters, and biological warfare vaccines. These shortages may have a serious impact on the Joint force's ability to survive and sustain combat operations under CBRN hazard conditions in all of the operational scenarios of the 1-4-2-1 construct. The potential operational impact of CBRN defense equipment shortages is under review.

3.5 PEACETIME REQUIREMENTS

In peacetime, quantities of CBRN defense equipment are necessary to train personnel in CBRN defense and to build confidence among our warfighters that CBRN equipment will provide the necessary protection when used correctly. The two most critical areas of peacetime stocks are individual protective equipment and medical chemical defense materiel. The Services have indicated that adequate CBRN defense equipment is on-hand to conduct training.

Generally, items used in peacetime for training are drawn from retail stocks, requiring units to maintain both training and contingency stocks. For selected items, such as protective clothing, contingency utility is lost when the item is used (or consumed) for training. Because peacetime training requirements are met in this manner, major commands are inconsistent in their accountability and tracking of training equipment and in their estimates of on-hand assets. Requirements or applicability for use in homeland security have not been determined or validated, however the difference between peacetime and wartime requirements is expected to be less distinct when supporting the global war on terror Homeland Defense/Homeland Security missions. Currently, each of the services has a mixed approach to the use of CBRN defense equipment intended for warfighters during peacetime. Until such time as requirements are defined these types of assets will not be a part of the logistics status report.

3.6 FUNDING

In accordance with statutory requirements (50 USC 1522), funding of RDT&E and procurement is centralized in a DOD defense-wide account. Operations and sustainment (O&S) funding for CB defense materiel is not consolidated at the DOD level. Therefore, for secondary items (*e.g.*, consumables such as decontamination kits, detection kits, and filters), each Service continues to separately fund replenishment and sustainment of CB defense equipment. Depot maintenance and contractor logistics support for some low density major items are also O&S funded. These appropriations are not included in the joint CB defense program.

Funding of CB defense items categorized as war reserves secondary items (WRSI) remains a significant issue. The Services are responsible for developing the requirements and funding items in war reserve stocks. (As noted in section 3.2, Navy Afloat Forces do not maintain War Reserves Secondary Items). Funding of WRSI comes from Congressional appropriations made into the Working Capital Fund from the transfer of Services' O&S funds. For example, replenishment of CB defense items in Army war reserves will require substantial funding through 2006 as some items reach their maximum extended shelf lives and require replacement. The recent plus-up of funds for protective suits is assisting in building an initial stockage and minimum sustainment (war reserve) stock to meet the current guidance.

Under current acquisition procedures and DOD guidance to minimize wholesale stockpiles, procurements are based only on funded Service requisitions. The Services remain responsible for program funding to replace CB defense equipment wartime stocks. Procurement is usually based on economic buy quantities (a consolidation of all Service requisitions) to provide the best value to the government. Some procurements, however, suffer significant delays in delivery because of the time required to accumulate sufficient requisitions to produce economic buy quantities. This situation occurs when item managers try to plan purchases of consumable items that have a low peacetime consumption but high wartime consumption (such as decontamination kits, large collective protection filters and M256A1 detector kits). The result is a low purchasing history with a small industry production capability, which in turn causes a very low war reserve status with minimal industry surge capability.

3.7 INDUSTRIAL BASE

The CB defense industrial base is characterized as small niche defense centric sectors embedded in larger commercially dominant industries such as materials, textiles, pharmaceuticals and electronic equipment. This industrial base was robust during the Cold-War era and supported a large number of producers.

With the end of the Cold War, excess inventory of CB defense items coupled with evolving and ill-defined threats, and declining budgets led to lower demand for products from the CB Industrial base. Mergers and acquisitions have further reduced the number of firms participating in current defense production.

Since the late 1990s, and especially since the events of September 11, 2001, demand has grown intermittently for CB defense products. The increased demand is a function of ongoing operations such as Operation Enduring Freedom and Operation Iraqi Freedom, DOD's increased emphasis on homeland defense for DOD installations and units, and the threat to homeland security. Another factor driving up demand is the shelf life expiration of inventories built-up during the 1980s such as chemical suits and masks. The decreased number of firms in the sector has reduced competition, but the remaining firms appear to have stabilized. While the current sector is stable, vulnerabilities still exist, particularly in collective protection.

The current global political climate coupled with the threat to homeland security is affecting the CB industrial base. Some firms with only commercial experience in producing related products are now attempting to enter the DOD market. Other firms with a long history of producing CB defense items for DOD are now attempting to market products to local and state governments, foreign military, the Department of Homeland Security, as well as to the commercial sector. The potential markets for DOD, foreign military, the Department of Homeland Security, state and local governments and direct sales to concerned citizens have attracted many firms. With the lure of increased demand, some firms without any history or expertise are making inquiries into how they can enter this market. The result is an industrial base in transition.

The industrial base currently ranges from small to large firms set in small subsectors of larger commercial industries but is adjusting to new buyers and increased demand. The sub-sectors of detection and individual protection (IP) should benefit in the long term from a more robust industrial base as new firms enter the market and older firms expand sales to civil agencies. These two sub-sectors are aligned with new demands from the new markets. The challenge to DOD is to work with the testing community to validate commercial product performance so that fielding decisions can be based on high-confidence government test data rather than on manufacturer-provided data. Many of the firms in sub-sectors other than detection and individual protection are still dependent on Service demands and sales for their financial survival. Collective protection systems (filters in particular) continue to be the most critical sub-sector in the CB defense area. Additionally, protective clothing procurement continues to receive intense scrutiny due to the possibility of industrial base shortfalls in satisfying requirements during a contingency.

Strategies in the medical sector work to circumvent these trends. The Chemical Biological Medical Systems (CBMS) Joint Project Management Office (JPMO) acquisition strategy for chemical-biological defense vaccines, therapeutics, and diagnostics is to buy

commercially available U.S. Food and Drug Administration (FDA) licensed medical products. The CBMS develops products for the DOD or co-develops medical products with allied nations or other government agencies. Medical chemical-biological development efforts are conducted through contracts with the medical industrial base. The CBMS prime systems contractor for vaccine development has had no difficulty in finding industry partners to achieve CBMS product development goals. Developmental programs for drugs and medical devices have also received multiple responses to requests for information and proposals indicating that sufficient industrial base exists to support the CBMS mission. The major issue in the pharmaceutical industry is concerns of legal liability over possible future side effects of the current generation of vaccines and medicines. Legal issues and limited profitability keep many major pharmaceutical companies from producing for the defense market.

Operation Enduring Freedom and Operation Iraqi Freedom are testing the capacity of the CBRN industrial base. The limitations of the industrial base are due in part to lowered DOD procurements in the ten years leading up to the Global War on Terror (GWOT) and Operation Enduring Freedom. The limited procurements are due to low peacetime demand and budget restrictions. Also contributing to this problem is the inability of DOD agencies to commit to long-term contracts with CBRN defense firms. In recognition of the potential effect on preparedness, an Annual Report to Congress CB Defense Industrial Base Working Group has been convening under the auspices of the JLAC to review recent industrial base studies and reports, and to identify ongoing and emerging industrial base issues that will be presented in this and subsequent reports. Examples of some of the industrial base management issues identified and discussed by the Working Group follow.

3.7.1 Diminishing Manufacturing Sources and Material Shortages (DMSMS)

DMSMS is the loss or impending loss of manufacturing or production sources, or suppliers of components, end items, and/or raw materials. The goal of DMSMS is to provide a comprehensive and coordinated program that supports efficient and effective resolutions of obsolescence/non-availability/single source issues. The Edgewood Chemical Biological Center (ECBC) has been tasked by the JPEO-CBD to establish, coordinate and implement a joint DMSMS Program to identify and mitigate obsolescence issues on CBRN systems.

DOD DMSMS efforts over the previous fifteen years have been focused on electronic issues. Within the last three years the role of the DOD DMSMS program has expanded to include non-electronic items. The Government-Industry Data Exchange Program (GIDEP) is a cooperative activity between government and industry that seeks to reduce or eliminate expenditures of resources by sharing technical information essential during the entire lifecycle of systems and equipment. The GIDEP is the primary database used within the DOD for obsolescence management and is designated as the DOD centralized database for managing and disseminating DMSMS information including “End-of-Life” notification issues.

DMSMS notices originate when a part manufacturer announces that a part or a production line will be discontinued. The majority of GIDEP DMSMS notices have been issued on piece-parts, especially in the electronics area; however, DMSMS also occurs at the module, component, equipment, or system level.

The CBRN DMSMS mission is to develop strategic policies and solutions to address parts obsolescence problems and reduce the impact of Diminishing Manufacturing Sources

(DMS) on CBRN programs. The CBRN DMSMS Program priority is to items identified by Critical Items Lists (CILs) developed and maintained by the U.S. Army Tank-Automotive and Armaments Command–Product Support Integration Directorate – Chemical Biological Defense (TACOM-PSID-CBD). The CIL tracks on-hand quantities, production, deliveries, demand and requirements for major CB defense items and secondary items. Item managers add remarks and status updates to the list, which is also forwarded to the JPEO-CBD. Managers use the list for asset management and production forecasting, and for facilitating action when JPEO-CBD assistance is needed to resolve issues. The goal is to achieve the best performance and readiness objectives, while reducing the overall operations and support cost. The ECBC DMSMS Program integrates research, development, engineering and manufacturing technologies to provide Acquisition Life Cycle Management sustainment from the synergy of logistics and technology that result in real time proactive solutions to system obsolescence and DMSMS.

Significant DMSMS Issues/Projects

M21 Remote Sensing Automatic Chemical Agent Alarm (RSCAAL). The M21 RSCAAL is an aging Legacy System that has experienced several DMSMS issues including a critical cryogenic cooler that supports the detection module for this system. The resulting system review/study resulted in the identification of 11 DMSMS cases, a review of the current supply support structure and a pending business case analysis for this system. The review/study of the M21 RSCAAL is still active with further research required to ensure system readiness through 2010.

M21 Remote Sensing Automatic Chemical Agent Alarm (RSCAAL) Depot Level Maintenance. The M21 RSCAAL has been experiencing extremely long depot level maintenance times. The Contractor Logistics Support Vendor has been unable to meet scheduled maintenance requirements for this system. The resulting system review identified four DOD Depot/Arsenal Activities that could potentially provide depot level maintenance support. A pending business case analysis for this system is being conducted to determine the road forward for future maintenance support of the M21 RSCAAL.

M17A3 Decontaminating Apparatus. The original manufacturer identified the control panel part as obsolete. Initially the TACOM (RI) Electronics Shop reverse engineered the module and became the sole source producer. The ECBC Industrial Base Team then researched and identified an electronics vendor as a valid source of supply for the control module.

ASZM-TEDA Carbon. Restriction of Potential Suppliers of Activated Charcoal. Coordinated research between personnel from RDECOM-ECBC, TACOM-PSID-CBD and TACOM-AC revealed that the current carbon detail specification, MIL-DTL-32101, as well as all carbon specification predecessors, were based on experience with carbon material obtained solely from a single vendor. This extensive database not only includes initial test results, but also historical information which documents the storage and operational performance characteristics of this product over time. The research resulted in a decision to restrict acquisition of MIL-DTL-32101 Carbon to the current validated product produced by the single vendor until additional standards can be defined which would allow the acquisition of carbon to be fully competitive.

M4A1 Mask Valve Leak Tester. Control Timer – The current manufacturer identified the part as obsolete and no longer produced. A substantial research effort identified a form, fit and function replacement timer as a valid source of supply for the timer control module.

DMSMS program objectives for FY 06 are:

- Define and document the joint DMSMS program, prescribe goals, identity procedures, establish objectives, for a comprehensive and coordinated program.
- Support the JPEO CBD in preparing the Chemical and Biological Defense Program (CBDP) Annual Report to Congress.
- Establish working relationship with the NBC Industry Group to support participation from industry in GIDEP.
- Draft the policies and guidance documents required for the joint DMSMS program.
- Establish and chair the JPEO-CBD joint DMSMS Working Group.
- Serve as the JPEO-CBD DMSMS representative to the DOD and other Services level.
- Promote DMSMS program awareness through the use of publications, periodicals, reports, briefings, etc.

3.7.2 Maintenance of a Warm Industrial Base

Commercial industries, and particularly small businesses, have difficulty handling the fluctuations in production necessitated by wartime demands when peacetime demand is low or non-existent. Once industry surges production to support a period of high demand, DOD is challenged to maintain the industrial capability after DOD requirements drop to typical low peacetime levels. Industrial production surge capability may also be limited by the supply of critical components with long lead times. Intervention is sometimes required to maintain an active production capability, or warm industrial base. CB defense items for which peacetime demand is often inadequate to maintain the industrial base include chemical protective suits and gloves, and nerve agent antidote auto-injectors.

DLA's Warstoppers program, mandated by law (HR 102-311), recognizes that preparedness measures must be taken for certain supply items, and that critical industrial capability must be preserved to support DOD's readiness and sustainment requirements. The Warstoppers program supports the Services' go-to-war estimated requirements and maintains sole-sources of supply for go-to-war surge. Among the industrial preparedness measures leveraged by Warstoppers to maintain critical industry capabilities are:

Industrial Base Maintenance Contracts (IBMCs): IBMCs preserve an essential manufacturing capability for the future by continuing to fund production of such items even if there is not a current demand for the item. Maintenance Contracts may also fund the sustainment of a manufacturing infrastructure to ensure viability of a production line. Examples are the IBMCs to help a sole source production facility achieve FDA certification and maintain production of nerve agent antidote injectors, and to maintain production of chemical protective gloves. IBMCs can help maintain the minimum sustaining rates that a manufacturer is willing to allow to keep a production line warm, thereby avoiding ramp up time and costly start up charges associated with a cold industrial base.

Eliminating Constraints to Surge: Quantities of critical items (raw material) may be bought in advance of an anticipated demand to reduce the surge burden on the industrial base and to meet contingency requirements in a more timely fashion. A related effective strategy is the purchase of long lead-time components, for instance long-lead-time subcomponents for the ATNAA dual chamber autoinjector, and chemical protective suit liner material essential to JSLIST suit production. Another typical industrial measure is to provide equipment that increase throughput capacity.

Warstoppers has demonstrated effectiveness in the CB defense sector by preserving production of nerve agent antidotes, protective suits, and gloves. However, the Warstoppers program also supports industrial base maintenance measures in other defense sectors; therefore CB defense efforts must compete for funds by seeking out and implementing best practice industrial practices that have a positive return on investment and better support the warfighter.

3.7.3 2005 Base Closure and Realignment (BRAC) Effect on CB Industrial Base

The 2005 Defense Base Closure and Realignment Commission recommendations were passed into law 9 November 2005. The 2005 BRAC continued to focus on current and future mission capabilities and attempts to move towards Joint warfighting. In regard to the industrial and depot functions the BRAC commission comments:

> *"Scaling back depots and industrial functions reduces the capacity to rapidly increase outputs and could lead to an unacceptable risk of single-point failures in our nation's capacity to repair and/or modify certain critical weapons systems and platforms. Under the 20-year Force Structure Plan, many major weapons systems and platforms are projected to remain in service for decades."*

The BRAC Commission did not accept the Secretary of Defense's recommendation to realign chemical-biological defense activities at (1) Naval Surface Warfare Center, Crane, Indiana, (2) Naval Surface Warfare Center, Dahlgren, Virginia, and (3) Tyndall Air Force Base, Florida, to Aberdeen Proving Ground, Maryland. They decided the realignment *"would not enhance DOD's chemical-biological defense research, development and acquisition activities at Aberdeen Proving Ground, but would instead degrade engineering and logistics support to chemical-biological defense equipment at operational units."* This BRAC did not affect major organic manufacturing sites for CB equipment such as Pine Bluff Arsenal, Arkansas. However, several key realignments will affect the CB industrial base. Many inventory management processes, including the Integrated Materiel Management Technical Support Inventory Control Point functions for consumable items, were reestablished as Defense Logistics Agency (DLA) Inventory Control Point functions and relocated to Defense Supply Centers in Columbus, Ohio, Philadelphia, Pennsylvania, Richmond, Virginia, and Fort Belvoir, Virginia. This "Depot-Level Repairable Procurement Management Consolidation" will streamline inventory and logistics support efforts for many consumable items.

BRAC actions must be initiated within two years and completed within six. Specific implementation plans are under review. The final, complete report can be found at: http://www.brac.gov/docs/final/BRACReportcomplete.pdf. The Industrial Base Working Group will continue to track the effects of the BRAC process in regards to the shape and scale of the industrial base.

The major BRAC selection criteria impacting the industrial base and organic capabilities are:

- *Selection criteria 1. The current and future mission capabilities and the impact on operational readiness of the total force of the Department of Defense, including the impact on joint warfighting, training, and readiness.*
- *Selection criteria 3. The ability to accommodate contingency, mobilization, surge, and future total force requirements at both existing and potential receiving locations to support operations and training.*

Following are approved BRAC decisions with potential impact on the Chemical Biological industrial base:

- Realign Rock Island Arsenal (RIA), IL, by relocating the depot maintenance of Combat Vehicles and Other to Anniston Army Depot, AL, and the depot maintenance of Other Equipment and Tactical Vehicles to Letterkenny Army Depot, PA.
- Realign RIA, IL, as follows: relocate the Budget/Funding, Contracting, Cataloging, Requisition Processing, Customer Services, Item Management, Stock Control, Weapon System Secondary Item Support, Requirements Determination, and Integrated Materiel Management Technical Support Inventory Control Point functions for Consumable Items to Defense Supply Center Columbus, OH, and reestablish them as DLA Inventory Control Point functions; relocate the procurement management and related support functions for depot-level repairables to Detroit Arsenal, MI, and designate them as Defense Supply Center Columbus, OH, Inventory Control Point functions; and relocate the remaining integrated materiel management, user, and related support functions to Detroit Arsenal, MI.
- Close Riverbank Army Ammunition Plant, CA. Relocate the artillery cartridge case metal parts functions to RIA, IL.
- Realign Naval Weapons Station Seal Beach, CA, as follows: relocate the depot maintenance of Electronic Components(Non-Airborne), Fire Control Systems and Components, Radar, and Radio to Tobyhanna Army Depot, PA; relocate the depot maintenance of Material Handling to Marine Corps Logistics Base Albany, GA; and relocate the depot maintenance of Other Components to Anniston Army Depot, AL.
- Realign Watervliet Arsenal, NY, by disestablishing all capabilities for Other Field Artillery Components.
- Close Lone Star Army Ammunition Plant (AAP), TX. Relocate the Storage and Demilitarization functions to McAlester AAP, OK. Relocate the 105MM and 155MM ICM Artillery, MLRS Artillery, Hand Grenades, 60MM and 81MM Mortars functions to Milan AAP, TN. Relocate Mines and Detonators/Relays/Delays functions to Iowa AAP, IA. Relocate Demolition Charges functions to Crane Army Ammunition Activity (AAA), IN.

3.7.4 Industrial Base Decision Support Tool (IB DST)

The Chemical Biological Industrial Base Decision Support Tool (CB IBDST) will assess the industrial base for chemical and biological equipment. A contract was awarded in September 2005 to develop the tool. Phase I of the effort will include the 54 “critical” CB items

currently in the IB Information System. This phase will input information from the annual Equipment Data Call to the Services and assess the DOD databases which will provide automated inventory in the future. Databases will include the Joint Total Asset Visibility Reporting Warehouse (JTAVRW), Joint Acquisition CBRN Knowledge System (JACKS), Federal Logistics Information System, and the CBRN Shelf-Life Information System among several others. The system will also link to supplier capability information. The program will be a web-based enterprise program accommodating multiple simultaneous users. Operational functionality will include the ability to run on demand and analyze the industrial base that supports the maintenance, support, and production of chemical biological assets through the use of built-in simulation tools. Production base calculations will have the ability to identify potential chokepoints and problem areas against various scenarios. The program will produce formatted report output that provides critical information pertaining to the industrial base in an aesthetic, graphical manner. This output will be structured in consonance with the JPEO-CBD so that it can directly support the Joint Logistics Support Plan, and the Chemical Biological Annual Report to Congress.

3.7.5 Industrial Base Outreach Efforts

Industrial Base outreach efforts are a way to expand or obtain new subject matter, latest technologies, and CB equipment across the commercial sector. The Chemical and Biological Defense Program (CBDP) relies on multiple methods and venues to leverage industry to meet program requirements. These include, but are not limited to, the following:

- Small Business Innovative Research (SBIR)
- Small Business Technology Transfer (STTR)
- Broad Agency Announcements (BAAs)
- Sources Sought Announcements
- Requests For Quotations (RFQs)
- Request For Information (RFI)
- Requests For Proposals (RFPs)
- Technology Transfer (to include Cooperative Research and Development Agreements (CRADAs))
- Conferences, Symposia, Events, and Working Groups

The single government source for government procurement opportunities over $25,000 is the Federal Business Opportunities (FedBizOpps) website http://www.fedbizopps.gov/. Current listings for many of the above listed CBDP opportunities may be found on this website.

Below are selected descriptions of current leveraging mechanisms

3.7.5.1 Small Business Innovative Research (SBIR). The CBD SBIR program is used to elicit innovative solutions from the small business community that address chemical and biological defense technology gaps confronting DOD and to include technologies that will also have high commercialization potential in the private sector. SBIR topics are developed in each of the following capability areas to address both chemical and biological threats: detection; protection (individual and collective); decontamination; modeling & simulation; and threat agent science. Additionally, specific program areas include chemical and biological defense medical technologies that address pre-treatments; therapeutics; and diagnostics.

The Defense Threat Reduction Agency (DTRA), Chemical and Biological Defense Directorate, provides technical and programmatic oversight to SBIR topic generation in addition to proposal evaluation and selection. The Army Research Office-Washington (ARO-W) administers the day-to-day administrative activities of the CBD SBIR program and is responsible for the operation of the CBD SBIR Program Management Office.

CBD-related SBIR opportunities are posted on a number of websites, to include the following:

- DOD SBIR (http://www.acq.osd.mil/sadbu/sbir/)
- Defense Advanced Research Projects Agency (DARPA) SBIR (http://www.darpa.mil/sbir/)
- Air Force Research Laboratory (AFRL) SBIR (http://www.afrl.af.mil/bc_sbir.asp)

3.7.5.2 Broad Agency Announcements (BAAs). A BAA is intended to solicit research ideas, and is issued under the provisions of the Competition in Contracting Act of 1984 (Public Law 98-369), as implemented in the Federal Acquisition Regulations. Research proposals are sought from educational institutions, nonprofit organizations and private industry. BAAs are general in nature and identify areas of research interest, including criteria for selecting proposals, and soliciting the participation of all offerers capable of satisfying the government's needs.

Selected CBD-related BAA opportunities are posted on a number of websites, to include the following:

- United States Army Medical Research and Material Command (USAMRMC) BAA (http://www.usamraa.army.mil/pages/)
- Technical Support Working Group (TSWG) BAA (http://www.tswg.gov/tswg/baa/baainfo.htm)
- Army Research Laboratory (ARL) BAA (http://www.arl.army.mil/main/main/default.cfm?Action=6&Page=8)

3.7.5.3 Technology Transfer The Secretary of Defense issued a policy memorandum in June 1995 on technology transfer which outlined the scope of DOD technology transfer activities. In DOD, technology transfer activities encompass the following:

- Spin-off activities that demonstrate non-defense technologies, e.g., commercial viability of technologies already developed or presently being developed for national security purposes. The primary purpose of these activities, which encompasses much of what has been traditionally called "technology transfer," is to promote and make available existing DOD-owned or DOD -developed technologies and technical infrastructure to a broad spectrum of non-defense applications.
- Dual-use science and technology activities that develop technologies having both defense and non-defense applications.
- Spin-off promotion activities that demonstrate the national security utility of technologies developed outside the DOD.

CBD-related technology transfer opportunities are posted on a number of websites to include the following:

- DOD Technology Transfer Office (http://www.dtic.mil/techtransit/)

3.7.5.4 Conferences, Symposia, Events, and Working Groups Conferences, seminars, symposia, trade shows, and exhibits play a significant role in providing information on the latest technologies and policies and education the CB defense community. They keep the community prepared to meet the daily challenges of managing and executing programs. APBIs include details on the Joint Service mid- and long-range research, development, test, and evaluation (RDT&E) plans and programs, future production projections, and emerging military doctrine.

In the past year, organizations across the CB defense community hosted and attended various conferences and symposia in support of furthering the latest thinking, technologies, and policies shaping the community. Each year, the joint CB defense representatives, including the JPEO-CBD, JRO-CBRND, JSTO-CB, and T&E Executive, are encouraged to build a unified conference strategy that will pursue best value for those events that have common interest and are of primary importance to our mission.

Examples of conferences, symposia, and APBIs that are representative of the major CB defense program commodity areas include:

- Environmental Sampling for Bio Threat Agents
- 21st Annual Test & Evaluation Conference
- JPEO-CBD Advance Planning Briefing for Industry (APBI)
- CBDP T&E Executive Capabilities and Process Review
- Collective Protection Conference and Exhibits
- AUSA Annual Meeting & Exposition
- Science and Technology for Chem-Bio Information Systems (S&T CBIS) Conference
- Joint Service Scientific Conference on Chemical & Biological Defense Research
- Annual Combatant Commander (COCOM) CBRN Defense Conference
- USSOCOM CBRN Conference & Exhibition
- Decontamination Conference
- AUSA Winter Symposium
- Individual Protection Conference
- Special Forces Operations APBI
- World Wide Chemical Conference
- AUSA Medical Symposium
- Modern Day Marine Exposition

Details of selected APBI and Working Group efforts include:

- *The Advanced Planning Briefing to Industry (APBI)*
  The CBDP APBI is hosted by the National Defense Industry Association (NDIA) (http://www.ndia.org) and provides a forum for industry to receive briefings on business opportunities, upcoming acquisitions and information on existing technology pursuits.
- *The NBC Industry Group* (http://www.nbcindustrygroup.com/index.html)
  An industry association established to: provide information on nuclear, biological, and chemical (NBC) civil and military matters to the U.S. Armed Forces, other appropriate Government agencies of the United States and the general public;

improve understanding of the importance of NBC defense and its contribution to the ability of the United States to carry out its global responsibilities; and advance NBC information, technology and materiel for any purposes proper and lawful for the Association. Group meetings serve as a means to exchange information on current events in the area and discuss emerging trends and requirements. Meetings typically include invited speakers from key Congressional committees, the Office of the Secretary of Defense, the Military Services, or other agencies who have a role in NBC defense.

In addition to CB defense conferences attended by the Industrial Base, it is important to have knowledge of OCONUS events across the CB defense community. OCONUS events can be a vital part of the sustainment effort of CB programs and a source of commercial-off-the-shelf (COTS) technologies. ***Table 3-2*** highlights some of the relevant events in the past year:

Table 3-2 Selected OCONUS CBRN Events (CY05)

Date	Event	Location
8-13 Jan 2005	4th Indo-US Workshop on Mathematical Chemistry	Pune, Maharashtra (India)
13-16 Feb 2005	DECON Down Under	Melbourne, Australia
18-20 Feb 2005	CB Terrorism: Forging a Response Conference	Steyning, West Sussex (United Kingdom)
18-21 Mar 2005	IWA and Outdoor Classics	Nuremburg, Germany
29-31 Mar, 1 Apr 2005	NATO CBRN Symposium	Paris, France
9-16 May 2005	International Workshop of Defense CBRN Specialists	Czech Republic
21-23 Jun 2005	International Symposium on NBC Terrorism Defense	Choshi, Chiba (Japan)
10-13 Jul 2005	15th World Conference on Disaster Management	Toronto, Ontario (Canada)
15-17 Jul 2005	Is US Counter Terrorism Policy Working? Conference	Steyning, West Sussex (United Kingdom)
9-13 Oct 2005	51st Analytical Sciences and Spectroscopy (ICASS) International Conference	Quebec City, Quebec (Canada)

3.7.6 Impact of Project BioShield Legislation

The events of September and October 2001, made it very clear that terrorism, including bioterrorism, is a serious threat to the Nation. To encourage the development of new medical countermeasures against CBRN agents to treat the citizens of the United States, and to speed the delivery and use of new medical countermeasures in the time of an attack, President Bush, in his 2003 State of the Union address, proposed, and Congress subsequently enacted, the Project BioShield Act of 2004. The Project BioShield Act of 2004 created several mechanisms to help the Department of Health & Human Services (DHHS) address gaps in the medical countermeasures development pipeline, including broadening the commercial industrial base capability. These mechanisms include:

- Ensuring resources are available to DHHS to pay for next-generation medical countermeasures
- Expediting the conduct of National Institutes of Health (NIH) research and development on medical countermeasures based on the most promising recent scientific discoveries
- Giving the US Food and Drug Administration (FDA) the ability to make promising treatments quickly available in emergency situations.

Under BioShield, DHHS can encourage companies to partner with the government, and if they meet milestones and develop a licensable countermeasure, assure industry there will be money available to them for the purchase of that product. This relies on the ability of the Federal government to define its requirements accurately and assure that funds will be available to purchase critical countermeasures, regardless of the level of appropriations for the year in question.

A critical aspect of interagency coordination is DOD support for Project BioShield. The National Defense Authorization Act of 2004 (P.L. 108-136) includes provisions on how DOD interacts with DHHS with respect the BioShield. DOD's role in BioShield allows it to leverage DHHS resources for research, development, and procurement activities to achieve DOD requirements for medical countermeasures, particularly when DHHS and DOD requirements overlap. The DOD BioShield provisions are limited to the ability to contract for procurement up to five years in advance of product availability, an increase in simple acquisition thresholds, and direction allowing DOD to provide funds to DHHS to support BioShield efforts. This latter provision would facilitate DOD leveraging the more flexible BioShield Act acquisition provisions available to DHHS. Such an approach would have to be supported by an interagency agreement to ensure DOD requirements would be met through such an arrangement.

The first product that DOD may be able to transition to the DHHS under Project BioShield is the plasma derived bioscavenger. The DOD has awarded an initial contract for development through Phase I clinical trials. DHHS will review product performance at that time and in light of its requirements, consider whether it will fund further development or take the product to licensure using provisions of the BioShield Act .

Some of the medical countermeasures being developed through DHHS for the Strategic National Stockpile have their technology basis in programs which originated in DOD. Examples are the next generation anthrax vaccine and cell culture derived smallpox vaccine. DOD and DHHS work cooperatively to leverage medical countermeasure programs of mutual interest and to ensure there is no funding redundancy.

It is important to note that military and civilian requirements and concepts of use for medical countermeasures do not always match. Military capabilities requirements generally focus on pre-exposure prophylaxis for a smaller, healthier population that will be put in harm's way. Civilian requirements focus on post-exposure prophylaxis or treatment for a larger, more diverse population. The military often needs products uniformed Service Members can administer to themselves under field conditions, while civilian requirements tend to focus on those products that will be administered by first responders, nurses, and physicians. The route of administration for a product may differ based on the concept of use. For DOD, when a product must be self-administered the best route is often via an intramuscular injection. For civilians, where the concept involves first responders, nurses, or physicians to administer the

countermeasure, intravenous injections may be the preferred route. This means that it is possible that countermeasures developed by DHHS to suit civilian concepts of use may not be suitable for DOD for wartime use by Service Members.

Under Bioshield, there is provision for emergency use authorization (EUA) to permit the effective use of promising medical countermeasures under development for treatments in an emergency if alternative treatments are not available. This will improve access by the public to a potentially beneficial treatment in an emergency situation, when it is most likely to save lives, even if it has not yet been fully approved by the FDA or is an approved product that would be used for a use not yet covered by an approved indication. In some instances, DHHS may decide to forgo full FDA licensure and rely on EUA as a means to balance cost, schedule, and risk across their countermeasures portfolio. DOD policy is that DOD shall make preferential use of products approved by the FDA for general commercial marketing to provide the needed medical countermeasure. When no FDA-approved product is available to meet a foreseeable threat, the DOD will investigate conducting appropriate research and development program activities directed toward obtaining general commercial marketing approval by the FDA.

Given the differing emphasis on FDA approval of products just discussed, each medical countermeasure must be considered separately to determine if it will meet interagency needs or will be developed by only one agency. When DOD considers transitioning a product to the DHHS for advanced development , it must ensure that DHHS intends to seek FDA licensure rather than choosing to use the product under the Bioshield EUA provisions. Should the DOD request approval of the Secretary of Defense to use a countermeasure as an Investigational New Drug (IND), the request must be justified based on the available evidence of the safety and efficacy of the drug and the nature and degree of the threat to personnel. When using INDs, the DOD must comply with 10 U.S.C. 1107, Executive Order 13139, and applicable FDA regulations.

Industry is unlikely to want to partner with DOD or DHHS if the products they help develop can be used only under EUA. The investment in infrastructure to manufacture medical countermeasures with no assured means to recover their investments or garner profit is seen as an extremely risky approach by the commercial sector. Industry may on their own initiative undertake the early stages of development of bio-defense countermeasures. They are willing to assume a degree of risk of failure for early development efforts, but also want assurances that a market will exist for their products if they are successful in development and FDA licensure.

3.8 INDIVIDUAL PROTECTION

Recognizing that the risk to individual protection of the Warfighter is contingent on the availability of a complete protective ensemble, an alternative risk calculation has been provided in past reports that compared the aggregate quantities of all available fielded items that fulfill a particular protective function with the sum of their requirements. The overall risk is then determined by the component in shortest supply. Until the requirements are updated, ***Table 3-3*** presents aggregate totals only based on information as of publication of this report.

The true readiness posture for individual protection has reflected a more accurate picture when the entire protective ensemble (suits, gloves, boots, *etc*.) is assessed instead of only tracking the sum of its individual components within each Service. The accelerated procurement of all JSLIST components over the past three years has significantly improved

readiness in this area and towards the overall goal to not allow one overlooked line item to degrade individual protection. Continued full funding of all protective ensemble component shortfalls for both the Services and JPM-IP is critical to maintain the upward momentum.

Table 3-3 Protective Ensemble Inventory Summary

ARMY			**AIR FORCE**		
Component	**FY05 On-Hand**	**FY06 (projected)**	**Component**	**FY05 On-Hand**	**FY06 (projected)**
Suits	507,102	537,480	Suits	1,551,550	1,786,788
Masks	606,315	679,362	Masks	596,668	602,525
Filters	1,108,696	2,995,098	Filters	2,685,603	2,697,141
Gloves	535,996	546,846	Gloves	2,150,595	2,665,021
Boots	413,126	458,207	Boots	1,284,271	1,408,717
Hoods	600,459	731,375	Hoods	2,233,778	2,242,368
NAVY			**MARINE CORPS**		
Component	**FY05 On-Hand**	**FY06 (projected)***	**Component**	**FY05 On-Hand**	**FY06 (projected)**
Suits	534,273	534,273	Suits	380,938	403,044
Masks	141,824	141,824	Masks	163,942	225,063
Filters	629,335	629,335	Filters	850,559	850,559
Gloves	305,883	305,883	Gloves	634,520	634,520
Boots	438,121	438,121	Boots	254,310	254,310
Hoods	1,313	1,313	Hoods	2,188	2,188
COMBINED SERVICES					
Component	**FY05 On-Hand**	**FY06 (projected)***			
Suits	2,973,863	3,261,585			
Masks	1,508,749	1,648,774			
Filters	5,274,193	7,172,133			
Gloves	3,626,994	4,152,270			
Boots	2,389,828	2,559,355			
Hoods	2,837,738	2,977,244			

* Partial data at time of publication

3.9 BIOLOGICAL DEFENSE IMMUNIZATION PROGRAMS

CBMS JPMO, via the Joint Vaccine Acquisition Program (JVAP), continues to ensure a constant supply of anthrax vaccine adsorbed (AVA) and Dryvax™ (smallpox vaccine) to meet the needs of the Military Vaccine Agency's (MILVAX) immunization programs. JVAP procures licensed AVA from the sole-manufacturer, BioPort Corporation. In FY05, BioPort let a contract with the Department of Health and Human Services (DHHS); however maintenance of the industrial base for this sole-source product remains a concern due to low demand outside the DOD. JVAP procures DryVax™, through an Interagency Agreement with DHHS. DryVax™ is a legacy product no longer actively manufactured and there is a finite supply of the product available. DHHS is developing a next-generation smallpox vaccine that DOD intends to procure after FDA licensure.

3.9.1 Anthrax Vaccine Immunization Program (AVIP)

The AVIP web site provides a detailed account on the nature of the threat from anthrax (*Bacillus anthracis*), description of the vaccine, explanation of U.S. DOD policies regarding biological-defense vaccines, U.S. DOD policies regarding the anthrax vaccine, immunization schedule, information on adverse event reporting, and other information related to the AVIP. The AVIP web site may be found on the Internet at http://www.anthrax.mil/.

As of January 5th 2006; 5,571,455 doses of the vaccine have been administered to 1,334,688 persons. Also as of this date, 236,786 service members have received 6 or more doses.

In December 1997, the Secretary of Defense announced plans to begin vaccinating Service personnel deployed in High-Threat Areas (HTAs) against the BW agent anthrax. Vaccinations for troops in Southwest Asia began in March 1998. Vaccinations for troops in Korea began in August 1998. The AVIP Agency was established in September 1998 to implement and monitor the DOD policy and Services' plans. Due to an unanticipated delay in release of FDA-approved vaccine, DOD slowed its implementation of the AVIP incrementally between July and November 2000 and June 2001.

BioPort received full approval of all aspects of their Biologics License Application supplement from the FDA on January 31, 2002. On the same date, FDA released three production lots of anthrax vaccine (BioThrax®). BioPort has earned FDA release of additional lots steadily since then.

DOD resumed the AVIP with a priority execution program, continuing with special-mission units, vaccinating forces assigned/deployed to HTAs for more than 15 days and expanding the vaccinations to early-deploying forces designated for this area of operations. On June 28, 2004, with the availability of more vaccine, DOD expanded the AVIP to all of the U.S. Central Command area of responsibility and to the Korean peninsula. On July 28, 2004, DOD resumed the AVIP for personnel previously deferred during the 2000 and 2001 slow downs. An extensive body of literature now documents the safety profile of anthrax vaccine. These data are summarized in the March 2002 report from the National Academy of Science and its Institute of Medicine.

On October 27, 2004, the United States District Court for the District of Columbia issued an Order declaring unlawful and prohibiting mandatory anthrax immunization to protect against inhalation anthrax, pending further Food and Drug Administration (FDA) action. www.anthrax.mil.

In January 2005, the FDA granted an Emergency Use Authorization (EUA) for anthrax immunization to prevent inhalation anthrax. An EUA is a regulatory category for medications not approved for general commercial marketing or not approved for the specific intended uses, but appropriate for emergency use, as provided by the Project BioShield Act of 2004. The FDA determined the known and potential risk of anthrax exposure or infection justifies anthrax immunization in the Military Services. On 6 April 2005, the Court modified the injunction to allow anthrax immunization of designated personnel with an option to refuse. The option to refuse required that each Service Member eligible for immunization be informed that anthrax vaccine was offered under an EUA, provided facts about the vaccine and offered the option to decline immunization without adverse consequences to their military or civilian standing.

On April 25, 2005, the Deputy Secretary of Defense directed the Department to resume anthrax immunization under the conditions set forth in the EUA issued by the FDA. The injunction against mandatory anthrax immunization continued in force.

On July 22nd 2005, the Food and Drug Administration extended the term of the EUA until January 14th 2006.

The FDA completed its administrative action on December 19th 2005 by issuing a Final Order, again finding anthrax vaccine to be licensed for the prevention of anthrax, regardless of route of exposure. The EUA expired on January 14th 2006.

On December 19, 2005, the FDA issued a new final order reaffirming its determination that anthrax vaccine is safe and effective for the prevention of anthrax disease, including inhalation anthrax. This action set the stage for further legal proceedings to clarify the legal status of the vaccine and for DOD decisions concerning the future course of the AVIP.

3.9.2 Smallpox Vaccination Program (SVP)

The SVP web site provides a detailed account on the nature of the threat from smallpox (variola virus), description of the vaccine, explanation of U.S. DOD policies regarding biological defense vaccines, U.S. DOD policies regarding the smallpox vaccine, immunization schedule, information on adverse event reporting, and other information related to the SVP. The SVP website may be found on the Internet at http://www.smallpox.mil/.

As of January 1st 2006; 889,921 DOD personnel were screened and 868,889 personnel were vaccinated against smallpox disease.

On December 13, 2002, the President announced the national smallpox vaccination program, a portion of which involved vaccinating military personnel in mission-critical roles. Vaccinations began three days after the President's announcement. The DOD program vaccinates troops before an attack, to ensure they are personally protected and can continue their missions. The program includes three main groups of people: more than 2,000 members of Smallpox Epidemic Response Teams (SERTs), more than 10,000 members of medical teams for military hospitals and large military clinics, and military personnel who constitute mission-critical forces, principally focused on the U.S. Central Command area of responsibility. On June 28, 2004, DOD expanded the SVP to the Korean peninsula.

In addition to the Smallpox Vaccination Program, DOD issued version 3.1 of the DOD Smallpox Response Plan (www.smallpox.mil/resource/SMAplan/SMAplan.asp) on September 29, 2002. This document consists of a base plan plus 10 detailed annexes. The plan describes DOD's global duties on military installations or during contingency operations, as well as military support to civil authorities. The plan helps DOD prepare for and respond to smallpox outbreak, regardless of magnitude or location. Plan allows for either ring-vaccination or wide-area vaccination as a means of outbreak control.

3.10 CBRN DEFENSE LOGISTICS SUPPORT ASSESSMENT

ISSUE: **Department of Defense CB Defense Program is identifying readiness shortfalls that may preclude full support of the entire 1-4-2-1 force planning construct. The Services' modernization efforts and common war reserve requirements are lessening the overall risk over the near term.**

SOLUTION: The Services continue to increase their readiness and sustainment status by consolidating common stocks and increasing visibility of their wholesale (war reserve) stocks. In most cases, accelerated procurement of critical items into war reserves will increase readiness against the potential use of weapons of mass destruction.

During 1998, all four Services participated in the development of the JCHEMRATES IV study, which was finalized in 1999. JCHEMRATES IV provided a more accurate

prediction of the initial issue and sustainment quantities required by each Service. A follow-on study, the *Expendable Equipment Combat Consumption* (E^2C^2) Study is being conducted under the auspices of the JRO-CBRN Defense. The use of this common methodology will allow the presentation of joint service requirements in future reports and facilitate improved joint logistics management.

ISSUE: **CBRN defense industries have a limited ability to augment specific shortfalls during any future contingency, in part due to lowered DOD procurements and the inability to retain warm production bases in critical areas. Without the introduction of significant plus ups or the use of innovative business practices (such as the use of performance specifications), many of the small firms that make up this sector may choose to re-focus on the commercial market place.**

SOLUTION: DOD continues to pursue innovative strategies to maintain a responsive industrial base, especially those strategies that decrease industry reliance on DOD procurement for industrial base survival. Strategies may include tapping into independent research and development (IR&D) conducted by universities and corporations, increasing reliance on dual-use technologies, and pursuing strategies that will encourage companies to decrease dependency on DOD requirements for their survival.

ISSUE: **Recent world events have focused concern on providing total protection for all deploying warfighters. The Services must have mechanisms in place to ensure that all warfighters are issued complete and functional protective ensembles when deployed.**

SOLUTION: The Services have the following processes in place:

NAVY

a. Issuance. All deployable Navy units have established allowances for IPE. The basic allowance document is the Allowance Equipage List (AEL) crafted for each ship class and deployable unit type. The AEL identifies a numeric allowance for each element of IPE, and if the item, say for example a protective suit or NBC protective mask, is issued in multiple sizes, then the size distribution oriented to the population of the unit in question is provided. The basis of issue for all clothing items is 2.15 per person for amphibious and mine warfare ships and 1.15 per person for the other surface ships; the basis of issue for the expeditionary warfare forces for all clothing items is 2.5 per person and 1.05 for naval installation commands; masks are issued at a rate of 1.05 masks per person. The excess quantities generated cover training needs, size anomalies, and surge assignments that may exist at the unit level. Each ship currently maintains this material centrally under control of the Damage Control Assistant. Those units having completed the Readiness Improvement Program (RIP) have all CBR-D IPE bar-coded and stored in a bag and a bar-coded etched mask sized and fitted and issued to each individual crewmember separately. The material will be returned to ship's custody prior to transfer of the individual. Aviation IPE is issued to the aviator and ground support personnel to the aviator squadron directly prior to overseas movement for Expeditionary Air Squadrons.

b. Inventory Management. As stated above, Navy will utilize a combination of CBRD TAVMS and JACKS to provide automated shelf life data updates to all units via the Internet throughout the equipment's life cycle. Outdated material is discarded or

reserved for training and replacement material ordered using unit operation funds. Relevant shelf life data will also be posted to the CBRD Information Website.

c. Preparation for Deployment. On a monthly basis or whenever mission readiness changes, each ship reports its operational readiness through the chain of command via the SORTS reporting system. Any projected deficiencies in readiness that are noted in pre-deployment workups are reported to the Immediate Superior in Command and Type Commander. If material shortfalls, such as a deficiency of IPE, cannot be remedied by requisitioning needed material from the supply system, the Type Commander takes action to fill the shortfall using assets from the NAVSEA Joint Storage Facility to fulfill requirements. It is important to note that the delivery of a fully equipped, mission-capable unit to the operational commander is a Type Commander responsibility.

ARMY

a. Issuance. Army policy varies regarding authorization of contingency stocks to various units:

Force Package 1 (FP1) and supporting units - Army authorizes these early deployer units to maintain two complete sets on hand per individual authorized on the unit Modified Table of Organization & Equipment (MTO&E), plus a small overage to accommodate sizing. These units conduct periodic command inspections to ensure that proper maintenance of contingency IPE, and Army training requirements include an annual evaluation of each soldier to ensure proper fit and employment of the protective ensemble components.

FP2 and above and supporting units - Army authorizes follow-on deployer units to draw IPE requirements from contingency stocks maintained at Blue Grass Army Depot (BGAD) through the automated Army Electronic Product Support (AEPS) network. Units determine requirements, to include sizing tariff, and submit them via secure email to the AEPS website. Submitted requirements are validated and approved by the parent MACOM, item manager, and ADC G-4, and then release by BGAD to the requesting unit.

Sustainment stocks for all units are maintained in pre-positioned accounts at various theater-specific support locations.

b. Inventory Management. Protective masks are unit property and receive PMCS inspection as prescribed by the appropriate item technical manual.

The Army's Natick Test Activity routinely tests, by lot number, each of the expendable ensemble components to validate shelf life. Deficient lots are identified to the appropriate item manager and the Army ADC G-4 for publication to Army units via appropriate notification message.

Army regulation and periodic technical bulletins direct owning units to survey on-hand stocks annually, unless sooner notified, of potential shelf life problems by the Army ADC G-4. Upon identification of expiring shelf life for specific commodity lots, deficient stocks are issued as training items and replacement stocks appropriately requisitioned.

c. Preparation for Deployment. At in processing at the unit, each soldier is evaluated by the unit CBRN defense staff for proper size and fit of each protective ensemble item.

The unit CBRN staff records the information for each individual and maintains in unit battle book.

When in receipt of deployment orders, each soldier is inspected by unit supervisors for possession of all required IPE. All shortages (FP2+ units) are immediately requisitioned from BGAD via AEPS for issue upon receipt prior to deployment from home station or at the port of embarkation.

d. Medical Chemical, Biological, Radiological and Nuclear Defense Materiel (MCBRNDM) Program. MCBRNDM is used for pre and post treatment of CBRN injuries to individual Soldiers and consists of the following items: three Antidote Treatment - Nerve Agent Antidote (ATNAA), which is replacing the existing inventory of Mark I Kits on a one-for-one basis, one Convulsant Antidote Nerve Agent (CANA) autoinjector, 15 days of supply (30 tablets) of an antibiotic (Ciprofloxacin or Doxycycline), and a users guide that explains how and when to use these items. The U.S. Army Office of the Surgeon General (OTSG) centrally manages MCBRNDM in deployable force packages, stored in strategic locations throughout the world, and approves all releases of centrally managed MCBRNDM to deploying units. MCBRNDM is issued to all deploying Soldiers and OTSG continues to sustain this initial issue inventory of consumable MCBRNDM for all forward deployed forces. Additionally, this program procures: Pyridostigmine Bromide (PB) for pre-treatment against nerve agent (Soman) exposure; Skin Exposure Reduction Paste Against Chemical Warfare Agents (SERPACWA), which, in conjunction with mission-oriented protective posture (MOPP), enhances soldier protection from chemical warfare agents; and 6 potency and dated items for the unit Medical Equipment Set (MES), Chemical Agent Patient Treatment. OTSG began centralized management of MCBRNDM in 1994.

   MCBRNDM provides the individual Soldier with the capability to give self-aid or buddy aid to treat injuries resulting from CBRN warfare agents. Each MES, Chemical Agent Patient Treatment, provides medical personnel with the capability to treat 30 chemical casualties. This program has successfully supported and continues to support all deployments for Operation Iraqi Freedom and Operation Enduring Freedom.

AIR FORCE

a. Issuance. Air Force Instruction (AFI) 10-2501, *Full Spectrum Threat Response Planning and Operations* establishes standard basis of issue (BOI) Air Force member stationed in or deployable to nuclear, biological, chemical and conventional (NBCC) medium and high threat areas. The current BOI consists of four operational suits (to provide 96 hours of protection) and one training suit per individual.

b. Threat Areas

   Low Threat Areas (LTA). Within LTAs, only military or emergency-essential personnel filling mobility positions are authorized individual protective equipment. One half of the BOI (C-1) authorizations will be stored and hand carried by the individual upon deployment or pre-positioned in the AOR. Sustainment assets for CONUS units (C-Bags) are stored at the Consolidated Mobility Bag Control Center according to AFI 23-226. For OCONUS units, sustainment assets will be stored using MAJCOM guidance.

Medium Threat Areas (MTA). Within MTAs, all military and emergency-essential civilian personnel are authorized a C-1 bag. Only personnel assigned to mobility positions are authorized sustainment equipment. Both C-1 and sustainment equipment are stored and deployed using MAJCOM guidance.

High Threat Areas (HTA). Within HTAs, all military and emergency-essential civilians are authorized the full issue of both C-1 and sustainment assets. Storage, issue and deployment of these assets will be according to MAJCOM guidance.

c. Inventory Management. Some individual units (normally Special Operation Forces, Battlefield Airmen or Security Forces), maintain a portion of their IPE, i.e., protective masks (minus operational filters), protective vests, etc. and are responsible for maintenance and inspection in accordance with tech manuals. Most IPE is centrally stored at Base Logistics Readiness and all required inspections and inventories take place there. Management of assets is accomplished through the Mobility Inventory Control and Accountability System (MICAS). HQ Air Force Civil Engineer Support Agency (AFCESA) and HQ Air Force Installations & Logistics monitor IPE issues such as shelf life expiration or extension and lot testing. Upon any changes in regard to stocked items, they send equipment advisories to each MAJCOM for distribution to their respective units.

d. Preparation for Deployment. Squadron or Group commanders identify deployable Air Force members and emergency-essential civilians at unit-level. Once identified, personnel are sized and information is maintained at the base Logistics Readiness function. Upon receipt of deployment orders, each individual is issued IPE and given a quantitative fit test in their protective mask. The test is conducted to ensure each mask will provide its wearer optimum respiratory protection. IPE shortages are reported in Status of Resources and Training System-Chemical (SORTS-C) and worked through MAJCOM to overcome.

MARINE CORPS

a. Issuance. Each command has a designated table of equipment that lays out the asset requirements for that unit. The Commands' equipment is stored, maintained, and issued by Consolidated Storage Facilities (CSFs). When the on hand inventory does not support issuing to a commands' full table of equipment, the Marine Expeditionary Force (MEF) Commander will determine which units are given priority and the quantities to be issued. Redistribution of CBRND equipment between CSFs may be required to resolve localized deficiencies. Redistribution between CSFs is coordinated between the MEFs, the NBC Defense Systems Program Manager, the Proponent for Readiness (Deputy Commandant for Plans Policies and Readiness), and approved by the Proponent for NBC defense (Deputy Commandant for Combat Development).

b. Inventory Management. The Marine Corps has initiated the Strategic Logistics Asset Management Project (SLAM). The SLAM geographically centralizes the Marine Corps' CBRN equipment in CSFs using contract logistics support. The equipment held in the CSFs is managed by the NBC Defense Systems Program Manager (PM) who has total asset visibility through a web-based system. The Deputy Commandant for Combat Development is responsible for determining the capabilities required and establishing the Tables of Equipment. The PM is responsible for the replenishment of equipment

held in the CSFs. Unit commanders are not responsible for providing O&M funds to sustain their equipment.

c. Preparation for Deployment. Units preparing for deployment will notify their MEF Headquarters and the CSF of their intent to draw CBRN equipment. Commands are required to inspect the equipment held in the CSF to ensure it is ready for deployment. All SORTS Reporting commands are required to include CBD Equipment readiness in their SORTS Report.

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Chapter 4

Chemical, Biological, Radiological and Nuclear (CBRN) Defense Education, Training and Doctrine

4.1 INTRODUCTION

This chapter provides an overview of education, training, exercises, and doctrine of the Department of Defense (DOD) that enables CBRN defense capabilities. Along with the Services, the Joint Requirements Office for CBRN Defense and the CBRN Defense Education and Training Integration Directorate play major roles in developing CBRN Defense education, training and doctrine.

The Joint Requirements Office (JRO) for CBRN Defense continued implementation of a multi-year strategy to enhance the CBRN Defense-related awareness across the Joint Service community. The JRO strategy includes providing CBRN defense education and awareness for Combatant Commander staffs, Services, Joint Professional Military Education institutions, and colleges. The JRO initiative also supports the review and evolution of joint doctrine, ensuring that the foundation, upon which education, training and operations is established, properly reflects CBRN conditions and issues.

During 2005, the CBRN Defense Education and Training Integration Directorate was established within the Office of the Secretary of Defense. The mission of this Directorate is to guide, provide oversight, and integrate CBRN defense education and training throughout DOD, and to facilitate the resolution of major issues and challenges, including those identified in this and prior annual reports. In the near term, this Directorate will facilitate the development and implementation of training and education standards to ensure integration.

The CBRN Defense Education and Training Integration Directorate has scheduled a conference for March 2006, as the initial phase. A key part of this conference is the planned establishment of a CBRN Defense Education and Training Integration Council (ETIC), which will include participation by all key stakeholders within the Department. This initial conference will assess current education and training efforts and standards, identify challenges, and discuss solutions. The ETIC will evolve into a Council that will be instrumental in decisions and planning efforts for CBRN Defense Education and Training across DOD. The charter for the Council is currently under development.

4.2 CBRN DEFENSE IN PROFESSIONAL MILITARY EDUCATION

Within the Professional Military Education (PME) system, most colleges currently provide limited CBRN defense considerations and do not adequately address CBRN threat or U.S. response capability in their curricula, and associated wargames and workshops. It is essential that personnel of all Services understand the CBRN threat, are familiar with U.S. capabilities to detect and mitigate the threat, and comprehend their staff roles and responsibilities in dealing with CBRN issues.

A current effort initiated by the JRO provides support to the Services and Joint PME systems by providing a review of curriculum and wargame scenarios to ensure CBRN defense is properly addressed; subject matter expert (SME) support to wargames; guest speakers who are experts in the CBRN arena; awareness training for faculty; workshops to stimulate CBRN defense synergy among the institutions; and by developing course curricula and other related support. During FY05, the JRO provided the following support:

- Coordinated and facilitated the JRO-CBRN defense SME Guest Speaker Program at Joint and Service PME institutions. This support involved 18 SME lectures at Senior and Intermediate Service Colleges, Joint Colleges and related activities, addressing 639 officers and senior civilians.
- Assisted with the development, execution, and assessment of wargaming events at Joint and Service PME institutions. The JRO provided assistance to the Army War College's Strategic Crisis Exercise, Marine Corps Command and Staff College's Nine Innings Exercise, Air War College's Solo Challenge, and the Joint, Land, Aerospace and Sea Simulation (JLASS) exercise conducted by the Air Force Wargaming Institute for all senior-level colleges. This support affected over 500 officers and ensured that the appropriate levels and types of CBRN defense events were inserted into these wargames.
- Coordinated and provided CBRN defense SME technical assistance at Joint and Service PME institutions in the review and improvement of existing core and elective curriculum. For example, the JRO reviewed and provided recommended CBRN defense-related improvements to the Marine Corps Command and Staff College and at five Senior Service and two Joint colleges participating in the JLASS exercise.
- Conducted CBRN Defense Faculty Curriculum Developers Courses at the Air Force Wargaming Institute and USAF Senior Enlisted Academy. This course is designed to provide CBRN subject matter expertise to curriculum developers and educators interested in integrating CBRN issues into their curricula.

4.3 CBRN DEFENSE TRAINING

All Services conduct CBRN defense specialist professional training at the same location in accordance with Congressional statute (P.L. 103-160, Section 1702). Currently, all Service training, except for medical CBRN courses, is co-located at the United States Army Chemical School (USACMLS), Fort Leonard Wood, Missouri. Each Service conducts training with Service instructors and establishes standards of proficiency for CBRN defense training, including live chemical agent training at the Chemical Defense Training Facility (CDTF), *shown*. The following sections describe each Service's activities for CBRN defense training, and training initiatives that support service and joint organizations.

4.3.1 Army CBRN Defense Training

The USACMLS is currently overseeing the training portion of the Army Emergency First Responder Program, a major component of the Chemical, Biological, Radiological, Nuclear, and High-Yield Explosive (CBRNE) Installation Preparedness Program. All training is being completed in accordance with 29 CFR 1910.120, *Hazardous waste operations and emergency response*, and consists of new equipment training, and new organization training. The training is divided up into individual segments covering Installation CBRN Awareness, Operations, Hazardous Materials (HAZMAT), Emergency Medical Services, Healthcare CBRN Provider and Incident Command. The USACMLS broke ground for the 1LT Terry CBRN Responder Facility in June, 2005. This state-of-the-art training facility and range will be used to train both Army and multi-service CBRN responders beginning in FY 07.

4.3.1.1 Individual Training The Army's policy is to train all soldiers on individual CBRN warrior tasks to ensure their survival and mission continuation. CBRN training is integrated into all phases of their professional development from initial entry training through the advanced education that the Army's leaders receive. The Army's goal is to survive and win under any conditions.

4.3.1.2 Medical Training The Army and the Defense Health Program fund medical CBRN defense training in support of casualty care, leader development and medical force health protection. Casualty care training provides medical professionals with the clinical skills necessary to diagnose and treat individuals exposed to CBRN agents. Leader development prepares Army medical leaders to plan for and manage CBRN in any environment. Force health protection training provides preventive medicine personnel with the skills necessary to support Force Health Protection programs across the full spectrum of military operations. Training is conducted at the following organizations:

- U.S. Army Medical Department Center & School (AMEDDC&S)
- U.S. Army Medical Research Institute of Chemical Defense (USAMRICD)
- U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)
- Armed Forces Radiobiology Research Institute (AFRRI)
- U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM)
- Defense Medical Readiness Training Institute

Training modalities include in-residence training, training conducted at the requesting unit's site (on-site training), and distance learning programs. Each training modality offers unique advantages. In-residence training enables students to use laboratory and field training facilities while maximizing student-instructor interaction. On-site training at military installations worldwide minimizes student travel costs while preserving direct student-instructor interaction. Distance learning programs minimize training costs and support increased audience size, but do not afford direct student-instructor interactions. A summary of Army-sponsored medical CBRN training is provided in ***Table 4-1*** and the expansion in ***Table 4-2,*** and a detailed summary of Army Medical Emergency Medical Preparedness & Response Course (EMPRC) Training is at ***Table 4-3***.

Table 4-1 Summary of Army Medical CBRN Training in FY05

Type of Training	Total Number Trained	Army Trained
AMEDDC&S		
Leader Development (NBC)	18,481	18,481
CBRNE	13,414	13,414
Army Training Support Center (See also *Table 4-3*)		
Emergency Medical Preparedness & Response Course (EMPRC)	13,385	13,385
AFRRI		
Medical Effects of Ionizing Radiation (MEIR)	699	438
USAMRICD		
Medical Management of Chemical and Biological Casualties Course (MCBC) in residence	336	167
Field Management of Chemical and Biological Casualties Course (FCBC) in residence	335	226
Hospital Management of CBRNE Incidents (HM-CBRNE)	248	65
USAMRICD		
On-site to active military	503	356
On-site training – Non military	272	0
MCBC Offsite	799	656
MCBC Computer based Training/Video	391	133
Medical Response to Chemical Warfare and Terrorism 2000 Satellite Broadcast/Video Course	8	3
Biological and Chemical Warfare and Terrorism: Medical Issues and Response 2001 Satellite Broadcast/Video Course	8	3
Satellite: Biological & Chemical Warfare and Terrorism: Advanced Topics on Medical Defense Against Biological and Chemical Agents	4,231	165

Table 4-2 Summary of Hours Awarded to Physicians and Nurses for MCBC during FY05

Type of Training	Physician Hours	Nurse Hours
USAMRIID/USAMRICD		
MCBC in residence	8409.85	4958.7
MCBC Offsite course	1367.25	4108.9

Table 4-3 Detailed Summary of Army Medical EMPRC Training in FY05
Emergency Medical Preparedness & Response Course (EMPRC)

EMPRC – Army	Total	Enrolled	Completed	% Enrolled	% Complete
Military Personnel					
Enlisted Medical Personnel/Corpsmen	10,323	5,290	4,770	51.2%	46.2%
Non-Medical Personnel (Enlisted & Officer)	2,318	627	606	2.8%	2.7%
Independent Duty (SF) Medics	605	18	9	3.0%	1.5%
Medical Corps	3,065	841	604	27.4%	19.7%
Dental Corps	718	614	172	85.5%	24.0%
Veterinary Corps	363	304	229	83.7%	63.1%
Nurse Corps	2,507	706	548	28.2%	21.9%
Medical Service Corps - Administration	1,421	570	467	40.1%	32.9%
USA - Medical Specialist Corps	678	366	174	54.0%	25.7%
Physician Assistant	214	68	38	31.8%	17.8%
Total Active Duty Personnel	**22,211**	**9,404**	**7,616**	**42.3%**	**34.3%**
DOD Personnel (Civil Service)					
Technicians/Medical Assistants	5,258	1,922	1,115	36.6%	21.2%
Medical Providers	815	247	168	30.5%	20.6%
Dentists	27	16	1	59.3%	3.7%
Veterinarians	22	10	0	45.5%	0.0%
Nurses	3,409	888	596	26.0%	17.5%
Healthcare Administration	1,673	522	530	31.2%	31.7%
Med SP Corps Equiv/ Bio-medical Specialists/ Technologists	1,069	438	320	41.0%	29.9%
Physician Assistants	425	118	69	27.8%	16.2%
Non-medical/Non-Security	7,730	2,787	3,041	36.1%	39.3%
Security	226	53	54	23.5%	23.9%
Total DOD Civilian Personnel	**20,654**	**7,597**	**5,769**	**36.8%**	**27.9%**
TOTALS	**42,945**	**17,001**	**13,385**	**39.6%**	**31.1%**

4.3.1.3 <u>Army CBRN Defense Specialists Training</u> U.S. Army CBRN Defense Specialist Professional training takes place at the U.S. Army Chemical School (USACMLS), Fort Leonard Wood, Missouri, with the exception of the Technical Escort Course which is conducted at Redstone Arsenal AL. Training consists of three enlisted/non-commissioned officer courses, two officer courses, and one reclassification course (Reserve Component only). At initial entry level (see ***Table 4-4***), enlisted CBRN defense specialist soldiers and officers receive training in chemical, biological, and radiological agents, plus HAZMAT characteristics, smoke and decontamination operations, chemical and radiological survey procedures, HAZMAT awareness operations, and individual protective clothing and equipment. This program provides 19 weeks of intensive training, culminating in live/toxic agent training in the Chemical Defense Training Facility. Toxic agent training is an integral, mandatory component of all Chemical Corps CBRN Defense Specialist initial entry and professional courses. There are two types of

toxic agent training, the Basic Toxic Agent Training provides students with personal confidence in protective, detection and decontamination equipment. The Advanced Toxic Agent Training, added in FY 05, provides Chemical Corps ANCOC, Captain Career, Civil Support Skills and Air Force students the opportunity to practice planning, monitoring and sampling skills in a toxic environment.

Table 4-4 U.S. Army Professional and Initial Entry Training (FY05) At the USACMLS

Type of Training	Training Method	Number of Graduates[1]
Chemical Officer Basic	Initial Entry - Resident	290
Chemical Captain's Career Course	Initial Entry - Resident	83
Chemical Officer Advanced -RC	Resident	23
Chemical Operations Specialist One Station Unit Training (OSUT/OSUT2/AIT)	Initial Entry -Resident	1747
Chemical BNCOC	Resident	123
Chemical ANCOC	Resident	159

Specialized functional training is conducted in standalone courses attended by DOD, allied, and international students, as shown in ***Table 4-5***. All courses use a resident training method and are conducted at USACMLS.

Table 4-5 U.S. Army Specialized Professional Training FY05

Type of Training	Training Duration	Number of Graduates[1]
Nuclear, Biological, Chemical Reconnaissance	6 weeks	125
Master Fox Scout	3 weeks	5
Biological Integrated Detection SYS (BIDS) P3I	4-weeks, 1 days	76
Biological Integrated Detection SYS (BIDS) JBPDS	2 weeks, 3 days	231
Decontamination Procedures (Non-US)	1 week	235
Radiological Safety (Installation Level)	3 weeks	39
Operational Radiation Safety	1 week	105
WMD Installation Emergency Responder	1 week	0
WMD-CBRN Installation Planner's Course	1 week	0
Civil Support Skills Course	7 weeks, 4 days	441
Chemical Pre-Command & Div/Corps	1 week	15
Technical Escort	3 weeks, 3 days	404

4.3.1.4 <u>USACMLS' Weapons of Mass Destruction – Civil Support Team (WMD-CST) Program</u> The USACMLS' WMD-CST program has been productive in FY05. The Army activated the remaining 11 WMD-CST teams creating a total of 55 teams. This provides each state and territory with one team with an extra team in California. Initial individual training for the team members will be provided at the USACMLS using the Civil Support Skills Course (CSSC). The CSSC classes are comprised of officer and enlisted members from the Army and Air National Guard. Additional CSSC classes were added in FY 05 for the congressionally mandated standup the new teams. The USACMLS had 446 students report for CSSC in FY 05. USACMLS continually analyzes CST training requirements and uses this information to adjust

[1] Graduates included from all services and foreign military.

the Program of Instruction (POI) and lesson plans for the CSSC.

4.3.1.5 Army Medical Initiatives

CBRN Defense Training. The Principles of Military Preventive Medicine Course prepare future preventive medicine officers to support medical force health protection programs in CBRN environments. In FY05, 70 students completed the Principles of Military Preventive Medicine Course. The Preventive Medicine Specialist Course was revised to incorporate low level radiological (LLR) training. LLR training was expanded in the Health Physics Specialists' Course and in training provided the Nuclear Medical Science Officers (NMSOs) during Officers Basic Courses, Officers Advanced Courses, and Principles of Military Preventive Medicine Courses. LLR training enables NMSOs and Health Physics Specialists, with support of Preventive Medicine Specialists, to provide medical force health protection to deployed forces supporting incidents involving potential radiation exposure, including radiological dispersal device (RDD) attacks or releases of radiological materials from nuclear facilities. In FY05, 20 students completed the training. In addition, 30% of the Army's NMSOs and two Environmental Science Officers completed an intensive one week Field Response to Radiologic Incidents Course at the Idaho National Environmental and Engineering Laboratory. This course is designed to give junior preventive medicine officers and enlisted soldiers hands-on skills in responding to either accidents or terrorist events involving radiological materials.

Nuclear, Biological and Chemical (NBC) Sciences Branch Joint Civilian CBRN Training Initiative. The AMEDDC&S provided support to the US Border Patrol and Joint Task Force 8 for the purpose of developing a well-trained civilian Emergency Medical Technician corps to meet surges in healthcare demands resulting from catastrophic events. The purpose of this initiative is to further develop the CBRNE medical recognition in our homeland's first line of defense.

NBC Sciences Branch Oversight Training Initiative. The Army Medical Command's advanced training in management of chemical and biological threat agent incidents is conducted through two subordinate commands of the Medical Research and Materiel Command, U.S. Army Medical Research Institute of Chemical Defense (USAMRICD and U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID). Together, USAMRICD and USAMRIID conduct the Medical Management of Chemical and Biological Casualties (MCBC) and the Field Management of Chemical and Biological Casualties (FCBC) Courses. These courses train all members of the health care team, including emergency responders and public health officers, in the medical preparation for, and treatment of chemical and biological warfare agents. Although they have a military focus, these courses have become increasingly important in the national and international anti-terrorism effort.

USAMRIID and USAMRICD additionally cooperated this past year to produce a six-part satellite program on advanced topics in the medical management of biological and chemical warfare agents. These were explicitly constructed to meet both deployed military and homeland defense needs. The data (***Table 4-2***) clearly demonstrate the utility of the programming and also demonstrate the outreach capability of this educational medium.

USAMRICD and USAMRIID successfully met their mission to train every Army medical unit deploying into theatre in support of Operations Enduring Freedom and Iraqi Freedom.

In addition, USAMRICD is actively engaged in support to homeland defense. The Institute established a course to prepare international partners to respond effectively to incidents involving WMD, and the Public Health Service included the MCBC as required training for its EMATs (Emergency Management Teams).

In short, the USAMRICD is actively engaged with both military and civilian medical and first responder communities in order that they are fully equipped and confident in their ability to medically manage chemical agent incidents.

Support to U.S. Army Medical Command (MEDCOM) Homeland Security Initiatives. AMEDDC&S provides subject matter expertise in support of the Joint Services CBRNE Defense Training Program. This program is evolving in collaboration with the Defense Medical Readiness Training Institute (DMRTI) and the Services. It is a two-phase program consisting of distance learning and on-site evaluations. Phase I consists of up to eleven modules depending on duty position distributed through the Army Distance Learning System and DMRTI.

Fort Sam Houston Anti-Terrorism Plan CBRNE Section Development. The AMEDDC&S, NBC Sciences Branch chaired the CBRNE Working Group in accordance with Army Regulation 525-13, *Antiterrorism Force Protection*, and DODI 2000.18, *Department of Defense Installation Chemical, Biological, Radiological, Nuclear and High Yield Explosive Emergency Response Guidelines*. The NBC Sciences Branch has lead in developing CBRNE emergency response for the installation's anti-terrorism plan. NBC Sciences Branch was instrumental in the development of Fort Sam Houston's Installation Support Team. In accordance with DODI 2000.18, Fort Sam Houston is standing up a team to support the base first responders in CBRN/Mass casualty event. NBC Branch provided subject matter experts and team members for both training and stand up phases for the team. Additionally, NBC Branch supported the AMEDDC&S in developing response and shelter-in-place plans for over 8000 students.

4.3.2 Army Reserve Initiative Training

As part of the on-going US Army Reserve Domestic Response Decontamination and Reconnaissance initiative (begun in 1999), US Army Reserve soldiers have been trained through the US Army Technical Escort Course (J5), the Pennsylvania State Fire Academy and at the US Army Reserve's Joint Interagency Civil Support Training Center. To date, 397 US Army Reserve Chemical Soldiers have received HAZMAT training through the Pennsylvania State Fire Academy in Lewistown, PA. Of this number, 200 were trained there in 2005. The HAZMAT training mission is expected to be transferred to Fort Leonard Wood in FY07. The Fort Dix Joint Interagency Civil Support Training Center continued to train soldiers on Mass Casualty Decontamination training at Fort Dix and elsewhere, including Fort Leonard Wood. Over 500 soldiers have been trained on Mass Casualty Decontamination so far. The US Army Reserve added 78 Technical Escort trained soldiers to its ranks in 2005.

4.3.3 Air Force CBRN Defense Training

Air Force policy is to provide initial Chemical, Biological, Radiological, Nuclear, and high-yield Explosive (CBRNE) defense training to military personnel and emergency essential civilians in or deployable to medium and high threat CBRNE areas (***Table 4-6***), and recurring training every 15 months. CBRNE defense course instructors at base level receive professional

training through Air Force Apprentice, Craftsman and Advanced courses at the Air Force Civil Engineer Readiness School, Fort Leonard Wood, Missouri. Selected command, control, and response personnel receive additional home station and/or in-residence training to meet requirements for hazardous material emergency response, WMD emergency response, or exercise evaluation team duty. The designation of CBRNE threat areas is used for both deliberate and execution level planning. Airbases within these geographical locations are categorized as CBRNE high, medium, or low threat areas. Assessments use open source publications; major command and theater guidance; and unclassified intelligence information and are updated annually or as needed.

Table 4-6 CBRNE Threat Areas

CBRNE Threat	Geographical Location
High Threat Area[2]	Bahrain, Balkans Region, Diego Garcia, Egypt, Greece, India, Iraq Israel, Jordan, Kingdom of Saudi Arabia, Kuwait, Pakistan, Qatar, Republic of China (Taiwan), Republic of Korea, Somalia, Singapore, Sudan, Thailand, Turkey, United Arab Emirates
Medium Threat Area[3]	Germany, Italy, Japan, and Yemen
Low Threat Area[4]	All locations not listed as a high or medium threat area

4.3.3.1 <u>Individual and Team (Collective) Training</u> At individual level, the Air Force uses a multi-level approach to CBRNE defense-related training. All new enlisted inductees receive 14 hours of CBRNE defense related orientation training during basic training at Lackland AFB, TX. Depending on recruiting quotas, approximately 45,000 new Airmen are trained annually. Instruction includes basic individual defense measures and wear of protective equipment; alarm signals; mission oriented protective postures; CBRNE characteristics, identification, detection, reporting, and decontamination; and a mask confidence exercise. Training combines with other combat skills training at the end of a full week leading to a full-scale ability to survive and operate exercise.

Additionally, enlisted medical personnel receive initial readiness training through the Expeditionary Medical Readiness Course at Sheppard AFB or Basic Expeditionary Medical

[2] *CBRNE High Threat Area (HTA).* Forces in these areas are at risk from attack with CBRNE weapons and subject to terrorist use of weapons of mass destruction (WMD). Potential adversaries within the region either possess or are likely to possess a substantial stockpile of CBRNE weapons and weapons systems and may have special operations forces capable of conducting sustained attacks on airbases. Actual or potential terrorist threats exist during peacetime or wartime. Air Force personnel and units in or deployed to these locations will be organized, trained, and equipped to survive CBRNE attacks and conduct sustained combat operations in CBRNE environments.

[3] *CBRNE Medium Threat Area (MTA).* Forces in these areas are at risk from attack with CBRNE weapons and subject to terrorist use of WMD. Potential adversaries within the region either possess or are likely to possess CBRNE weapons and have weapons systems and may also have special operations forces capable of conducting limited attacks on airbases. Actual or potential terrorist threats exist during peacetime or wartime. Air Force personnel and units in or deployed to these locations will be organized, trained, and equipped to survive CBRNE attacks and conduct combat operations in CBRNE environments.

[4] *CBRNE Low Threat Area (LTA).* Forces in these areas are not considered at risk from attack with CBRNE weapons, but are subject to attack by terrorists using WMD. Actual or potential terrorist threats exist during peacetime or wartime. Air Force personnel and weapons systems in or deployed to these locations will be organized, trained, and equipped to survive attacks by terrorists using WMD and restore primary mission capability. CONUS installations will comply with applicable Continuity of Operations Plans and nuclear fallout shelter requirements in AFI 10-2501 and AFMAN 32-4005, *Personal Protection and Attack Actions*.

Readiness Training at Brooks AFB, in conjunction with their Air Force Specialty Code awarding courses. All other members, including emergency essential civilians and contractor personnel, that are in or deployable to chemical threat areas who have not completed training during their inception into the Air Force receive eight hours of initial CBRNE defense training at respective installations. The USAF Counter-CBRNE Council's Education, Training, and Exercise Working Group is formulating a strategy to ensure all new officer inductions receive similar indoctrination in the future.

To keep skills up-to-date and to introduce new or changed procedures and equipment, all initially trained mobility members and those in threat areas are required to attend recurring training 15 months after initial training and each 15 months thereafter. For both initial and recurring training, the Air Force is transitioning to a blended learning concept to train all Airmen to prepare for, respond to, and recover from the full spectrum of physical threats. Distance learning technologies will be used to deliver standardized knowledge-based materials, which will allow for academic self-paced learning and provide the student the ability to access the materials 24/7. Upon successful completion of knowledge-based training objectives, Air Force Civil Engineer Readiness Flight instructors help students accomplish demo-performance objectives in a classroom environment focusing on key tactics, techniques, and procedures. After receiving hands-on instruction and meeting demonstration performance objectives, members must complete functional task qualification training (TQT), normally at their respective duty location. During TQT, members perform individual wartime duties while wearing appropriate chemical defensive equipment. In addition, aircrews are required to conduct TQT flights while wearing chemical defensive equipment. [5]

Finally, each individual's education and training are further refined during various exercises (***Table 4-7***) conducted to hone the individual's skills and identify shortfalls in the unit's overall capability while operating in a CBRNE environment. Beyond the standard CBRNE defense related training, as described above, selected command, and response personnel (***Table 4-7***) receive additional home station and/or in-residence training and participate in exercises to respond to hazardous material emergencies including terrorist use of WMD. Specialized team members and personnel in senior or key leadership positions also receive additional information that will help them make appropriate risk management decisions and to better lead their personnel while ensuring air base survivability.

[5] Instructors from Civil Engineer Readiness Flights are the Air Force's CBRNE Defense instructors. These instructors receive their professional training through Air Force Apprentice, Craftsman and Advanced courses at the Air Force Civil Engineer Readiness School, Fort Leonard Wood, MO

Table 4-7 Major Accident and WMD In-Residence Training Requirements

Target Audience	Rank (or Civilian Equivalent)	Assigned To:	In-Residence Training (In Addition to Local Training)
On-Scene Commander	0-7 through 0-10	Response Task Force	Commander and Staff Radiological Accident Response Course Response Workshop (DNWS)[6]
			Air Force On-Scene Commander Course (AU)
On-Scene Command and Alternates	0-5 through 0-6	Initial Response Base or Disaster Control Group	Radiological Accident Command, Control and Coordination Course (DNWS)
			Air Force On-Scene Commander Course (AU)
Officer or Civilian		Response Task Force	Radiological Accident Command, Control and Coordination Course (DNWS)
			Air Force On-Scene Commander Course (AU)
Officer/Enlisted or Civilian	E-7 through 0-5	Response Task Force or Disaster Control Group	Radiological Accident Command, Control and Coordination Course (DNWS) or Radiological Emergency Teams Operations Course (DNWS)
Disaster Response Force	Any Rank	Contingency Support Staff, Contamination Control Team, or EOD	Radiological Emergency Team Operations Course (DNWS)
Exercise Evaluation Team Chief or Inspector General Evaluator		Response evaluation duties	Air Force On-Scene Commander Course (AU)

Key: DNWS - Defense Nuclear Weapons School, Kirtland AFB, NM; AU – Air University, Maxwell AFB, AL

During 2005 Air Force Medical Service personnel completed a DOD directed CBRNE defense web-based training requirement. ***Table 4-8*** provides a summary of active duty medic completion, as of October 2005. In accordance with Assistant Secretary of Defense for Health Affairs Memo, Subject: Chemical, Biological, Radiological, Nuclear, and (High Yield) Explosives Training for Military Medical Personnel, dated 9 January 2004, Health Affairs requires 75% of active duty Medical Corps and 50% of all active duty medical personnel to complete the training.

Additionally, the Air Force conducted its 4th annual USAF Medical CBRNE Defense Seminar. This seminar, which began in 2002 for bioenvironmental engineers, was expanded to include wing level public health, laboratory, and casualty management officers. It included plenary sessions, didactic presentations by CBRNE SMEs, and an interactive TTX, Loaded Dice, for 400 personnel. The next seminar is scheduled for May 2006 with a similar format.

Table 4-8 Active Duty Medic Completion

	Personnel Assigned	Personnel Completed	% Completed
Enlisted Medics	15,091	11,140	74%
Med Techs/IDMT*	6,269	4,921	79%
Medical Corps	2,931	2,492	85%
Dental Corps	910	710	78%
Nurse Corps	3,512	3,254	93%
Medical Service Corps	1,132	934	83%
Biomed Sciences Corps	2,034	1,516	75%
Physician Asst	322	260	81%
Total Active Duty	**32,201**	**25,277**	**78%**

** IDMT – Independent Duty Medical Technician*

4.3.3.2 Contagious Casualty Management (CCM) During FY04–05, the Air Force, through the leadership of Headquarters, Air Combat Command (ACC) and Headquarters, Air Mobility Command (AMC), began developing its newest deployable capability for treatment-in-place of biologically contagious casualties, and the aeromedical evacuation of joint index contagious casualties. For treat-in-place, the concept of employment, personnel requirements, and prototype allowance standard for a 25-bed increment to supplement Expeditionary Medical Support (EMEDS) facilities has been accomplished. Field testing of this newest EMEDS specialty CCM capability is scheduled for FY06. Total bed requirement is being worked. The aeromedical capability to transport and treat en route limited numbers of index contagious casualties will be provided via a patient isolation unit (PIU). For this, AMC operational project, concept of employment, and capability requirements were identified. The planned buy is for 20 PIUs and training sets through 2009. Expeditionary Medical Support, Critical Care Air Transport, and Flight NurseTechnician training courses will be modified to include contagious casualty management concepts as these new capabilities are fielded.

4.3.3.3 Air Force CBRNE Defense Specialist Training The 366th Training Squadron, Detachment 7, Civil Engineer Readiness School at Fort Leonard Wood, MO offers seven in-residence courses designed to enhance the CBRNE defense proficiency of primary-duty Air Force Civil Engineer Readiness Flight personnel (***Table 4-9***).

Table 4-9 Air Force Professional Training

Course Name	Training Duration	Number of 2005 Graduates
Civil Engineer (CE) Readiness Apprentice course	53 days	295
CE Craftsman Course	10 days	81
CE Advanced Readiness Course	5 days	61
CE Readiness Flight Officer Course	20 days	36
CBRN Cell (Resident) Course	5 days	101
CBRN Cell (Mobile Training Team)	5 days	44
Full Spectrum Threat Response Course	5 days	12

These courses fulfill the differing needs of the total force, including active duty, Air National Guard, Air Force Reserve and international students. The Readiness Apprentice Course is being expanded from 53 to 67 academic days beginning January 2006 to include more detailed CBRNE defense training and additional emphasis on automated warning and reporting. The advanced level course (seven level) is being updated, and will include a mandatory distance learning course prior to attending the two week residence course. This allows for more hands-

on application during the in-residence portion of the course. Lastly, the Readiness Flight Officer Course is currently in validation and graduated 36 Civil Engineer Readiness Officers to date.

4.3.3.4 Air Force CBRN Defense Training Initiatives Because CBRNE defense is an urgent need, Air Force efforts focused on expanding and improving readiness through the Counter - CBRNE concept of operations (C-CBRNE CONOPS) as describe below.

The Counter-Chemical Warfare (C-CW) Element of the C-CBRNE CONOPS. The Air Force continues to implement the C-CW element and achieved initial operational capability in 2005. Analysis indicates that adopting these procedures will help reduce sortie degradation following a CW attack from roughly 40 to less than 10 percent. To support accelerated training of the C-CW element, the Air Force has been conducting Operational Effectiveness Assistance (OEA) visits to airbases.

Operational Effectiveness Assistance (OEA) The OEA is an installation-level analysis to assist unit-level training of critical C-CW tactics, techniques, and procedures. OEAs include evaluation of threat, mission and infrastructure, and model each installation's processes to identify high-leverage actions for improving mission capability in a contaminated environment. The OEA provides quantifiable recommendations and tools to tailor the C-CW element to the installation's unique capabilities and requirements through a hands-on, unit-level approach.

Code Silver Tabletop Exercise (TTX). The Air Force conducted Code Silver TTXs at 51 air bases (active and Air National Guard bases) in FY05. The exercises are designed to train installation leadership on terrorist generated chemical and/or biological agent attacks. Code Silver TTX requirements are being incorporated into WMD incident response training and Air Force Instruction (AFI) 10-2501, which is in revision and expected to be published in 2006. See section 4.4.2 for more information on Code Silver TTX.

Counter-Biological Warfare (C-BW) Element of the C-CBRNE CONOPS. In 2004, the Air Force began to focus its C-BW CONOPS development effort on three activities:

- The first was a series of exercises designed to develop Counter-BW policy and guidance for fixed-site operations in an OCONUS wartime operations environment. The Air Force engaged a cross-functional team that worked in cooperation with Kunsan Air Base, ROK between May 2004 and April 2005 to develop C-BW TTPs that formed the basis of a C-BW CONOPS for Air Force-wide implementation. Kunsan Air Base was viewed as an ideal setting given its robust exercise regime and wartime footing. Referred to as the Kunsan Focused Effort (KFE), it was the first analytic effort that quantitatively linked C-BW to operational capability. The initiative specifically examined the BW impact on mission recovery and sustainment of operations in a wartime setting. KFE included a well-defined methodology supported by modeling and analytic tools. The results of KFE included findings and recommendations related to:
    - Threat and hazard environment
    - Detection and identification
    - Protection and decontamination
    - Disease containment
    - Operations.

Its recommendations are included in the Air Force's C-CBRNE FY06-07 Roadmaps.

- The second activity was to improve bio-defense guidance in CONUS/peacetime environments through the WMD Installation Training and Exercise Program and the Joint Service Installation Pilot Project.
- The third activity is the research into the operational impacts of biological weapons. The direction of the research is guided by the USAF C-CBRNE Council. The Council is the single coordinating body for C-CBRNE activities within the Air Staff. In 2005, the Director of Strategic Security for the Deputy Chief of Staff Air and Space Operations chaired the Council.

In 2005, the Air Force began coordination of the USAF C-BW CONOPS. The publication contains high-level concepts for how to work through a biological agent event. It is based on the KFE findings and focuses on base-level actions required for plans, response, and mission sustainment and recovery. The Air Force began developing a strategy for implementing these C-BW procedures through Air Force-wide training programs.

The Counter-Radiological Warfare (C-RW), Counter-Nuclear Warfare (C-NW), and Counter-High-Yield Explosive (C-EW) Elements of the C-CBRNE CONOPS. The Air Force has moved forward in creating a C-RW element. The primary objectives of this initiative are:

- Determine operational impact of RW on critical missions
- Assess requirements for sustaining mission capability in a radiological environment
- Assess, augment and develop C-RW policy
- Institutionalize the ability to operate through a radiological attack.

Work on the C-RW element began in 2003, with a C-RW study completed in early 2004. The C-RW study was an operationally focused, science-based report the Air Force used to develop guidance for commanders to deter, prevent, and respond to radiological attacks and to recover operational capability in an RW environment while limiting risks to personnel and resources. A set of five Baseline Studies was undertaken in 2005.

1) The first of five Baseline Studies looked at the RW threat and operational impacts.
2) The second study, C-RW policy and doctrine described what guidance was available to Airmen.
3) The third study, C-RW procedural capabilities and reach-back options, described USAF existing procedures for RW detection, response, protection, sustainment and recovery; and, it surveyed the C-RW related procedures used by the other Services, other USG agencies, and US allies not in use by the Air Force; and what reach-back resources were available.
4) The fourth study, C-RW existing and emerging DOD equipment and technologies, assessed whether current equipment and technology meets Air Force requirements, determined battle lab initiatives, sought out future plans for C-RW acquisitions, and assessed whether any of these technologies could provide a quick fix for capability shortfalls.

5) The last baseline study written in 2005 involved an examination of the state of C-RW related education, training and exercises for senior leadership, key functional staff, responders, operators, and the base populace.

In 2006, a C-RW Tiger Team will use these baseline studies to determine key shortfalls, recommend near-term solutions and identify the way ahead to create a C-RW CONOPS and an effective C-RW capability. All C-RW related tasks are planned for completion in 2007. As for the status of the remaining two elements, the requirements for C-NW and C-EW elements are still evolving.

The USAF C-CBRNE Master Plan. The USAF published a C-CBRNE Master Plan with four implementation roadmaps. This plan coordinates USAF efforts over a five-year period (2004-2009) to establish, maintain, improve and evaluate its readiness to accomplish the full suite of C-CBRNE missions and to operate in a CBRNE environment. The Master Plan outlines the operational capabilities the Air Force needs to counter the CBRNE threat, outlines a methodology and approach for developing and enhancing those capabilities, and organizes these efforts into four sub-plans or "roadmaps." The roadmaps are a comprehensive set of overarching tasks that support the master plan. Three of these roadmaps parallel the Service's Title X responsibilities to organize, equip, and train, and the fourth covers fundamental research and definition of the problem and potential solutions. The Air Force is crafting the next iteration of roadmap tasks for FY 06-07.

4.3.4 Navy CBRN Defense Training

During FY05, the Navy completed several significant accomplishments to improve CBR-Defense (CBR-D) training. These actions included:

- Approval of OPNAV Instruction 3440.17, *Navy Installation Emergency Management Program (EMP)*, dated 7 July 2005. The EMP provides new guidance and organization for all hazards response actions, including CBRN events at Navy installations.
- Update of OPNAV Instruction 4790.2, *Naval Aviation Maintenance Program* dated 1 February 2005. The revised instruction strengthens CRBN defense requirements for personnel protection and for equipment cleaning. This doctrinal change institutionalizes CBR-D in Naval Aviation.
- Integration of the Senior Enlisted Damage Control Course with the Damage Control Assistant (DCA) course in San Diego, California. The new course has an integrated Navy and US Coast Guard staff similar to the existing Damage Control Assistant (DCA) course in Newport, RI.
- Started professional training of Navy aviation personnel at the Shipboard CBR Defense Specialist Course located at the US Army Chemical School at Fort Leonard Wood, Missouri.
- Transition of new CBR-D training materials to the Integrated Learning Environment (ILE) portion of the Navy Knowledge Online (NKO) internet website.

Within the Navy, CBR-D training is conducted in two phases: individual and unit/installation training. Individual training consists of attendance at formal school courses, web-based instructions, and completion of basic and advanced CBRN defense personnel

qualification standard (PQS) training. At the unit/installation-level, Navy personnel conduct periodic CBRN defense training and pre-deployment unit training exercises.

Table 4-10 lists all CBRN-D related courses offered in the Navy, or via Joint schools. Some are discussed in the paragraphs that follow under individual, unit and installation training.

Table 4-10 U.S. Navy CBR-D Courses

Course Name	Course Location
Shipboard CBR-D Specialist Course	Fort Leonard Wood, MO
Disaster Preparedness Officer Course	
Recruit Training CBR-D	Naval Training Center Great Lakes, IL
Basic Engineering Core Course (BECC)	
Hospital Corpsman "A" School	Naval Training Center Great Lakes, IL
Independent Duty Corpsman	Naval School of Health Sciences San Diego, CA and Naval School of Health Sciences Portsmouth, VA
Preventive Medicine Technician "C" School	Naval School of Health Sciences, San Diego, CA
Confirmatory Lab Operator	Naval Medical Research Center, Silver Spring, MD
Management of Chemical Casualties	U.S. Army Medical Research Institute for Chemical Defense, Aberdeen Proving Ground, MD
Medical Affects of Ionizing Radiation	Armed Forces Radiobiology Research Institute Bethesda, MD
Radiation Health Indoctrination	Naval Undersea Medical Institute Groton, CT
Radiation Health Officer	
CBR-D Command Center	Naval Construction Training Center Gulfport, MS and Naval Construction Training Center Port Hueneme, CA
CBR-D Personnel Protection	
CBR-D Team Training	Naval Construction Training Center Gulfport, MS and Naval Construction Training Center Port Hueneme, CA
MSC CBR-D Course	Military Sealift Command Training Center Earle, NJ
Repair Party Leader	Fleet Training Center San Diego, CA Norfolk, VA; Mayport, FL Ingleside, TX Pearl Harbor HI; Yokosuka, Japan
Senior Enlisted Damage Control & Damage Control Assistant (DCA) Course	Fleet Training Center San Diego, CA
Damage Control Assistant (DCA)	Surface Warfare Officer School Command, Newport, RI
Department Head	
Executive Officer	
Commanding Officer	

4.3.4.1 <u>Navy Individual Training</u> In support of the Navy Knowledge Online (NKO) initiative, the Navy material developer is working to develop integrated learning environment (ILE) compliant courses that will further enhance CBR-D training in the areas of operations and maintenance. In the first quarter of FY06, the ILE product for the collective protection system was completed and delivered to the Center for Naval Engineering (CNE) for incorporation into CBR-D training. CBR-D courses that will be affected by the CPS ILE product include Basic Enlisted Common Core (BECC), Damage Control Assistant/Senior Enlisted (DCA/SE), CBR-D Training Specialist, and the Repair Locker Leader Courses. The Navy material developer is also in the process of developing an ILE product that encompasses all Navy detectors. This product is currently 20% complete and scheduled to be completed prior to FY07.

In the fourth quarter of FY05, the effort to outfit all of the Navy schoolhouses with CBR-D technical training equipment (TTE) was completed. This effort also included briefing

the schoolhouses on the use of the TTE and verifying that they have the level of support needed from the Navy material developer. The following sections are divided into initial training and advanced level CBR-D training for shipboard, ashore and medical training.

4.3.4.2 Navy Recruit/Accession Level Training The Navy provides initial entry-level CBR-D training to all junior officers and junior enlisted personnel in accession programs. At the Recruit Training Center, all enlisted personnel receive three hours of training (two hours in the classroom; one hour in the lab) focused on the use of personal protection equipment and survival skills, including an exercise designed to increase individual confidence in the protective equipment. At Officer Candidate School, officers receive two hours of class time focused on personal protection equipment and survival skills.

During 2005, the US Navy began new initiatives to improve CBR Defense and related training. In a collaborative effort between Chief of Naval Operations, Chief of Naval Education and Training and the Fleet, the Navy reviewed methods to efficiently, but significantly, increase CBRD-related training for all recruit (enlisted) and accession (junior officers) personnel. Professional level training at the mid-level (Journeyman) and senior level (Master) will continue to be conducted at Fort Leonard Wood, MO. Areas under active preparation include:

- *Mask Use During Real Work.* In a CBR-D environment, personnel must be prepared to conduct routine tasks while wearing individual protective equipment (IPE), especially the Individual Protective Mask. Students will wear the mask while concurrently participating in a "current" training task (e.g., classroom environment, individual study time, cleaning weapons, et al). This will give sailors greater experience in wearing IPE and how to accommodate actions during assigned tasks.
- *Updated Instructions*. The Navy is updating all instructions for small arms training (rifle, pistol, shotgun and small caliber crew-served weapons), to include requirement for familiarization firing, while wearing CBRD individual protective equipment (IPE) (gas mask and gloves). Semi-annual refresher training, wearing CBRD IPE, will be conducted with active ammunition or simulated rounds where such systems are available. This will apply to active duty and reserve units.
- *Integrated Small Arms CBR D Training.* Realizing the importance of increasing proficiency in small arms skills when standard weapons ranges are not available, Fleet Commanders used their operational funds to procure small arms simulators. The simulators allow personnel to fire weapons using standard military clothing and CBRD individual protective equipment. In addition to providing additional CB training, the per-round cost of using simulators is a significant "cost avoidance" to the Fleet.
- *Computer, Web-Based, On-Line Refresher Courses*. NKO, compatible with the Navy Marine Corps Internet (NMCI), provides sailors with opportunities to conduct interactive training and testing almost anywhere: in port, at any US shore facility, at home, while deployed at sea or at a foreign base. These computer-based courses meet Navy-Marine Corps Integration (NMCI) and DOD requirements for Integrated Learning Environment (ILE). ILE-designed programs assure that other service's courses can be uploaded into NKO without additional cost.

4.3.4.3 Navy Individual Training – Professional Level Officer and enlisted personnel assigned to ship and shore billets requiring specialized CBR-D expertise attend the Disaster

Preparedness Specialist Course (DPSC), a 20-day course, and the CBR-D Shipboard Operations and Training Specialist Course (10-days) conducted by US Navy personnel located at the U.S. Army Chemical School, Fort Leonard Wood, MO. The Navy Construction Training Center Detachment at USACMLS supervises the program for the Navy and offers two courses of instruction for Navy CBR-D specialists. The courses are open to Navy, Coast Guard, Military Sealift Command, and select foreign military personnel, E-5 and above. Courses are designed to provide both afloat and ashore commands with personnel who can successfully perform their duties in a CBR contaminated environment. In addition, the training enables CBR-D specialists to act as the primary CBR-D trainers for their respective commands. ***Table 4-11*** displays the student thru-put numbers.

In 2005, the Navy conducted a detailed periodic review of the two courses as required by Joint and Navy instructions. As a result, the Navy is currently reviewing options to disestablish the Disaster Preparedness Course and create two new courses; a new Emergency Manager Course for Navy installation personnel and a new Expeditionary CBR Specialist Course for personnel assigned to shore based expeditionary forces.

Table 4-11 Navy Professional CBRN Defense Training Status Conducted at Joint School

	2005 Accomplishments			2006 Goals[7]		
	DPSC*	**CBR-D Ops**	**Total**	**DPSC***	**CBR-D Ops**	**Total**
Officers	27	11	38			
Enlisted	96	112	108			
Total	123	123	246	92	124	216[8]

** DPSC – Disaster Preparedness Specialist Course*

Additional CBR-D training is covered in the Repair Party Leader Courses conducted at the Fleet Training Centers. Officers receive CBR-D–related training at the Damage Control Assistant Course, Shipboard Department Head Course, Prospective Executive Officer Course/ Prospective Commanding Officer Course held at the Surface Warfare Officer School Command, Newport, RI. Officer and enlisted personnel assigned to Ashore Expeditionary Forces (including the Naval Construction Forces) also receive follow-on CBR-D instruction after assignment to their unit. This training includes the Naval Construction Force (SEABEE) Personal Protection and Decontamination and Command Center Staff CBR-D Operations courses of instruction at Naval Construction Training Center Gulfport, MS and Port Hueneme, CA.

4.3.4.4 <u>Medical Training.</u> Information on the status of FY05 Navy CBRNE defense medical training is provided in ***Table 4-12***.

[7] 2006 goals have been established for total numbers trained. Commands have the authority and option to send either officers or senior enlisted personnel to courses (in the past that were designated only for commissioned officers) to earn the position of Officer in Charge. As a comparison, 219 personnel graduated from the schools in FY 2004.

[8] Student thru-put is cyclical, primarily dependent on ship and shore rotations and numbers of ships in the Fleet. Based on anticipated requirements in 2007, the school is planning to teach 338 officers/enlisted. As a comparison to FY 2004, the total number was 219 graduating students.

Table 4-12 Navy Medical CBRN Defense Training Status (2005)

	Clinicians			Non-clinicians		
	Trained	**Total**	**% Trained**	**Trained**	**Total**	**% Trained**
Officers	2,670	5,626	47%	1,573	5,256	30%
Enlisted	144	909	16%	8,755	24,050	36%
Total	**2,814**	**6,535**	**43%**	**10,328**	**29,306**	**35%**

Clinicians by Corps	Trained	Total Inventory	% Trained
Medical Corps	2,078	3,978	52%
Dental Corps	413	1,156	36%
Nurse Practitioner	70	263	27%
Physicians Assistant	109	229	48%
Hospital Corpsman (HM)	144	909	16%
Total	**2,814**	**6,535**	**43%**

Navy Medicine restructured CBRNE training programs to better support existing training requirements. The updated training includes standardized, formal courses, and the tri-service CBRNE electronic training program. The Navy Surgeon General mandated that all Navy Medicine personnel complete their training by 30 September 2006.

- CBRNE Emergency Medical Preparedness and Response Courses hosted on Navy E-Learning:
  - Clinician's Course – All Physicians (MC), Dentists (DC), Nurse Practitioners (NP), Physician Assistants (PA) and Independent Duty Corpsmen (IDC)
  - First Responder/Operator Course – Corpsmen (HM), Dental Techs (DT), Nurses (NC), Medical Service Corps Officers (MSC)
  - Executive/Commander's Course – Senior Leadership
  - Basic Awareness Course – All other non-medical DON personnel, civilian, and contactor
- Other training courses include:
  - Medical Management of Chemical and Biological Casualties Course (MCBC) – USAMRICID
  - Field Management of Chemical and Biological Casualties Course (FCBC) – USAMRICID
  - Medical Effects of Ionizing Radiation Field Course – AFRRI
  - Biological Warfare Detection Course (BWDC) – Biological Detection Research Department (BDRD) – This course is for Advanced Lab Technicians (NEC 8506) and Preventive Medicine Technicians (NEC 8432)

In FY05, Navy Medicine transitioned to a standardized and auditable reporting system for documentation of CBRN completions. It also provides data on clinician training by Corps. Non-medical/non-security medical department personnel were required to participate in the CBRN Basic Awareness Course posted on Navy e-Learning in FY05.

Presently, Navy clinicians attend the Management of Chemical, Biological and Radiological Casualties Course at USAMRICD, USAMRIID, or AFRRI. Further, two Medical Service Corps Officers are selected annually to complete a one-year fellowship at the US Army

Research Development and Engineering Command, Aberdeen Proving Ground, MD. Advanced training in the entire medical defense spectrum against chemical, biological and radiological agents, including environmental contaminates encountered during deployment, is provided. Specific focus on the planning and execution of military response and support to CBRN related events, both domestically and during conflict, is also emphasized. Additionally, Advanced Lab Technicians and Preventive Medicine Technicians receive Biological Warfare detection training provided by the Navy Medical Research Center (NMRC).

4.3.4.5 Unit Training Navy units conduct basic, intermediate, and advanced training exercises as part of the Inter-Deployment Training Cycle. During the basic training phase, CBR-D training exercises may involve additional unit training by CBR-D specialists from an Afloat Training Group (ATG) or Naval Construction Training Center.

After reporting to designated units, Navy personnel are required to complete basic and advanced CBR-D personal qualification standards (PQS) training. PQS is a compilation of the minimum knowledge and skills that an individual must demonstrate to stand watch or perform other specific duties necessary for the safety, security, or proper operation of a ship, aircraft or support system.

Naval Expeditionary Air units receive IPE fit testing and training in donning and doffing CB protective equipment (mask and JLIST suit). A total of ten (10) Naval Expeditionary Air squadrons and their associated 6,000 personnel received CBR-D training prior to their deployments overseas. Naval Air Systems Command (NAVAIR) in coordination with Commander Naval Air Forces (CNAF) forwarded a proposal to add Aviation-related ratings to be included as part of the source ratings to attend the CBR-D Operations and Training Specialist course in order to establish an organic CBR-D training capability within Naval Expeditionary Air squadrons.

Information on basic unit qualification CBR-D training tasks is provided in ***Table 4-13*** below.

Table 4-13 Navy Basic CBR-D Standards Complete CBR-D Fundamentals Personnel Qualification Standard to Locate and Transit Decontamination Station/ CCA Stations

• Locate and transit Decontamination station/ CCA stations • Locate Casualty Collection stations and Deep Shelter Stations • Don and doff Chemical Protective Ensemble • Change protective mask canister • Use the M-291 skin decontamination kit • Demonstrate self and buddy aid for nerve agent exposure • Identify CBR markers • Use M8 and M9 paper • Pass through CPS air lock/pressure lock • Decontaminate internal and external areas • Satisfactorily perform or simulate immediate actions for the following emergencies: nuclear attack, chemical attack, biological attack, nuclear radiation exposure, chemical agent exposure, and biological agent exposure.

4.3.4.6 Installation Training The OPNAV Instruction 3440.17, *Navy Installation Emergency Management Program (EMP),*" was signed July 7, 2005. EMP is a contingency plan for preparing for, mitigating the potential effects of, responding to, and recovering from all man-made and natural emergencies, including CBRN-D events. It is applicable to all Navy installations in the United States and overseas including active and reserve components, Navy civilians, Navy families, and Navy and non-Navy tenants on Navy installations. The Chief of Naval Installations assumes overall responsibility for the Navy installation EM Program. EMP uses a three "tiered approach" to training depending on installation size and criticality. Annually, all installations will be required to conduct a simulated CBRN TTX event. Larger bases are required to conduct the TTX and an all-hands Field Training Exercise. The instruction has already resulted in four significant accomplishments:

- All installation Fire Department Chiefs and 762 of 2,800 (27%) Naval Security Force (NSF) personnel received five days training (instructor classroom and hands-on demonstration) for Hazardous Material (HAZMAT) and CBRN-D Awareness. By the end of 2006, all NSF personnel will receive this training. A new course with 2 days of classroom and hands-on instruction will be preceded and supplemented by web-based NKO instruction.
- The first CNI CBRN TTE was conducted in late FY05, and is discussed briefly in section 4.4.3, Navy Exercises.
- Commander, Naval Facilities Engineering Command (NAVFAC), was tasked with assessing the status of and updating the approved equipment lists and the appropriate tables of allowance (TOA) for each installation. NAVFAC with NAVSEA has initiated bar coding or laser etching all CBRN-D related equipment. The program is referred to as the Consolidated Storage Initiative (CSI).
- The EMP instruction requires the 16 Navy Regional Commanders to further coordinate with counterparts at the Federal, Inter-Service, State and Local government. Though just implemented in July 2005, the Navy believes that this instruction was instrumental in accelerating and improving the Navy-Marine Corps response to the overall Joint response to Hurricanes Katrina, Rita and Wilma. Lessons learned are still under review and are expected to enhance response capabilities prior to the next emergency, natural or man-made.

Metric goal for non-IPP-related installation training: Provide specific results of implementing the instruction, and include information on Fire Chief, NSF students and Navy Regional Commander efforts in formalizing EMP memorandums of understanding/agreement and inter-service agreements, as applicable.

4.3.5 Marine Corps CBRN Defense Training

The Marine Corps trains its personnel to accomplish their wartime mission in any battlespace condition and in every environment. *Anytime* Chemical, Biological, Radiological, and Nuclear (CBRN) Defense is separated from other training events, it is conditioning Marines to regard CBRN Defense operations as a separate form of warfare. Complete integration of CBRN defense training will ensure that all Marines possess a thorough understanding of CBRN defense operations and procedures. All personnel must be trained to recognize CBRN attacks, don the field protective mask and protective clothing quickly, perform assigned missions

wearing protective clothing, and survive and continue to operate for extended periods in a CBRN environment. All Marine Corps organizations must continually integrate NBCD training to develop unit integrity, cohesion, and CBRN defense operational expertise.

4.3.5.1 Individual Training Annually, individual survival standards (ISS) training is conducted for all Marines using the standards of proficiency outlined in MCO 3400.3F, *Nuclear, Biological, and Chemical (NBC) Defense Training*, dated 1 March 2004. In conjunction with ISS training, all Marines complete an individual protective equipment (IPE) confidence exercise once per calendar year.

4.3.5.2 Unit Training Units must be able to perform to the basic operating standards of proficiency and CBRN defense team operations when conducting missions under CBRN conditions. These standards are outlined in MCO 3400.3F**.**

4.3.5.3 CBRN Defense Specialist Training Completion of the required initial basic instruction and sustainment of proficiency are paramount to the ability of the unit CBRN defense officer and CBRN defense specialist in accomplishing the mission of CBRN defense in respective units. The minimum training requirements for initial instruction and sustainment of proficiency are located in MCO 3500.70, *NBC Defense Training and Readiness Manual*. In addition to the *Training and Readiness Manual*, the Marine Corps developed and implemented a military occupational specialty (MOS) career roadmap for all enlisted CBRN defense specialists, Private through Master Gunnery Sergeant. As the name implies, the roadmap will provide a guide through the training and education continuum for our enlisted CBRN defense specialists. The roadmap outlines the combination of skill training (both MOS and other skill training), professional military education, and off-duty, voluntary education necessary to progress and refine those abilities necessary to increase combat readiness. ***Table 4-14*** provides a complete list of schools available for CBRN Officers/Specialists.

Table 4-14 USMC CBRN Defense Operating Force Training

Training Command	Type of Training	Training Duration
USMC CBRN Defense School	NBC Defense Specialist Basic Course	12 weeks
USMC CBRN Defense School	NBC Defense Officer Basic Course	7 weeks
USACMLS	Chemical Captains Career Course	26 weeks
USACMLS	Nuclear, Biological, Chemical Reconnaissance	6 weeks
USACMLS	Master Fox Scout	3 weeks
USACMLS	Radiological Safety (Installation Level)	3 weeks
USACMLS	Operational Radiation Safety	1 week
USA Red Stone	Technical Escort	3 weeks, 3 days
DNWS	Radiological Emergency Team Operations Course	9 days

4.3.5.4 <u>Marine Corps CBRN Defense Initiatives</u> Marine Corps CBRN defense initiatives are broken down into two areas, Operating Force Initiatives and Supporting Establishment Initiatives.

- *Operating Force Initiatives*. The Marine Corps' focal point for all CBRN defense issues resides under the Deputy Commandant for Combat Development and Integration (DC CD&I). The DC CD chartered an Operational Advisory Group (OAG) that has completed a 3-year effort where they have evaluated the Marine Air Ground Task Force's (MAGTF) ability to conduct the CBRN defense operations necessary to support the Marine Corps' Expeditionary Maneuver Warfare Concept. The evaluation assessed the doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF) necessary to support a MAGTF operating in a CBRN environment. The results of this evaluation were incorporated into a MAGTF CBRN Defense Operating Concept, which will serve as the basis for a rewrite of the Marine Corps Warfighting Publication 3-37, *MAGTF NBC Defense Operations*. The concept was approved by the Assistant Commandant of the Marine Corps in February 2005. DC CD&I will publish a CBRN Defense Campaign Plan to outline a time phased effort to transition the operating force to the new concept, and resolve numerous DOTMLPF deficiencies identified by the OAG. Operating Force Training is shown in ***Table 4-14***.
- *Supporting Establishment Initiatives*. The Deputy Commandant for Plans, Policies and Operations continued to improve the Marine Corps' installation first responder capability with equipment upgrades and training. Enhanced WMD-related exercises for installations include local communities that further cement our initial response capabilities. The completion of Joint Service Installation Pilot Project (JSIPP), continuation of Unconventional Nuclear Warfare Defense (UNWD), coupled with our First Responder Program provided a valuable tool for the preparedness of our installations. Camp Pendleton, CA will be the first Marine Corps installation inducted into the Guardian (Lite) project during FY05 and further enhance the Marine Corps' Installation Protection Program.

The Marine Corps continued CBRNE Tier III equipment upgrades for its installations improving responder capabilities in line with local communities and other DOD programs. The combination of various sustainment training identified in ***Table 4-15*** was provided to seven Marine Corps installations: 29 Palms, CA, MC Air Station Cherry Point, NC, MC Air Station Miramar, CA, MC Base Camp Pendleton, CA, MC Base Camp LeJeune, NC, MC Base Hawaii, and Camp Fuji, Japan.

Table 4-15 USMC CBRN Defense Supporting Establishment Training

Course Name	Course Location/Duration
CBRN Awareness	Mobile Training Team / 4 hrs
CBRN Operations	MTT / 4hrs
Incident Command	MTT / 8 hrs
Hazmat Technician	MTT / 16 hrs
CBRN EMT Technician	MTT / 8 hrs
Healthcare CBRNE Provider	MTT / 8 hrs
Command and Staff	MTT / 2-4 hrs
Healthcare CBRNE Provider	MTT / 8 hrs
Command and Staff	MTT / 2-4 hrs
Bio Agent Detection/ ID	MTT / 8hrs
CBRNE Counter Terrorism Awareness for Employees	MTT / 2hrs
Chemical Agent Detection/ID	MTT / 8hrs
CBRNE Counter Terrorism Pre-Incident Planning	MTT / 8hrs
Advanced CB for Clandestine Operations	MTT / 16hrs
Basic Biology	MTT / 8hrs
National Incident Management System (NIMS)	MTT / 4hrs
CBRNE Crime Scene Evidence Collection	MTT / 8hrs
First Responder Improvised Explosive Devices	MTT / 4hrs

4.3.6 Armed Forces Radiobiology Research Institute Training

The Armed Forces Radiobiology Research Institute (AFRRI) is a tri-service organization that develops, organizes and conducts the post-graduate level Medical Effects of Ionizing Radiation (MEIR) Course for medical professionals and ancillary health care providers. The course is partially supported by the U.S. Army Office of the Surgeon General in coordination the Defense Health Program. The MEIR Course is designed to improve the operational capabilities of the military services by providing medical and operational personnel with up-to-date information concerning the biomedical consequences of radiation exposure, how the effects can be reduced, and how to medically manage casualties. The training, formerly known as the Medical Effects of Nuclear Weapons Course, was expanded to include nuclear or radiological incidents that can occur on or off the battlefield and that go beyond nuclear weapons events.

The MEIR Course generally travels to host installations worldwide and is always tailored to meet the needs of the specific audience. Four variations of the course are available, all sharing a common core, but with differing lengths to accommodate greater breadth and depth of coverage as needed. The variations include the:

- Mini-MEIR – A 1-day course that focuses primarily on the medical/health and psychological effects of radiation
- MEIR – The standard 2.5-day course taught regularly in the Washington, DC area and at other locations by request. This course is most frequently requested and covers thoroughly the four key subjects of health physics, biological effects of radiation,

medical/health effects, and psychological effects.

- MEIR Scientific Update – A four day course taught once a year in residence at AFRRI. This course incorporates everything in the standard MEIR course plus lectures by leading scientists on the latest developments in radiobiological research. It is the most academic of the four course offerings.
- MEIR Field Course – This 1-week course is the longest version of the four and is taught once or twice a year only at Kirtland AFB where the unique facilities needed are located. It includes everything from the standard MEIR plus preparation for and conduct of actual field exercises. The course culminates with a day in the field during which students, dressed in full protective gear, rescue role-playing victims at a real air crash site on the base in an area of low-level radiological contamination. This is the least academic and the most applied, hands-on version of the course.

Continuing education credits are granted for successful completion of the MEIR course and the Uniformed Services University of the Health Sciences (USUHS) is the certifying authority. The USUHS grants Continuing Nursing Education (CNE) credits as institution of the American Nurses Credentialing Center's Commission on Accreditation. Accreditation refers to recognition of continuing nursing education activities only and does not imply Commission on Accreditation approval or endorsement of any commercial product. The USUHS grants Continuing Medical Education (CME) credits as an accredited institution of the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians. This activity has been approved for American Medical Association (AMA), Category 1, Physician's Recognition Award (PRA) credit.

4.3.7 Defense Threat Reduction Agency (DTRA) Training

The Defense Threat Reduction Agency (DTRA) is designated as the Department of Defense (DOD) Executive Agent for providing the warfighter with topical information relating to nuclear weapons. As part of DTRA, the Defense Nuclear Weapons School (DNWS) is the only DOD school for courses that familiarize the U.S. nuclear community with the national nuclear weapons stockpile and the nuclear weapons program. In addition, DNWS also provides training to the global nuclear community in nuclear weapons accident response procedures. To ensure comprehensive training, the DNWS maintains the DOD's only radioactive field training sites, as well as an extensive classified nuclear weapons display area. The DNWS trains students from all levels of DOD, federal and state agencies, and allied countries. The school provides specialized training in U.S. nuclear weapons, incident response, and counterproliferation with emphasis on operational support.

In FY 2006 the Defense Threat Reduction Agency (DTRA) will develop a Defense Threat Reduction University (DTRU) with a coordinated CBRNE education, training, and research capability operating at the international, federal, state, and local levels. The Agency is working closely with the CBD Program Office, the US Army Chemical School, and the Joint Staff on this initiative. As one of its first steps, the DTRU will publish a catalog of all of the individual and collective training courses that are conducted by DTRA, including that conducted by the DNWS. The DTRU will also establish qualification standards for CBRNE subject matter experts (SMEs) who act as instructors. DTRA estimates an Initial Operational Capability (IOC) of FY 2008.

4.3.8 Joint CBRN Defense Training

A JRO initiative assists the combatant commands reduce CBRN defense-related training gaps by working within the Joint Training System (JTS). This is accomplished by providing: CBRN defense familiarization training to staffs, subject matter expert support to exercises from concept development through lessons learned, and other related exercise execution support. Part of the JRO initiative is the Joint Senior Leaders Course (JSLC). JSLC is sponsored by the JRO and conducted at the USACMLS in Ft Leonard Wood, MO three times per year. This course is designed to offer critical elements of CBRN defense subject matter expertise, with an operational to strategic-level focus, to senior leaders who wish to augment their understanding of current CBRN issues. The highlight of JSLC continues to be the opportunity to conduct toxic agent training at the Chemical Defense Training Facility (CDTF). This training allows senior leaders to experience actual conditions in a contaminated environment. JSLC also provides a forum for senior leaders to exchange ideas and gain a familiarization with current CBRN defense issues. See ***Table 4-16.***

Table 4-16 Joint Senior Leaders Course (JSLC) 2005

Component	Number Attended
Army	8
Army Reserve	10
Army National Guard	13
Marine Corps	4
Marine Corps Reserve	0
Navy	8
Navy Reserve	5
Coast Guard	3
Air Force	13
Air Force Reserve	1
Air National Guard	4
Foreign Military	2
Civilian/Other Agency	22
TOTAL	**93**

Other JRO initiatives and activities included the following:

- Provided Mobile Training Team (MTT) sessions of the Joint Chemical, Biological, Radiological, and Nuclear Familiarization Course (JCBRNFC) at United States Northern Command; Marine Corps Medical Logistics Detachment (San Diego, California); and US Coast Guard Pacific Area and 11th District Headquarters with total audience of 148 students. The JCBRNFC is designed to familiarize Joint Staff Officers with the threat of CBRN weapons, joint force NBC defense, and joint staff officer NBC roles and responsibilities. This 12- hour curriculum reinforced participants' awareness of the CBRN proliferation threat, and of their potential roles in combating WMD while serving in the billets to which they are assigned.

- Conducted a Biological Senior Level Seminar (SLS) at United States Forces Korea (USFK) with the objective to educate and inform seminar participants about the North Korea Biological Threat, its potential impact and associated battlefield planning and actions. The seminar supported the USFK staff in their preparation for Exercise Ulchi Focus Lense and future revisions of operational and contingency plans. Participants included 80 Republic of Korea and United States senior military leaders (O6 and above) from the Combined Forces Command and USFK staffs and component commands including General Laporte (Commander, CFC) and General Kim (Deputy Commander, CFC). Two major portions of the seminar included lectures on the biological threat and biological agent impacts and mitigating actions.
- During 2005, the Joint CBRN Defense Capabilities Improvement Initiative Team (JCBRN CIIT) continued to integrate new JCBRN processes and developments into the Joint National Training Capability and Joint Training System in order to provide and improve CBRN defense capability to the warfighter. This organization codified a formal working relationship between the JRO and Joint Forces Command (JFCOM) to improve current and emerging joint force warfighting and supporting capability in a CBRN environment. Under the JRO lead, the JCBRN CIIT assisted Combatant Commanders (COCOM) with CBRN-related tasks/missions in each of the four phases of the JTS - Requirements, Plans, Execution and Assessment. The JCBRN CIIT provided support to three COCOMs: United States Pacific Command, United States Northern Command, and United States European Command. (See Section 4.4.5 for details.)

4.4 EXERCISES

During 2005, the Services and joint organizations planned and developed scenarios and conducted exercises that integrated CBRN considerations to varying degrees. Some exercises were specifically designed to respond to CBRN-related events while others added CBRN defense considerations into the master scenario events list as a condition of the battlefield. The following sections highlight service and joint organization exercise activities that dealt with CBRN events in exercises.

4.4.1 Army Exercises

4.4.1.1 AMEDD CBRN Defense Exercise Program Initiatives The AMEDD CBRN Exercise Program (ACEP), under the auspices of the Army Office of The Surgeon General (OTSG) and the United States Army Medical Command (USAMEDCOM), is dedicated to developing, testing, refining, and/or validating medical CBRN operational concepts, capabilities, command and control (C2) relationships, policies, and TTPs for the AMEDD. The ACEP achieves results by executing a series of unit,/installation/joint/international/MTF exercises and directing the outcomes of these events to further develop and enhance all levels of USAMEDCOM's CBRN defense readiness.

The focus of the FY05 ACEP program was to enhance CBRN defense medical capabilities for deploying units and homeland defense forces through hazard analysis, professional CBRN training and exercises, and operational support to medical organizations in all facets of medical CBRN operations. This included soldier training, validation of doctrine and policy, management of operational issues and deployments, and participation in the North

Atlantic Treaty Organization (NATO) medical policy and Standardization Agreements (STANAGs). In FY05, the ACEP successfully executed one Corps-level exercise, four TTXs, two command post exercises, and two international exercises.

Additionally, USAMEDCOM complies with the Joint Commission on Accreditation of Health Care Organizations (JCAHO) recommended external emergency/mass casualty exercises twice a year at all Military Treatment Facilities (MTF); one of these semi-annual exercises includes reaction to a CBRNE incident in accordance with MEDCOM Regulation 525-4, *Emergency Preparedness*. MTF Commanders are encouraged to conduct their MTF exercises in conjunction with those of the installations on which they are located. Forty-six USAMEDCOM MTFs have been supplied with decontamination equipment and train in patient decontamination regularly. USAMEDCOM is also developing a Pandemic Influenza Preparation and Response Plan and conducting a series of exercises to test the plan in FY06.

4.4.2 Air Force Exercises

All AF installations are required to develop scenarios and conduct exercises based on the installation's Full Spectrum Threat Response (FSTR) Plan 10-2 and other emergency plans. The Joint Operational Effects Federation (JOEF) demonstrated capabilities to the Air Force during the Peninsula Combat Employment Readiness Exercise (Exercise Pencere) November 6-10, 2005 in Osan Korea. ***Table 4-17*** is a summary of all Air Force CBRNE Defense Exercise requirements based on threat location. ***Table 4-18*** below is a summary of the types and frequencies of exercises that installations must conduct.

Table 4-17 Air Force CBRNE Defense Exercise Requirements

CBRNE Threat Area [9]	Minimum Exercise Requirements
Low	**Annually** - Conduct attack response exercise implementing the base FSTR Plan 10-2 and other contingency plans (*i.e.*, CBRN, terrorist, or conventional attack). - Conduct an attack response exercise for units' mobility commitments based upon the threat at deployment locations.
Medium	**Semiannually** - Conduct attack response exercise implementing the base FSTR Plan 10-2, BSP, and other contingency plans (*i.e.*, CBRN, terrorist, or conventional attack). One exercise may be satisfied by a tabletop exercise. - Conduct attack response exercise for unit mobility commitments based on the threat at deployment locations. One exercise can be satisfied by a tabletop exercise.
High	**Semiannually** - Conduct attack response exercises implementing the base FSTR Plan 10-2, BSP, and other contingency plans.

[9] Air Force installations within these geographical locations are categorized as CBRNE high, medium or low threat areas based on threats posed by enemy ranges of theater ballistic missiles (TBMs). However, bases also face threats other than missile-delivered weapons, to include infiltrators, witting or unwitting human vectors infected with contagious BW agent, off-base dispensing of agent from ground sources, and aerial dispersal from aircraft that remain outside the base perimeter.

Table 4-18. Installation Full Spectrum Threat Exercise Requirements

Type of Exercise	Category	Frequency [10]	Remarks
Major Accidents	Munitions	Annually	Applies only to the munitions at the installation.
	Radioactive material	Annually	Applies only if the installation is an Air Force fixed nuclear facility.
	Nuclear weapons	Annually [11]	
	Off-base response	Annually	
	Mass casualties	Annually	
	Air Show Response	As applicable [12]	
	HAZMAT Team	Annually	
Terrorist Use of WMD	Chemical, radiological, nuclear or high-yield explosive incident	Biannually	Execute cross-functionally according to the local WMD threat; incorporate all local response elements. Alternate annually between the two categories of Terrorist Use of WMD exercises.
	Biological Attack incident	Biannually	
Enemy Attack	CBRNE Low Threat Area	Not to Exceed 15 Months	Implement FSTR Plan 10-2 and other contingency plans.
		Not to Exceed 15 Months	Exercise unit's mobility commitments.
	CBRNE Medium Threat Area	Not to Exceed 7.5 Months	Implement FSTR Plan 10-2, BSP and other contingency plans. Integrate exercise requirements for units with mobility commitments.
	CBRNE High Threat Area	Quarterly	Implement FSTR Plan 10-2, BSP and other contingency plans.

In FY2004-05 the Air Force Medical Service conducted a medically centric TTX Code Silver that included wing and civilian community CBRNE responders. This TTX was conducted at 91 installations (80active duty, 11 Air National Guard). TTX Code Silver

[10] Exercise frequency requirements are minimum, and may be increased by the EET Chief as approved by the installation RWG.

[11] CONUS MAJCOM RTF and the OSC exercise at least every other year. The theater commander determines RTF exercise frequency in OCONUS areas.

[12] CONUS MAJCOM RTF and the OSC exercise at least every other year. The theater commander determines RTF exercise frequency in OCONUS areas.

provided the medical treatment facilities, installation and civilian responders the opportunity to respond to a CBRNE event that would generate 300 casualties in the first 24-72 hours. Responders from Civil Engineering, Public Affairs, Medical Group, and Wing leadership were among some of the participants who responded to a decision-based scenario, cues, player input, and focused questions to deal with the consequences of an event. This team building exercise permitted installation personnel to identify shortfalls in planning through cross communication and senior leadership involvement.

4.4.3 Navy Exercises

In accordance with the updated Navy instruction for installation protection, all Navy installations are required to conduct annual simulated TTX CBRN events. The larger bases are required to conduct tabletop and all-hands field training exercises every three years.

Naval Base Guam conducted the first CBRN TTE in late FY 2005 with CNI and Pacific Command monitored the exercise. A second TTX was conducted at Naval Base Norfolk in mid-November 2005. Lessons learned from these two exercises will result in installation templates being developed by the Commander, Naval Facilities Engineering Command.

Exercise Dingo King 2005 was a nuclear accident/incident-related event conducted in August 2005. Fleet and installation personnel participated. Lessons learned are being be applied to CBRNE counter-preparation for other Navy applications.

In 2005, the Navy participated in the several NORTHCOM exercises with interagency, federal, State and local officials including:

- Exercise Ardent Sentry 2005, a biological event-related exercise,
- Exercise Topoff 3, a chemical event-related exercise, April 2005;
- Exercise Northern Edge 2005, a terrorist induced exercise consisting of biological, high yield explosives and chemical simulation, August 2005.

The Navy also participated in Exercise Vigilant Shield 2006 in November 2005; however, portions of the exercise were cancelled due to Hurricanes Katrina and Rita.

4.4.4 Marine Corps Exercises

The following CBRN defense training was conducted by Marine Forces Atlantic (MARFORLANT).

- 12 January – 11 February. Chemical Biological Incident Response Force (CBIRF) Enhanced NBC Training with 26th Marine Expeditionary Unit. CBIRF conducted enhanced NBC training with MEU personnel in preparation for upcoming deployment. Training prepares the unit to be ale to respond to a possible CBRN consequence management event.
- 18 January – 11 February. CBIRF Enhanced NBC Training with 13th Marine Expeditionary Unit. CBIRF conducted enhanced NBC training with MEU personnel in preparation for upcoming deployment. Training prepares the unit to be ale to respond to a possible CBRN consequence management event.
- 1-12 February. CBIRF Enhanced NBC Training with 1st Force Service Support Group. CBIRF conducted enhanced NBC training with MEU personnel in preparation for

upcoming deployment. Training prepares the unit to be ale to respond to a possible CBRN consequence management event.

- 7 February – 8 March. CBIRF supported Neon Falcon 05 Mobile Training Team, Bahrain. CBIRF participated in a consequence management training event.
- 14-25 March. CBIRF Enhanced NBC Training with 2d Force Service Support Group. CBIRF conducted enhanced NBC training with MEU personnel in preparation for upcoming deployment. Training prepares the unit to be ale to respond to a possible CBRN consequence management event.
- 4-10 April. CBIRF participated in Exercise Ardent Sentry, a consequence management training event.
- 17-20 May. CBIRF participated in Capabilities Exercise aboard Camp LeJeune, NC CBIRF participated in a Marine Corps capabilities demonstration.
- 13 June – 8 July. CBIRF Enhanced NBC Training with 22nd Marine Expeditionary Unit. CBIRF conducted enhanced NBC training with MEU personnel in preparation for upcoming deployment. Training prepares the unit to be ale to respond to a possible CBRN consequence management event.
- 20-30 June. CBIRF conducted live agent Chemical training in Suffield, Canada. CBIRF conducts live agent training twice a year to maintain proficiency with equipment and procedures.
- During October 2004, 2nd MLG CBRN training in support of deployment to OIF. CBIRF conducted enhanced NBC training with MEU personnel in preparation for upcoming deployment. Training prepares the unit to be ale to respond to a possible CBRN consequence management event.
- During the period September/October 2005, 2nd MAW conducted CBRN training in support of the JPACE/JSAM programs. MARFORLANT supported new equipment testing and training for JPACE/JSAM with personnel from 2nd MAW in order to facilitate future fielding requirements.

Marine Forces Pacific (MARFORPAC) CBRN Defense Training

- Headquarters MARFORPAC Joint CBRN Training**.**
    - Exercise Terminal Fury (December 2004). This exercise consisted of multi-service participation (Joint Headquarters architecture with U.S. Marine and Army units) and involved activation of the NBC Warning and Reporting System using the Joint Warning and Reporting Network (JWARN) software suite, coupled with the Command and Control Personal Computer (C2PC) software program.
    - Exercise RSO&I (March 2005). MARFORPAC units participated in this annual USFK exercise conducting NBCD planning and execution, while exercising the NBC Warning and Reporting System using the Joint Warning and Reporting Network (JWARN) software suite, coupled with the Command and Control Personal Computer (C2PC) software program.
    - Exercise Ulchi Focus Lens (August 2005). MARFORPAC units participated in this USFK sponsored exercise including exercising the NBC Warning and Reporting Network System using the Joint Warning and Reporting Network (JWARN) software suite, coupled with the Command and Control Personal Computer (C2PC) software program. Within the construct of the exercise, U. S. Marine Corps units

actively engaged in NBC scenario development and execution with Combined forces.

- MARFORPAC CBRN Defense Training and Initiatives
    - Counter Chemical Warfare (CCW) development, experimentation and validation of CCW doctrine, tactics, techniques and procedures. Through the evaluation of CCW the Commander MARFORPAC intends to improve the way our forces operate in a contaminated environment.
- I MEF
    - CBRN Defense Training. I MEF conducted two NBC Control Center exercises with MNFI, March and August 2005.
    - Contractors in support of V Corps conducted two Joint Warning and Reporting Network (JWARN) periods of instruction for 40 personnel within the I MEF.
    - Enhanced NBC Suite (E-NBC) training was conducted for the 13th Marine Expeditionary Unit (MEU) as well as the 1st Marine Logistics Group (MLG) for their pre-deployment training.
    - 13th MEU conducted one E-NBC exercise. Conducted enhanced NBC training with MEU personnel in preparation for upcoming deployment. Training prepares the unit to be ale to respond to a possible CBRN consequence management event.
    - 3d MAW units aggressively embarked upon a training program throughout their areas of responsibility; conducting five NBC Defense Officer/Enlisted classes, providing instruction to over 130 USMC and USN Army personnel through a one week training course, and conducting numerous drills and training exercises aboard each airbase during OIF II in preparation for real world missions.
    - CBRN Defense Conference and Operational Advisory Group (OAG). I MEF and its three MSCs(1st MARDIV, 1st MLG, and 3D MAW) participated in the OAG conference; a task-based group of Subject Matter Experts (SMEs) evaluating CBRN Defense and presenting solutions at the NBC Conference.
    - In preparation for OIF II-2 and OIF 04-06 combat operations, I MEF units conducted CBRN Basic Survival Standard and Basic Operating Standard periods of instruction, as command directed.
    - MEF and MSC CBRN Defense Officers conducted 7 NBC Anti-terrorism/Force Protection (AT/FP) inspections at all camps located in Iraq, under the I MEF command, during OIF II-2. The result of these inspections provided innumerable hours of training time as well as measures to resolve potential shortcomings.
- III Marine Expeditionary Force (III MEF) Joint CBRN Defense Training.
    - Exercise Terminal Fury. This exercise consisted of multi-service participation (Joint Headquarters architecture with U.S. Marine and Army units) and involved activation of the NBC Warning and Reporting System using the Joint Warning and Reporting Network (JWARN) software suite, coupled with the Command and Control Personal Computer (C2PC) software program.
    - Exercise RSO&I. III MEF units conducted CBRN Defense planning and execution for this annual USFK exercise, actively participating in CBRN

Defense operational scenarios which included the full range of operational functions, e.g., detector emplacement/detection plan, decontamination planning, and developing scenarios in a Chemical and Biological contaminated environment. When the mission scenario event list depicts a CBRN attack in the virtual world, units reciprocated with CBRN Defense battle operations and donned appropriate MOPP levels for the time duration required. This exercise also integrated Theater Area Missile Defense (TAMD) training in warning and reporting networks.

- Exercise Ulchi Focus Lens (UFL). III MEF units participated in UFL with focused objectives, which included exercising the NBC Warning and Reporting Network (via JWARN), activating MEF and Major Subordinate Command local warning systems, and conducting limited monitoring operations. Within the construct of the exercise, Marine Corps units actively engaged in CBRN Defense scenario development and execution with Combined forces. The Marine Corps Tactical Systems Support Agency (MCTSSA) provided JWARN support and training.

- III MEF CBRN Defense Training and Initiatives.
  - Exercise Ryukyu Warrior I. Marine Wing Support Group (MWSG) 17 validated their Counter-Chemical Warfare (CCW) Tactics, Techniques, and Procedures (TTP) in support of 1st Marine Aircraft Wing's Counter-CBRN DEFENSE initiative. The MWSG exercised zone establishment, CBRN Warning and Reporting, Medical Mass Casualty in a simulated contaminated environment, and contaminated waste control and disposal methods.
  - CBRN Defense Operational Advisory Group (OAG), October 2005. III MEF participated in the OAG conference; a task-based group of Subject Matter Experts (SMEs) evaluating CBRN Defense and presenting solutions.
  - The Marine Corps Tactical Systems Support Agency (MCTSSA) provided JWARN Training for 24 personnel.
  - Enhanced NBC Suite (E-NBC) training was conducted for the 31st Marine Expeditionary Unit (MEU) and 3rd Material Logistics Group (MLG) for their pre-deployment training**.** The training included a Situational Training Exercise (STX), which included the following missions: Identification, Casualty Extraction, Dirty Bomb Scenario, and a Capabilities Exercise to identify an unknown toxic industrial chemical (TIC) and extract personnel.
  - The III MEF Special Operations and Training Group (SOTG) integrated and evaluated E-NBC during the 31st MEU Special Operations Capable (SOC) Exercise. An E-NBC team accompanied by the Maritime Special Purpose Force (MSPF) conducting a helicopter insertion and extraction to verify simulated agent pre-cursors.
  - The 31st MEU conducted E-NBC equipment and employment familiarization training with the Philippine Marines during Philippine Bi-Lateral Exercise (PHIBLEX)**.**
  - The Joint Equipment Assessment Units WESTPAC and Hawaii provided training on the Joint Service Mask Leakage Tester (JSMLT) to III MEF

personnel in order to support a 100 percent M40A1 Field Protective Mask serviceability inspection.
- The 1st MAW Commanding General published 1st MAW FRAGO 05-G3-002 in order to define, develop, experiment, and validate the Counter Chemical Warfare concept within 1st MAW to ensure the Wing possesses the capability to sustain sortie generation in a chemical environment. This was an exercise to determine the Wings capability to continue missions in a chemical environment.
- III MEF CBRN Defense Professional Military Education (PME) for Military Occupational Specialty (MOS) 5702 and 5711. This PME program is designed to maintain MOS proficiency and enhance professional development. Monthly lectures and training included; E-NBC, NBC Reconnaissance, Chemical Casualty Decontamination, and Fixed Site Operations.
- III MEF participated in the Republic of Korea Army (TROKA) talks. CBRN related discussions included task organization, command relationships, CBRN Defense Standing Operating Procedures, and CBRN Defense capabilities.

4.4.5 Joint Exercises

JRO and CBRN Capabilities Improvement Initiative Team (CIIT) - Joint Forces Command support to COCOMs, JTF-CS and Services in 2005 is outlined below. This support included academic support, exercise concept development, scenario writing support, master scenario event list (MSEL) writing, collection plan development, observer/trainer support, after action writing and lessons learned writing support:

4.4.5.1 Northern Command (NORTHCOM) – Exercise Northern Edge 2005 (NE-05):

- JRO/CIIT provided SME support to the academics phase in the form of a TTX prior to the execution of NE-05. The TTX began with initial presentations focusing on the strategic, operational and tactical challenges facing the participants in a large scale bioterrorism event affecting the rim communities of Alaska. Following these presentations, several vignettes were provided to the participants to spur open discussion and identification of key policy and procedural issues at the executive/administration level that need resolution prior to the full-scale exercise (or actual event).
- During NE-05, JRO/CIIT provided SME and analytical support to Joint Task Force - Alaska as well as the NORTHCOM Joint Exercise Control Group. NE-05 was a five-day, homeland defense exercise comprised of simulated natural disasters and terrorist events, including earthquakes, aircraft crashes and anthrax attacks in 21 communities statewide. This exercise allowed nearly 5,000 people from local, state and federal agencies to train on how to respond effectively to a wide range of emergencies. These agencies included: Alaska Division of Homeland Security and Emergency Management, Department of Defense, Alaska Army National Guard and Air National Guard, Federal Emergency Management Agency Region 10, Transportation Security Administration, Federal Aviation Administration and the FBI.
- Coalition Warrior Interoperability Demonstration 2006 (CWID 2005). JPEO-CBD/JPM IS participated in CWID 06 hosted by NORTHCOM and is the Chairman's annual event that enables U.S. Combatant Commanders, national civil authorities and the

International community to investigate C4 solutions that focus on relevant and timely objectives for enhancing coalition interoperability and exploring new partnerships. A total of 78 systems participated in the HLD/HLS focused CWID. There were four CBRN/TIM CONUS events called Trials involving military, First Responders, and Military (COCOM) cooperation. JPM IS participated in three of the events demonstrating abilities:

- Rapid, sharing of CBRN information across Civilian and Military Command and Control (C2) domains
- JPM IS demonstrated JWARN / JEM communications across 3 geographically distributed sites (VA, CO, and CA). Sent NBC & USMTF messages and displaying the results on COP
- JWARN interoperable, near-real time demonstration with other non-ORD specified products (including a Civilian medical product)
- JWARN web-based cross-domain prototype demonstration using web services
- JEM built and demonstrated new plume capabilities
- JEM geo-referenced overlays displayed on GCCS, C2PC, and IIMS and were used to calculate which assets were exposed

- JWARN used in V Corps Victory Surge Exercise (Oct - Nov 05) in preparation for V Corps deployment to Iraq

4.4.5.2 Pacific Command (PACOM)

- Pandemic Influenza Tabletop Exercise. JRO/CIIT assisted PACOM in the planning and execution of a Pandemic Influenza TTX, 15-16 November 2005. Major objectives of this TTX were to develop a greater understanding of PACOM area of responsibility (AOR) country capabilities, expected responses to pandemic influenza and to identify further steps necessary to finalize the PACOM Pandemic Influenza Event Response Concept of Operations. The JRO provided logistic (playbooks, classroom, billeting), vignette and scenario writing and facilitation support to this event. More than 100 participants from Office to the Secretary of Defense (OSD), Department of Defense (DOD) and non-DOD governmental agencies, World Health Organization (WHO) and Center for Disease Control (CDC) took part in this TTX. Support included exercise planning of this exercise, scenario development, administrative support, facilitation and follow-on analysis in conjunction with USPACOM.
- Reception, Staging, Onward Movement and Integration-05 (RSOI-05) Exercise. (PACOM/USFK). JRO support included the provision of exercise analysts and SMEs. Furthermore, JRO and CIIT involvement/support focused on biological sample transfer training for the USFK Staff, as well as writing the draft concept of operations for sample transfer for the Korean peninsula. Sample transfer refers to the processes, procedures and concept of operations for controlling movement of contaminated materials for sampling purposes.

4.4.5.3 European Command (EUCOM)

- Exercise Flexible Response 2006 (FR-06). JRO and CIIT provided EUCOM analytical and CBRN SME support during exercise FR-06. The overall purpose of the exercise was to train EUCOM and service component staffs in strategic level consequence

management (CM) and foreign consequence management (FCM). This was one of the more robust and comprehensive FCM exercises the JRO team has seen. What was truly unique about this exercise is the fact that the primary training objective was CBRN FCM.

- Major exercise participants included USEUCOM, USAFEUR, and CNE-C6F staffs. The Defense Threat Reduction Agency (DTRA) also heavily supported this exercise with SME personnel and funding. NATO, host nations, and Department of State provided response cells or individual representatives. JRO/CIIT SME's supported EUCOM's Joint Exercise Control Group in developing and executing the exercise.

4.4.5.4 Southern Command (SOUTHCOM)

- Exercise Fuertes Defensas 2005 (FD-05). The JRO/CIIT supported SOUTHCOM by providing SMEs (via reachback technology) to assist in developing exercise scenario, biological medical training objectives, and MSEL injects to the exercise.
- FD-05 focused on crisis action planning and intelligence flow of information.

4.4.5.5 Strategic Command (STRATCOM)

- In support of a WMD TTX Exercise, the JRO/CIIT supported STRATCOM by providing assistance in scenario development, preparation of facilitator questions, construction of tabletop books, and execution of the tabletop exercise event. CIIT supported both USJFCOM and USTRATCOM during the development of this short notice event.
- During this exercise, STRATCOM evaluated its own and other governmental agencies' capabilities in responding to a WMD interdiction scenario. The primary objective of this exercise was to identify Department of Defense operational/tactical roles and functions, planning processes, and interactions related to WMD Interdiction.

4.4.5.6 Joint Task Force-Civil Support (JTF-CS) Exercise Support

- JTF-CS Deployment Exercise 2005. JRO/CIIT provided exercise design, concept development, MSEL development and observer/trainer support to this exercise. This training event was an internal, command directed, no-notice deployment exercise. Its primary objective was to test JTF-CS staff's ability to meet its requirement to fully deploy the JTF, while maintaining situational awareness, in response to an event with little or no warning. It was conducted at Ft Monroe, VA and at the Virginia Beach Armory 15 to 17 June 2005.
- Sudden Response 2005 (SR-05). JRO/CIIT provided concept development, MSEL development, collection plan design, observer/trainer and senior mentor support to this exercise. JTF-CS conducted SR-05 15-19 August 2005 at Fort Monroe, VA. The JTF was employed as an Operational Level Headquarters conducting tactical operations in support of a lead federal agency. The Scenario involved a simulated terrorist attack (10kt nuclear device) in vicinity of Veterans Terminal in Charleston, SC. Exercise participants included the JTF-CS, NORTHCOM (role players), response TF Headquarters (role players), interagency players, and local responders. Major exercise objectives were to deploy JTF-CS, conduct a command post exercise in conjunction with all consequence management partners and integrate local responders.

4.4.5.7 Headquarters, 5th U.S. Army

- Rotunda Thunda 2005 (RT-05). JRO/CIIT provided MSEL development, observers and SME role players for this exercise in support of 5th Army's role as Army North (ARNORTH). JRO and CIIT personnel supported this exercise while serving as CBRN and consequence management SMEs on the 5th Army Staff, Medical Teams and as Task Force Role Players.
- During the exercise, 5th Army established JTF-CM-West with the Main Command Post at Fort Sam Houston, TX and the Operational Command Post (OCP) deployed to Nellis AFB, NV. From these Command Posts, 5th Army provided command and control to all NORTHCOM-directed DOD assets (minus USACE and JSOTF) supporting the primary agency (FEMA) in incident management and disaster relief operations due to simulated multiple terrorist events and a simulated natural disaster in Clark County, NV.

4.5 CBRN DEFENSE DOCTRINE

CBRN Defense doctrine exists at the joint, multi-service and Service levels. Initiatives have continued through 2005 that have supported efforts to make CBRN defense doctrine more integrated, relevant and current. Each Service (including National Guard Bureau and Reserve Components) has CBRN defense doctrine that supports or is integrated into the multi-Service doctrine/TTP manuals developed by the four Services. The core Joint and Multi-Service, and Service unique CBRN Defense doctrine publications are listed in ***Table 4-19*****.**

Table 4-19 Core CBRN Defense Doctrine

Publication	Status/Comment	Army	Air Force	Navy	Marine Corps
Joint Publication 3-11, *Joint Operations in a Nuclear, Biological, and Chemical Environment,* 11 July 2000	Joint Doctrine	•	•	•	•
Joint Publication 3-26, Joint Doctrine for Homeland Security	Joint Doctrine (Under development)	•	•	•	•
Joint Publication 4-02, *Doctrine for Health Service in Joint Operations,* July 2001	Joint Doctrine (Under revision)	•	•	•	•
Joint Publication 3-40, *Joint Doctrine for Combating Weapons of Mass Destruction*	Joint Doctrine	•	•	•	•
Joint Publication 3-41, *Joint Tactics, Techniques and Procedures for CBRN Consequence Management*	Joint Doctrine (Under development)	•	•	•	•
Multi-Service Tactics, Techniques, and Procedures (MTTP) for NBC Defense of Theater Fixed Sites, Ports and Airfields	Multi-Service Doctrine	FM 3-11.34	AFTTP (I)3-2.33	NTTP 3-11.23	MCWP 3-37.5
MTTP for—CBRN—Contamination Avoidance	Multi-Service Doctrine (FM 3-11.3 under revision)	FM 3-11.3[13]	AFTTP 3-2.56	NTTP 3-11.25	MCRP 3-37.2A

[13] FM 3-11.3 under revision

Publication	Status/Comment	Army	Air Force	Navy	Marine Corps
Nuclear Contamination Avoidance	Multi-Service Doctrine (FM 3-11.3 under revision)	Part of 3-11.3[14]	Part of AFTTP 3-2.56	Part of 3-11.25	MCRP 3-37.2B
MTTP for NBC Aspects of Consequence Management	Multi-Service Doctrine	FM 3-11.21	AFTTP (I)3-2.37	NTTP 3-11.24	MCRP 3-37.2C
MTTP for NBC Defense Operations	Multi-Service Doctrine	FM 3-11	AFTTYP(I) 3-2.42	NWP 3-11	MCWP 3-37.1
MTTP for CBRN Decontamination	Multi-Service Doctrine (FM 3-11.5 under revision)	FM 3-11.5[14]	AFTTP (I) 3-2.60	NWP 3-11.26	MCWP 3-37.3
MTTP for NBC Protection	Multi-Service Doctrine	FM 3-11.4	AFTTP (I) 3-2.46	NWP 3-11.27	MCWP 3-37.2
Field Behavior of NBC Agents (including smoke and incendiaries)	Multi-Service Doctrine	FM 3-6	AFM 105-7		FMFM 7-11-H
NBC Field Handbook	Army Doctrine	FM 3-7			
Potential Military Chemical/Biological Agents and Compounds	Multi-Service Doctrine	FM 3-11.9	AFTTP(I) 3-22.55	NTRP 3-11.32	MCRP 3-37.1B
MTTP for NBC Vulnerability Assessment	Multi-Service Doctrine	FM 3-11.14	AFTTP (I) 3-2.54	NTTP 3-11.28	MCRP 3-37.1A
MTTP for NBC Reconnaissance	Multi-Service Doctrine	FM 3-11.19	AFTTP (I) 3-2.44	NTTP 3-11.29	MCWP 3-37.4
Weapons of Mass Destruction Civil Support Team Tactics, Techniques, and Procedures	Army Doctrine	FM 3-11.22			
MTTP for Biological Surveillance	Multi-Service Doctrine	FM 3-11.86	AFTTP(I) 3-2.52	NTTP 3-11.31	MCRP 3-37.1C
CBRN Handbook: SSE and Environmental Recon Operations	Army Doctrine (New Publication)	FM 3-11.24[15]			
CBRN Responder Operations Handbook	Army Doctrine (New Publication)	FM 3-11. 23[16]			
Health Service Support in a Nuclear, Biological, and Chemical Environment	Multi-Service Doctrine (under revision)	FM 4-02.7 (FM 8-10-7)	AFTTP 3-42.3 AFTTP 3-47.3	NTTP 4-02.7 Draft	MCRP 4-02.1E
Treatment of Nuclear and Radiological Casualties	Multi-Service Doctrine	FM 4-02.283	AFMAN 44-161 (I)	NTRP 4-02.21	MCRP 4-11.1B
Treatment of Biological Warfare Agent Casualties	Multi-Service Doctrine	FM 8-284	AFMAN (I) 44-156	NTRP 4-02.23	MCRP 4-11.1C
Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries	Multi-Service Doctrine (under revision)	FM 8-285	AFJMAN 44-149	NAVMED P-5041	FMFM 11-11

[14] FM 3-11.5 under revision

[15] New Publication

[16] New Publication

Publication	Status/Comment	Army	Air Force	Navy	Marine Corps
NATO Handbook on the Medical Aspects of NBC Defensive Operations (AMedP-6[B])	Multi-Service Doctrine	FM 8-9	AFJMAN 44-151	NAVMED P-5059	
MTTPs for Recovery Operations in a Chemical Biological, Radiological, Nuclear Environment	Navy/Marine Corps Dual Designated Doctrine			NTTP 3-02.1.1	MCWP 3-37.6
Chemical and Biological Defense NATOPS (Naval Air Training and Operating Procedures Standardization)	Navy and Marine Corps Doctrine			NAVAIR 00-80T-121	
Surface Ship Survivability	Navy Doctrine			NTTP 3-20.31	
Chapter 470 Shipboard BW/CW Defense and Countermeasures	Navy Doctrine (Under revision)			NTRP 3-20.31.470	
Guide to Biological Warfare Defense and Bioterrorism – Afloat and Ashore	Navy Doctrine			TM 3-11.1.02	
Marine Air Ground Task Force (MAGTF) NBC Defense Operations	Marine Corps Doctrine				MCWP 3-37
Counter-Chemical, Biological, Radiological, Nuclear, and High Yield Explosive Operations	Air Force Doctrine		AFDD 2-1.8		
Full-Spectrum Threat Response	Air Force Doctrine		AFPD 10-25		
Full Spectrum Threat Response Planning and Operations	Air Force Doctrine		AFI 10-2501		
Nuclear, Biological, and Chemical Defense Operations and Standards	Air Force Doctrine		AFMAN 10-2602		
Airman's Manual	Air Force Doctrine		AFMAN 10-100		

4.5.1 Joint/Coalition Medical Doctrine Initiatives

The Army's Office of The Surgeon General, Directorate of Health Care Operations (DASG-HCF) is the lead agent for DOD on medical international issues, to include CBRNE medical operational issues. The Force Management Division (DASG-HCF) is responsible for coordinating and developing U.S. positions within the medical NBC functional area in accordance with the policies and directives established by The Assistant Secretary of Defense for Health Affairs, ASD (HA), and The Assistant Secretary of Defense for Policy, ASD(P). The Medical NBC Staff Officer serves as the US Head of Delegation to the NATO NBC Medical Working Group (NBC Med WG) and its subcommittee, the Biological Medical Advisory Committee (BioMedAC).

During FY05, the U.S. achieved significant milestones with NATO NBC Medical Working Group STANAGs under U.S. custodianship.

- STANAG 2242, *Policy for the Chemoprophylaxis and Immunotherapy of NATO Personnel Against Biological Warfare Agents.* This STANAG developed a unified approach in NATO doctrine and policy in the use of chemoprophylaxis by NATO

personnel against biological warfare agents that cause infectious disease. STANAG 2242 was promulgated on 10 May 2005 after being ratified by 15 nations.

- STANAG 2873 (AMedP7), *Concept of Operations for Medical Support in NBC Environments*. The US posted Study Draft 3 of AMed P7 to the NATO Standardization Agency protected website on 7 October 2005 for NATO nations review and comment. Study Draft 3 was briefed to the BioMedAC in November 2005. Additionally, a prototype document search tool was provided to all nations present to allow the search of ratified STANAGs used in the development of the AMedP-7. AMedP7 defined the strategic concept of operations (CONOPS) and a planning methodology for Allied Forces, providing broad guidance rather than technical detail.
- STANAG 2476 (AMedP8), *Planning Guide for the Estimation of NBC Battle Casualties (Biological)*. The US staffed Edition2, Ratification Draft 1 for US ratification in the Fall of 2005. The Ratification Draft provided casualty estimates for smallpox, brucellosis and glanders for tactical scenarios, delivery systems and attack intensities considered in the STANAG; provides estimates of casualties from secondary infection for the contagious agents plague and smallpox; and considers human sources of exposure as a delivery mechanism for these agents. The Ratification Draft also provided a set of casualty estimates for influenza, considered as a contagious disease of operational significance spread from human to human.

The US recommended ratification for three NATO NBC Medical Working Group STANAGs since January 2005. Documents recommended for ratification by the US include:

- STANAG 2358, *First Aid and Hygiene Training in an NBC or ROTA Environment*
- STANAG 2463, (AMedP-6) *NATO Handbook on the Medical Aspects of Defensive Operations (Chemical)*
- STANAG 2491, *Policy for the Immunization of NATO Personnel Against Biological Warfare Agents*

During FY05, the US also reviewed and commented on several NATO NBC Med WG STANAG Study Drafts. STANAGs reviewed include:

- STANAG 2278, *Medical Advice on Restriction of Movement*
- STANAG 2463, (AMed P6) *NATO Handbook on the Medical Aspects of Defensive Operations (Chemical)*

The DASG-HCF also oversees doctrine development to support CBRNE hazards in domestic applications for the support of the Federal Response Plan and the National Response Plan. The Army Medical Department Center and School (AMEDDC&S) leads in doctrine and development for military medical support for Defense/Military Support to Civilian Authorities (DSCA/MSCA). The AMEDD focus is on medical support of Homeland Defense and Homeland Security consequence management in a CBRNE environment.

4.5.2 Navy and Marine Corps Doctrine

During FY05, the Navy and Marine Corps Team participated in all multi-Service doctrine working groups to produce and update the joint and multi-Service CBRN Defense doctrinal publications listed in ***Table 4-19*** above. Navy and Marine Corps representatives also continued to play actives roles during FY05 in all meetings and reviews associated with the

ongoing development of improved NATO standardization agreements (STANAGS) and Allied Publications such as the Allied Joint Publication 3.8, *Allied Joint Doctrine for NBC Defense*.

The two service partners have continued their work in tandem to update existing and produce new doctrine focused on the unique maritime-related requirements of Navy and Marine Corps warfighters.

During FY05, procedures were updated for recovering potentially contaminated military forces and civilian personnel, equipment, and supplies. The procedures were refined and documented into a new dual designated doctrinal publication, *Recovery Operations in a CBRN Environment*. With the emerging/evolving concepts of sea basing, ship to objective maneuver (STOM), operational maneuver from the sea (OMFTS), and maritime prepositioning forces (MPF) 2010, the effectiveness of these maritime-unique CBRN-defense and consequence management procedures are becoming more and more critical.

As of October 2005, the Navy updated the CBR-D Navy Mission Essential Task Lists (NMETLs) and Personnel Qualification Standards (PQS) (NAVEDTRA 43119-I-Change-2) for Damage Control. The Navy Tactical Task List and Surface Forces Training Manual (SURFORTRANMAN) are in the process of being updated to reflect current PQS for Damage Control and CBR-D training requirements.

In 2005, the Navy developed NTRP 3-20.31.470, *Shipboard BW/CW Defense and Countermeasures* (formerly referenced as NSTM 470), with updated detailed guidance on defending a ship against chemical or biological agent attack. It was promulgated to the Fleet and training schools.

As part of the Joint Chiefs of Staff acquisition requirements process, and in response to the Global War on Terrorism (GWOT), the Navy is developing doctrine and acquisition requirements for CBRN at-sea maritime interdiction operations. Results will be reported in next year's Report to Congress.

The Marine Corps Warfighting Publication (MCWP) 3-37 is the Marine Corps capstone doctrinal publication for *Marine Air Ground Task Force (MAGTF) NBC Defense Operations*. MCWP 3-37 is being rewritten to address the current Marine Corps Expeditionary Maneuver Warfare (EMW) concepts.

4.5.3 Defense Threat Reduction Agency (DTRA) Doctrine

As a member of the joint doctrine development community, DTRA fully participates in the development and/or revision of joint doctrine for CBRN defense. DTRA voices their views and influences the development of joint doctrine at biannual conferences attended by Joint Staff, Combatant Commands, all Services, as well as multi-Service doctrinal schools and organizations. During FY05, DTRA participated in all joint doctrine working groups involved in the development of CBRN joint doctrine and provided technical review authority support for the development of JP 3-41, *CBRNE Consequence Management* and JP 3-28, *Civil Support.* DTRA wrote the foreign consequence management chapter of JP 3-41, as well as an appendix detailing DOD consequence management capabilities in support of the Department of Homeland Security across the 15 emergency support functions detailed in the National Response Plan. This appendix also cross-referenced capabilities to pertinent tasks contained in the UJTL.

DTRA sustains a robust internal doctrine review process exploiting its diverse expertise to ensure that emerging doctrine accurately reflects the current scope of CBRN activities and concerns. DTRA retains a CBRN doctrine expert resident in the Joint Doctrine Group in the US Joint Forces Command. USJFCOM is responsible to the Chairman for the development, assessment, and maintenance of the joint doctrine program. This provides DTRA maximum opportunity to coordinate directly with military analysts who are assessing the joint pubs that contain DTRA equities. DTRA has equities in 43 joint pubs but their main efforts are toward those pubs associated with Combating WMD, Homeland Defense, Civil Support/ Consequence Management and, in general, all CBRNE issues.

4.6 CBRN DEFENSE TRAINING, EXERCISES, AND DOCTRINE ISSUES

ISSUE: **Air Mobility Command (AMC) Counter-Chemical, Biological, Radiological, Nuclear, and High Yield Explosives (C-CBRNE) Education, Training, and Exercise (ETE) Initiatives.**

SOLUTION: AMC is currently incorporating C-CBRNE education and training into seven courses of instruction (35 classes annually) throughout the command. AMC has identified 20 additional courses for the inclusion of C-CBRNE instruction that addresses employment of air mobility assets in a CBRNE-contaminated environment. Each block of instruction is tailored to the specific audience and is designed to foster a better understanding of the effects of CBRNE attack on air mobility-specific operations.

ISSUE: **Air Mobility Command (AMC) Counter-Chemical, Biological, Radiological, Nuclear, and High Yield Explosives (C-CBRNE) Education, Training, and Exercise (ETE) Initiatives.**

SOLUTION: AMC is incorporating C-CBRNE education and training into courses of instruction throughout the command. AMC has identified 27 courses for the inclusion of C-CBRNE instruction that addresses employment of airlift and aerial refueling assets in a CBRNE-contaminated environment. Each block of instruction is tailored to the specific audience and is designed to foster a better understanding of the effects of CBRNE attack on air mobility operations.

ISSUE: **CBRN Defense Medical Readiness and Training**

SOLUTION: In January 2004, the Assistant Secretary of Defense for Health Affairs directed the services to implement the initial and sustainment levels of the Tri-Service CBRNE Training Program, which are based on the medical CBRNE Standards of Proficiency. The Services selected the on-line, distance learning *Emergency Medical Preparedness/Response Course (EMPRC)* to meet this requirement by the end of FY06. In order to provide up-to-date training for medical personnel, funding is needed in FY06 to revise the EMPRC courseware. At this time, no funding has been allocated.

As the program manager, the Defense Medical Readiness Training Institute (DMRTI) submitted quarterly *C*BRNE Standards of Proficiency Training Reports to the Force Health Protection Council (FHPC) for their review. FHPC monitors compliance and provides DASD/FHP&R an annual status report. Current training status for active

duty personnel assigned to the Military Healthcare System (MHS) as of the end of FY05 is provided in ***Table 4-20***.

Table 4-20 Tri-Service CBRNE Training Status FY05

U.S. Army Medical Command*	Trained	Total Inventory	% Trained
Medical Corps	604	3065	19.7%
Dental Corps	172	718	24.0%
Veterinary Corps	229	363	63.1%
Nurse Corps	548	2507	21.9%
Medical Service Corps	467	1421	32.9%
Medical Specialist Corps	174	678	25.7%
Physicians Assistant	38	214	17.8%
Enlisted Medical Personnel	4779	10928	43.7%
Total	7010	19893	35.2%

U.S. Navy	Trained	Total Inventory	% Trained
Medical Corps	2078	3978	52.2%
Dental Corps	413	1156	35.7%
Nurse Corps	1185	2952	40.1%
Medical Service Corps	388	2304	16.8%
Physicians Assistant	109	229	47.6%
Enlisted Medical Personnel	8899	24959	35.7%
Total	13072	35578	36.7%

U.S. Air Force	Trained	Total Inventory	% Trained
Medical Corps	2492	2931	85.0%
Dental Corps	710	910	78.0%
Nurse Corps	3254	3512	92.7%
Medical Service Corps	934	1132	82.5%
Biomedical Sciences Corps	1516	2034	74.5%
Physicians Assistant	260	322	80.7%
Enlisted Medical Personnel	16061	21360	75.2%
Total	25227	32201	78.3%

** U.S. Army Medical Command reflects MEDCOM assets only. It does not reflect medical personnel assigned to non-medical commands.*

To assist the Services to meet current CBRNE training requirements, a collaborative partnership was established between the Defense Medical Readiness Institute (DMRTI), United States Army Reserve Command (USARC) Homeland Defense, and Joint Interagency Civil Support Training Center (JICSTC). In 2005, JICSTC served as the pilot for the EMPRC Clinician Course Mobile Training Team concept. JICSTC trained medical personnel from four Combat Support Hospitals during their AT rotation. JICSTC also serves as the Training Platform for the Mass Casualty Decontamination Course (MCD) of which the Executive Agent is USARC Homeland Defense. The Mass Casualty Decontamination Course is an integrated program that

trains medical and chemical soldiers to perform the mission of casualty decontamination. The EMPRC Clinician Course and the MCD Course were conducted simultaneously, culminating in a CBRNE Mass Casualty Exercise that trained more than 500 medical and chemical soldiers.

JRO and DMRTI established a CBRN Integrated Concept Team (ICT) dedicated to guiding the Services in CBRNE medical training to strengthen not only a particular Service's medical response to a CBRNE event, but to form a standardized, seamless joint medical response to support the joint warfighter in the areas of passive defense, force protection, homeland defense, and consequence management. Goal is to train all DOD medical responders (military, civilian, and contractors) to be competent in their particular medical field of expertise in a CBRNE event. During 2005, the CBRNE ICT conducted a review of the current Universal Joint Task List (UJTL) and service-specific METL that were medical-based. During the review, the UJTLs and METLs were crosschecked against the medical CBRNE Standards of Proficiency. This review determined that all Standards of Proficiency were in full alignment with the medical-based UJTLs and METLs.

ISSUE: **Need for an Integrated Process Team (IPT) to discuss issues and solutions that will improve the effectiveness of CB Defense training and education.**

SOLUTION: The CBD Education and Training Directorate will establish a ETIC (Education and Training Integration Council) which will allow for improved communication and a more positive functioning CBD Education and Training program across the Department. The first ETIC meeting will take place in 1st Quarter FY ’06.

ISSUE: **Lack of a consistent and standardized system to educate, train, and exercise CBRN.**

SOLUTION: The ETIC which will be established by the CBD Education and Training Directorate will establish evaluation metrics and competencies as minimum requirements for the Department.

ISSUE: **Training and Education does not have a central information source.**

SOLUTION: The CBD Education and Training Directorate will establish a DOD military website that will provide a streamlined information source for CBD related issues. This website will increase the efficiency and effectiveness of the program across the Department.

ISSUE: **The Marine Corps Does Not Provide Any Clearly Articulated NBC Defense Training Tasks or Requirements That Must Be Accomplished in Conjunction with the Combined Arms Exercises**

SOLUTION: The General Accounting Office (GAO) Draft Report 05-08, *Chemical and Biological Defense, “Army and Marine Corps Need to Establish Minimum Tasks and Improve Reporting for Combat Training Centers,* dated October 22, 2004, recommends the Secretary of Defense direct the Secretary of the Navy to direct the Commandant of the Marine Corps to establish the minimum NBC tasks for units attending the combined

arms exercise at Twentynine Palms.

ISSUE: **The Marine Corps Does Not Employ a Standard Method of Reporting NBC Training at Twentynine Palms or Provide the Marine Corps' Trend and Lessons Learned Reporting Systems with NBC Training Information**

SOLUTION: The General Accounting Office (GAO) Draft Report 05-08, *Chemical and Biological Defense, "Army and Marine Corps Need to Establish Minimum Tasks and Improve Reporting for Combat Training Centers,* dated October 22, 2004, recommends the Secretary of Defense direct the Secretary of the Navy to direct the Commandant of the Marine Corps to standardize reporting formats to capture NBC training that occurs during a combined arms exercise at Twentynine Palms.

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Annex A

Contamination Avoidance Programs

Table A-1 Contamination Avoidance Research, Development, & Acquisition (RDA) Efforts

Category	Nomenclature	Status	USA	USAF	USMC	USN
Automatic Detectors and Monitors	- M22 Automatic Chem Agent Detector Alarm (ACADA)	Production	Joint	Joint	Joint	Rqmt
	- Improved Point Detection System (IPDS)	Production				Rqmt
	- Improved CAM (ICAM)	Production	Rqmt	Interest	Rqmt	Rqmt
	- Joint Chemical Biological Agent Water Monitor (JCBAWM)	RDTE	Joint*	Joint*	Joint*	Interest
	- Joint Chemical Agent Detector (JCAD)	RDTE	Joint*	Joint*	Joint*	Joint*
	- CB.37 Chemical/Biological Agent Water Monitor	DTO				
	- CB.50 Lightweight Integrated CB Detection	DTO				
Stand-Off Detection and Remote/ Early Warning	- Joint Service Lightweight Stand-off Chemical Agent Detector (JSLSCAD)	RDTE	Joint	Joint	Joint	Joint
	- CB.73 Threat Agent Cloud Tactical Intercept and Countermeasure (DARPA)	DTO				
NBC Reconnaissance	- Joint NBC Reconnaissance System (JNBCRS)	RDTE				
	--NBCRS/CB Mass spectrometer	*	*Rqmt*		*Rqmt*	
	--Joint Service Light NBC Reconnaissance System (JSLNBCRS)	*	Rqmt	Rqmt	Joint	*Interest*
	- NBC Recon Vehicle (NBCRV)	RDTE	Rqmt			
	- CB.53 Wide-Area Aerial Reconnaissance for Chemical Agents	DTO				
	- JA.40 Chemical Unmanned Ground Reconnaissance (CUGR) ACTD	DTO				
Radiation Detection (Multi-Service Radiacs)	- AN/UDR-13 Pocket Radiac	Production	Rqmt	Interest	Interest	
	- AN/PDR-75 Radiac	Production	Rqmt		Fielded	
	- AN/PDR-77 Radiac	Production	Rqmt		Interest	
	- AN/VDR-2 Radiac	Production	Rqmt		Fielded	

Joint = Joint Service requirement
Joint* = Draft Joint Service requirement
Rqmt = Service requirement
Interest = Service interest (Requirement may be pending)
Rqmt Interest = requirement or interest in sub-product
* = Sub-product(s) of a Joint project
DTO = Defense Technology Objective (Science & Technology Base Program)
RDTE = Research, Development, Test & Evaluation (Advanced Development program)

AUTOMATIC DETECTORS AND MONITORS

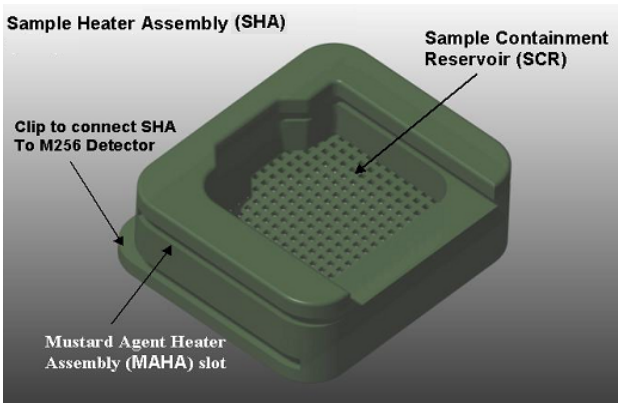
FIELDED AND PRODUCTION ITEMS

Chemical Agent Monitor (CAM) and Improved Chemical Agent Monitor (ICAM)

The CAM is a hand held instrument that provides a relative indication of G and V type threat agent concentrations. The CAM uses ion mobility spectrometry (IMS) to detect and identify agents within one minute of agent exposure. A radioactive source ionizes air drawn into the system, and the CAM then identifies chemical threat agents based on the agent's

characteristic ion mobility in the monitor's drift tube (i.e. cell modules). The ICAM has the same chemical agent detection capability as the CAM; improvements are that it is 300% more reliable, starts up 10 times faster, and the modular design is much less expensive to repair. The ICAM has the additional features of an RS-232 data communications interface, and the ability to be programmed for new/different threat agents. The four pound, 15" long ICAM can be powered either by an internal battery or by an external source through the ICAM's combination power/fault diagnosis/RS-232 plug. The ICAM may be used for a variety of missions, to include area reconnaissance and area surveillance, monitoring of decontamination operations, and medical triage operations. The ICAM significantly reduces the level and frequency of maintenance *vs*. CAM without affecting performance. The ICAM sieve pack has double the capacity of two CAM sieve packs, which results in twice the operational life of the ICAM over the CAM. The ICAM significantly reduces operating and sustainment costs associated with the CAM.

M256A1 Chemical Agent Detector Kit



The M256A1 kit can detect and identify field concentrations of nerve agents (sarin, tabun, soman, GF, and VX), blister agents (mustard, phosgene oxime, mustard-lewisite, and lewisite), and blood agents (hydrogen cyanide and cyanogen chloride) in both vapor and liquid form in about 15–20 minutes. The kit consists of a carrying case containing twelve Sampler-Detector tickets individually sealed in a plastic laminated foil envelope, a book of M8 chemical agent detector paper, and a set of instructions. Each detector ticket has pretreated test spots and glass ampoules containing chemical reagents. In use, the glass ampoules are crushed to release a reagent, which runs down pre-formed channels to the appropriate test spots. The presence or absence of chemical agents is indicated through specific color changes on the test spots. The kit may be used to determine when it is safe to unmask, to locate and identify chemical hazards (reconnaissance), and to monitor decontamination effectiveness. In FY05, three major improvements to the unit were delivered. First, researchers and engineers improved the heater (*shown*) to allow for more consistent and reliable test results in all environmental conditions. Secondly, a new commercial source for the blister spot paper was identified and validated this year to broaden the industrial base for the manufacture of the kits. The third, and maybe most significant improvement, was the addition of the Low Volatility Hazard (LVH) Kit, which expands the detection capabilities of the M256A1 beyond traditional chemical warfare material to include low volatility liquids and granular-solids. The LVH capability meets an Urgent Need and is currently undergoing further development/testing to field the LVH as a standard item.

ABC-M8 VGH, and M9 Chemical Agent Detector Paper

M8 and M9 paper are dye impregnated papers that change color when exposed to liquid chemical agents or aerosols. These papers cannot detect chemical agents in vapor form. M8 paper comes in 4" x $2^{1}/_{2}$" booklets. Each booklet contains 25 sheets of detector paper that are

capable of detecting G series nerve agents (GA, GB, GD, and GF), V type nerve agents, and H (mustard) type blister agents. M8 paper can identify agents through distinctive color changes from its original off-white: yellow-orange for G, blue-green for V, and red for H. M8 paper is typically used to identify unknown liquid droplets during chemical reconnaissance/surveillance missions.

M9 (SR119) detector paper is rolled into 2-inch wide by 30-feet long rolls on a 1.25-inch diameter core. M9 paper can detect G and V nerve agents, H agents, and L agents but it cannot distinguish the identity of agents. It turns pink or a shade of red when in contact with liquid chemical nerve and blister agents. M9 paper is typically placed on the BDO, equipment, and vehicle exteriors to warn personnel of the presence of a liquid chemical agent.

M18A3 Chemical Agent Detector Kit

The M18A3 can detect and identify dangerous concentrations of nerve agents (sarin, tabun, soman, GF, and VX), blister agents (mustards, phosgene oxime, mustard-lewisite mixture, phenyl dichloroarsine (PD), ethyl dichloroarsine (ED), and methyl dichloroarsine (MD)), blood agents (hydrogen cyanide and cyanogen chloride), and choking agents (phosgene) in about 1–4 minutes. The kit is also used to confirm results of the M256A1 kit. The M18A3 kit contains a squeeze bulb and enough detector tubes, detector tickets, and chemical reagents needed to conduct 25 tests for each agent vapor. The kit also contains a booklet of M8 chemical agent detector paper to detect liquid agents. Agent vapor detection is indicated by the production of a specific color change in the detector tubes. The M18A3 kit is only used by special teams such as surety teams or technical escort personnel.

M272 Water Test Kit

The M272 kit can detect and identify hazardous levels of nerve, blister, and blood agents in treated or untreated water resources in about 20 minutes. The kit contains enough detector tubes, detector tickets, a test bottle, and pre-packed, pre-measured test reagents to conduct 25 tests for each agent. The kit also contains simulants used for training. Agent detection in water is indicated by the production of a specific color change in the detector tubes or in the ticket. The M272 was fielded in 1984 and does not meet current lower level detection requirements.

M8A1 Automatic Chemical Agent Alarm (ACAA)

The M8A1 ACAA is a system that continuously samples the air to detect the presence of dangerous concentrations of G and V type nerve agent vapors. This system is currently being replaced by the ACADA in many Army units. Displaced M8A1 systems are being cascaded to lower priority units throughout the Army. The M8A1 ACAA may be employed in a number of configurations, but all configurations are built around the M43A1 detector unit and the M42 alarm unit. The configurations differ primarily in their mountings and power supplies: ground mounted and battery operated, or mounted on a vehicle and powered by the vehicle's electrical system. The M43A1 detector unit measures $7^1/_2$" x $5^1/_2$" x 11". Using the battery in ground mounted operations adds another $7^3/_4$" to the height. The M43A1 detector unit uses a radioisotope to ionize molecules in the air that is pumped through the system, and then detects electrical current changes that occur in the presence of nerve agents. The M43A1 detector unit will alarm within about 1–2 minutes from exposure to agent. The M42 alarm unit is a remote

visual and audible alarm that measures 7" x 4" x $2^{1}/_{3}$". The M42 alarm unit may be placed up to 400 meters from the M43A1 detector unit to give users warning of an approaching agent cloud.

M90 Automatic Mustard Agent Detector (AMAD)

The AMAD is an automatic nerve and mustard agent detector that detects agents in vapor form. This system is currently in use by the Air Force. It transmits an alarm by radio to a central alarm unit.

Chemical Agent Point Detection System (CAPDS), MK 21, MOD1

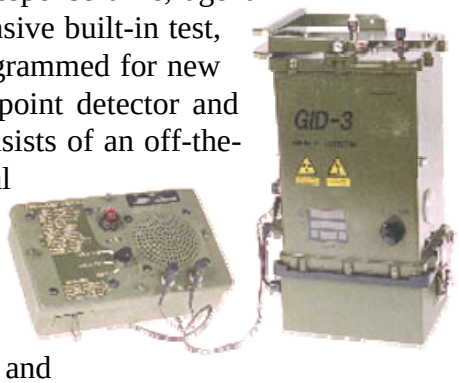
CAPDS is a fixed system capable of detecting nerve agents in vapor form, using a simple baffle tube ionization spectrometer. Installed in a ship's upper superstructure level, CAPDS obtains a sample of external air, ionizes airborne vapor molecules, and collects them on a charged plate after eliminating lighter molecules via the baffle structure. When a sufficient mass of ions is collected, a pre-set potential is achieved, and an alarm signal is generated and sent to both Damage Control Central and the bridge. The CAPDS system is being replaced by the MK 26 Mod 0 Improved (Chemical Agent) Point Detection System

Improved (Chemical Agent) Point Detection System (IPDS)

The IPDS is a shipboard point detector and alarm that replaces the existing shipboard CAPDS. IPDS uses special elongated ion mobility cells to achieve the resolution necessary to counter false alarms caused by interfering vapors. IPDS can detect nerve and blister agent vapors at low levels, and automatically provide an alarm to the ship. The unit is built to survive the harsh sea environment and the extreme electromagnetic effects found on Navy ships.

M22 Automatic Chemical Agent Detection Alarm (ACADA)

ACADA is a man-portable, point sampling alarm system that provides significant improvement over the capabilities of the M43A1 Detector; it detects and identifies GA, GB, GD, and VX as G-type nerve agents and will detect HD and L as blister agents. ACADA provides concurrent nerve and blister agent detection, improved sensitivity and response time, agent identification capability, improved interferents rejection, extensive built-in test, a data communications interface, and the capability to be programmed for new threat agents. It replaces the M8A1 Alarm as an automatic point detector and augments the CAM as a survey instrument. The ACADA consists of an off-the-shelf non-developmental item (NDI)—the GID-3 chemical agent alarm. In FY04, enhancements were made to the ACADA to decrease maintenance and increase life expectancy of systems that are operating 24 hours a day, 7 days a week. The ACADA 24/7 version has been fielded within the Joint Service Installation Pilot Program in FY03 and early FY04. Additional improvements allow the ACADA 24/7 to detect and identify Toxic Industrial Chemicals that pose a threat to DOD Installations. This variant of the ACADA was fielded in FY04 in support of JPM Guardian programs.



AUTOMATIC DETECTORS AND MONITORS

RDTE ITEMS

Agent Water Monitors

The Joint Service Chemical Biological Radiological Agent Water Monitor (JSBRAWM) is a cooperative RDTE effort, chartered to develop a detection system that will detect chemical and biological agents in water. The detector will feature multi-agent capabilities, and operate automatically, improving both ease and response time of existing system. The project will accommodate the four services' requirements.

Key Requirements:

- Detect, identify, and quantify chemical agents and agents of biological origin in water
- Perform monitoring automatically with continuous and batch sampling capabilities
- Easy to operate and support in forward areas, austere environments, and limited lighting

Description:

The Agent Water system will improve current water monitoring and purifying capabilities. It will detect CBR agents at or below harmful levels in water and not false alarm to common interferents. The system will be compact, man-portable and easy to use, and be decontaminated to a negligible risk level.

Defense Technology Objective (DTO) CB. 37 Chemical/Biological Agent Water Monitor

Objectives. This effort will develop system concepts and technologies to meet the service requirement for a Joint Chemical/Biological Agent Water Monitor (JCBAWM). The desired capability is for the detection and identification of hazardous chemical and biological agents in potable water. The system will be capable of processing source (pretreatment, ponds, lakes, rivers, etc.,) and product waters (post treatment verification and distribution quality assurance). It is unlikely that a single technology will be able meet this objective; therefore, the system will most likely consist of two or more integrated technologies that have been optimized to meet a specific challenge.

Payoffs. This DTO address Joint Future Operational Capability of Contamination Avoidance: Medical and Environmental Surveillance. The only system currently fielded for the detection of agents in water is the M272 Water Test Kit. This kit has several drawbacks, including an inability to detect biological agents and a relatively long response time. This kit is difficult to use when in a protective posture and is incapable of autonomous operation, requiring a user to interpret the results. The water monitor developed in this effort will be capable of detecting both chemical and biological agents. In addition, it will be capable of real-time, autonomous operation, which will allow the system to be used as a true water monitor. In FY01, development of standardized test evaluation protocols was completed and the testing of technologies was initiated. Transition criteria were established based on JCBAWM Operational Requirements Document (ORD). A first-generation design for a water monitor system was completed and the breadboard build was initiated. In FY02, the breadboard was completed and surety testing was initiated. In FY03, receiver operator curves (ROC) were established on the breadboard to predict technology performance. In FY04, Milestone A was completed for the biological detection portion of the program.

Defense Technology Objective (DTO) CB. 37 Chemical/Biological Agent Water Monitor

Challenges. The challenges for the system will include a requirement to operate under a variety of environmental conditions, ranging from extremely turbid source water to chemically treated ”clean” water. Experience shows that this will pose a challenge in terms of both agent sensitivity and specificity. The system will also be required to operate in near real time. Research conducted in FY03 based on ROC curve analysis predicts chemical agents will be more difficult than previously assumed. Sensitivity requirements also pose a significant challenge. The requirement is in the parts-per-trillion to parts-per-billion range for chemical agents. Chemical agents undergo chemical changes in water much more quickly than in air. Factor such as hydrolysis will be significant. Biological agents could undergo changes as well, making the detection problem somewhat dynamic.

Milestones/Metrics.

FY2006: Complete Milestone A for chemical detection portion of program. Conduct utility assessment.

Integrated CB Detection Capability

DTO CB. 50 Lightweight Integrated CB Detection

Objectives. This DTO will develop technology to meet the requirements of the Joint Biological Tactical Detection System (JBTDS). The critical path is to demonstrate an overall size of 2 cubic ft and weight of 35 lb, with biological sensitivity of 15 agent containing particles per liter of air (ACPLA) and chemical identification equal to that of the Joint Chemical Agent Detector. This will demonstrate the potential to meet the JMCBD operational requirements.

Metrics. This DTO is to demonstrate a capability to detect both biological and chemical aerosols in a 2 cu ft size and 35 lb weight. The biological sensitivity is 15 ACPLA. The chemical identification capability to be equivalent to that of the Joint Chemical Agent Detector.

Payoffs. This effort addresses the Joint Future Operational Capabilities for Contamination Avoidance in Biological Early Warning Detection/Discrimination, Chemical Early Warning Identification, and Chemical Detection and Identification. This effort will provide the next generation of smaller, lighter CB detection capabilities, and will be the first to provide an integrated system for chemical and biological capabilities. This DTO addresses the overarching need to reduce the total number of systems out in the battlefield for better logistics. In FY04, tradeoff analysis was completed to identify the best three approaches.

Challenges. The major technological challenges are in the biological detection and discrimination to reduce the overall size, weight, and power requirements; integration of chemical and biological capabilities; and integration of the next generation of aerosol collection/sampling technology. The primary focus will be a cost-benefit analysis on the level of discriminate for biological detection and the size and weight of the overall system. The current philosophy is that the higher level of biological discrimination will require a bigger and heavier system. Integration of chemical and biological capabilities will be a challenge due to the fundamental differences in the nature of the materials. Integration of aerosol collection/sampling will be dependent on the availability of technology.

Milestones.

FY2006: Assess ability of technology to meet JMCBDS requirements. Design brassboard. Initiate fabrication of brassboards.

FY2007: Complete fabrication of brassboards. Test and evaluate.

Joint Chemical Agent Detector (JCAD)

The JCAD is a fully cooperative joint RDTE effort, chartered to develop a chemical agent detector for a variety of mission requirements and service platforms. The detector will provide warfighters near-real time information on the presence of chemical agents so that miosis or more severe effects can be avoided and not subvert the mission. The project will accommodate the four services' requirements.

Key Requirements:

- Small, lightweight detector capable of detecting presence of chemical agent vapors
- Capable of de-warning, allowing for rapid reduction of protective postures Increment 2)
- Detect, identify, quantify, and warn of presence of even low levels of nerve, blister, and blood agents in vapor form in aircraft and shipboard interiors (Increment 2)
- Capable of being modified to detect future agents

Description:

JCAD (Increment 1 *Gate II candidate shown*) will provide a detector or a network of detectors capable of automatically detecting, identifying, and quantifying chemical agents (nerve, blister, and blood) inside aircraft and shipboard interiors. The device must be sufficiently sensitive to warn aircrews before accumulation, over the entire mission, of levels of agent that may cause miosis or more severe effects. JCAD will also provide hand-held monitoring capabilities, protecting the individual soldier, sailor, airman, and marine through the use of pocket-sized detection and alarm. The requirements are for the detector to be considerably smaller (within 40 cubic inches) and lighter (2 lbs. or less) than the ACADA and to be configurable for a variety of applications, such as individual soldier detectors, post-attack monitoring, shipboard chemical agent monitoring, special operations forces applications, and aircraft interior detection.

STAND-OFF DETECTION AND REMOTE/EARLY WARNING

FIELDED AND PRODUCTION ITEMS

AN/KAS-1/1A Chemical Warfare Directional Detector (CWDD)

This is a semi-portable system designed to detect nerve agent vapor clouds at ranges up to five kilometers. The AN/KAS-1/1A must be removed from its stowage case and set up on a pre-installed pedestal for operation. A trained, diligent operator must manually aim the detector at the suspect cloud and interpret its infrared images to determine whether or not the cloud contains nerve agent vapors. The AN/KAS-1A provides a remote video display, an enhanced capability for vapor cloud analysis, and a remote relative bearing indicator useful for avoiding the agent cloud or other surface target with a thermal signature.

M21 Remote Sensing Chemical Agent Alarm (RSCAAL)

The M21 RSCAAL is an automatic scanning, passive infrared sensor that detects nerve (GA, GB, and GD) and blister (H and L) agent vapor clouds based on changes on the infrared spectrum caused by the agent cloud. It is effective at line-of-sight distances of up to five kilometers. The alarm is used for surveillance and reconnaissance missions in both vehicle-mounted and tripod-mounted modes. The M21 is no longer in production.

STAND-OFF DETECTION AND REMOTE/EARLY WARNING

RDTE ITEMS

Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)

Key Requirements:

- Automatically detect nerve, blister, and blood agents at standoff distances up to 500 meters
- Lightweight and employed from manned and unmanned systems
- Capable of being data-linked with centralized hazard information data collection center
- Capable of remote operations; aerial and on-the-move operation

Description:

JSLSCAD will be capable of scanning 360° x 60°, and automatically detecting nerve or blister agents at a distance up to 500 m. The system will be light, compact and operate from a stationary position or on-the-move. The JSLSCAD Michelson interferometer employs a passive infrared system that will detect presence of chemical agents by completing a spectral analysis of target vapor agent chemical clouds. JSLSCAD is envisioned for employment on various platforms and in various roles, including fixed site defense, unmanned aerial vehicles, tanks and other vehicles, and on board ships. Among the vehicle platforms will be the STRYKER NBCRV and JNBCRS. During FY05, DOD continued development and test and evaluation of the JSLSCAD.

DTO CB.53 Wide-Area Aerial Reconnaissance for Chemical Agents

Objectives. This DTO will: (1) develop and demonstrate a lightweight, wide-area passive standoff imaging detection system for airborne reconnaissance of chemical warfare (CW) agents for the purpose of contamination avoidance and facilities evaluation; (2) utilize existing hyperspectral imaging sensors

DTO CB.53 Wide-Area Aerial Reconnaissance for Chemical Agents

to perform phenomenology studies to determine the optimal tradeoffs between spatial and spectral resolution for mapping of CW threats; and (3) design and demonstrate a passive CW imaging detection system based on commercial off-the-shelf (COTS) focal plane array (FPA) and digital signal processing (DSP) technology. This DTO will have a strong focus on measurement and analysis of airborne detection phenomenology, real-time signal processing requirements, and algorithm development.

Metrics. This DTO will collect sufficient data for an analysis to determine the optimal configuration of hyperstpectral imaging technology (spatial/spectral resolution and scan rates) to meet the needs of an airborne chemical agent reconnaissance platform.

Payoffs. This DTO addresses Joint Future Operational Capability of Contamination Avoidance: Chemical Early Warning. The Wide-Area Aerial Reconnaissance System (WAARS) will allow rapid evaluation of large areas for CW contamination, and provide detailed information as to the position of a CW agent cloud. Current single-pixel designs have an extremely limited field of view (typically 26 m at a distance of 1 km). In addition, they cannot scan at sufficient speeds for proposed high-speed applications (i.e., tactical helicopter, high-speed aircraft, hemispherical scanning applications). The WAARS will be capable of operating at fields of view 8-100X greater than current systems. In addition, scan speeds must be increased significantly to allow for high-speed applications and more sophisticated signal processing techniques. The potential deployments include fixed sites, ground vehicles, unmanned aerial vehicles, helicopters, and high and low aircraft. In FY04, laboratory characterization of the systems was completed. Modeling studies of the system requirements under various warfighting scenarios has been initiated. Finally, in FY05 a prototype high spatial resolution wide-area tunable imager was flight tested. Advances in real-time detection algorithms were successfully demonstrated on the prototype.

Challenges. Airborne deployment of a passive standoff system requires a detailed understanding of the measurement phenomenology. Wide-area detection using imaging focal plane array technology demands higher speed operation and more sophisticated signal processing techniques than current systems. A significant effort is required to perform the necessary measurements and determine the tradeoffs between wide-area spatial resolution and the spectral resolution required to detect and map a CW threat. Knowledge of these tradeoffs will enable the design of practical detection algorithms that can be implemented using existing digital signal processing technology. The most significant current challenge is posed by the high frame rate required to do imaging interferometry. Novel solutions must be developed to efficiently acquire and process this high-speed data and to implement algorithms that can execute in real time.

Milestones.

FY2006: Conduct demonstration of enhanced FTIR and tunable IR systems with real-time data processing. Determine optimum spectrometer performance specifications in terms of scan speed, spatial resolution, and spectral resolution.

CB.73 Threat Agent Cloud Tactical Intercept and Countermeasure

Objectives. This DTO will develop and demonstrate technologies to achieve high confidence standoff detection of chemical and biological agent clouds and use that information to locate the cloud and remove it from the air in real time. The integration of the detection and countermeasure technologies into the Threat Agent Cloud Tactical Intercept and Countermeasure (TACTIC) system will enable active response to the attack by agents of chemical or biological warfare. The TACTIC system will protect military forces downwind from the threat cloud, the agents' lethal effects, and minimize or eliminate the need to decontaminate vehicles and equipment.

CB.73 Threat Agent Cloud Tactical Intercept and Countermeasure
Payoffs. Enabling military personnel to respond actively and in real time to the presence of threat agents will greatly reduce the effectiveness of such attacks. The system will enable the maintenance of high tempo military operations even in the presence of chemical or biological warfare agent clouds. The ultimate payoff, upon development of a highly efficient system, is the removal of the chemical and biological threat from the battlefield.
Challenges. Development of the technologies for assured identification of aerosolized agent in a one minute timeframe at standoff distances of 10km and the countermeasure of an entire 105 m3 cloud at levels >104 in 5 minutes. Development of an accurate system model that can predict the applicability of the system to open-air challenges against CWAs and BWAs. Integration of the detection and countermeasure components into a prototype that demonstrates accurate detection and efficient countermeasure. Integration of these subsystems with a delivery platform with minimal logistics burden to produce a prototype operational system.
Milestones/Metrics.
FY2006: Demonstrate high efficiency countermeasure of chemical and biological agent simulants in static aerosol test chambers. Demonstrate accurate correlation between system model and aerosol chamber test results.
FY2007: Demonstrate integration of detection and countermeasure subsystems into a prototype system. Demonstrate the joint detection and countermeasure of chemical and biological agent simulants in flowing-air test chambers with the prototype system.
FY2009: Demonstrate integration of detection and countermeasure systems onto a deployable detection and countermeasure delivery platform. Demonstrate system and conduct open-air field test.

NBC RECONNAISSANCE

FIELDED AND PRODUCTION ITEMS

M93 NBC Reconnaissance System (NBCRS)

The M93 NBC Reconnaissance System, known as the FOX, is a high mobility armored vehicle capable of performing NBC reconnaissance on primary, secondary, and cross country routes throughout the battlefield. The NBCRS was procured as a Non-Developmental Item and is capable of detection, warning and sampling the effects of NBC weapons and is used as a reconnaissance vehicle to locate, identify and mark chemical and nuclear contamination on the battlefield. The M93 FOX usually accompanies the scouts or motorized reconnaissance forces when performing its NBC mission. The NBCRS has an overpressure filtration system that permits the crew to operate the system in a shirt sleeve environment, which is fully protected from the effects of NBC agents and contamination. It utilizes a secure communications system to warn follow-on forces. Samples gathered are forwarded to the Theater Area Medical Laboratory for further analysis and verification. The mobility platform is a six wheeled all wheel drive, armored combat vehicle capable of cross-country operation at speeds up to 65 MPH. The Fox System is fully amphibious and is capable of swimming speeds up to 6 MPH. Sixteen M93 NBCRS are fielded with Army and Marine Corps forces.

M93A1 – FOX NBC Reconnaissance System (NBCRS)

The Block I Modification–M93A1 NBCRS contains an enhanced and fully integrated NBC sensor suite consisting of the M21 RSCAAL, MM1 Mobile Mass Spectrometer, CAM/ICAM, AN/VDR-2, and M22 ACADA. The NBC sensor suite has been digitally linked with the communications and navigation subsystems by a dual-purpose central processor system known as MICAD. The MICAD processor fully automates NBC Warning and Reporting functions and provides the crew commander full situational awareness of the Fox's NBC sensors, navigation, and communications systems. The M93A1 FOX is also equipped with an advanced position navigation system (GPS & ANAV) that enables the system to accurately locate and report agent contamination. The NDI mobility platform is a six wheeled, all wheel drive armored vehicle capable of cross-country operation at speeds up to 65 MPH. The Fox System is also fully amphibious and is capable of swimming at speeds up to 6 MPH. It is used as a reconnaissance vehicle to locate, identify, and mark chemical agent and nuclear contamination on the battlefield. The FOX usually accompanies the scouts or motorized reconnaissance forces when performing its NBC mission. The M93A1 FOX NBCRS is fielded worldwide with U.S. Army and Marine Corps forces.

NBC RECONNAISSANCE

RDTE ITEMS

Stryker NBC Reconnaissance Vehicle (NBCRV)

The Stryker NBCRV will incorporate enhanced chemical and biological detectors that will allow on-the-move standoff chemical agent vapor detection (*i.e.*, JSLSCAD). The NBCRV integrates a biological agent detector with detection, identification and sampling capabilities equivalent to or greater than the JBPDS. CB agent detection capability is added through the Chemical Biological Mass Spectrometer (CBMS), which improves the detection and identification of liquid agents. Integration of common NBC technical architecture will facilitate low-cost expansion/upgrading of on-board computers. Stryker NBCRVs Program with enhanced CB Sensor Suites will be used to equip the Army's future Brigade Combat Teams.

Joint NBC Reconnaissance System (JNBCRS)

Key Requirements:

- Stand-off and point detection from vehicle mounted or dismounted operations
- Chemical standoff detection
- Detection while on-the-move capability from speeds of 0–45 kph
- Biological point detection and identification
- A dismountable, handheld, self-contained chemical point detection capability
- Radiological detection capability (vehicle mounted or dismounted operations)
- Collective protection
- Environmental Conditioning Unit capable of providing climate conditioning for the crew and equipment
- Overpressure protection from all known agents

Description:

The JNBCRS will provide a premiere vehicle for accurate, rapid NBC combat hazard information by verifying the absence of, finding, mapping, and marking radiological, biological, and chemical hazards. The Light Armored Vehicle JNBCRS will be an integration of advanced NBC detection and analysis equipment suited for Marine Air-Ground Task Forces (MAGTFs), U.S. Air Force tactical forces, and U.S. Army Light Contingency Forces. Two variants, the HMMWV and the Light Armored Vehicle (LAV) are planned and will house the same equipment.

DTO JA.40 CBRN Unmanned Ground Reconnaissance (CUGR) ACTD

Objectives. The CUGR ACTD will exploit Next Generation Sensor (NGS) technology to demonstrate an improved CBRN contamination detection capability in the current manned reconnaissance capabilities and demonstrate the military utility of CBRN unmanned ground reconnaissance systems. These capabilities will improve the speed of traditional zone, area, and route reconnaissance, as well as provide unmanned and restricted terrain reconnaissance. CUGR will permit future NBC Reconnaissance assets to keep pace with maneuver forces on the battlefield, extend protection for both the mounted and dismounted forces and permit rapid maneuver to exploit our superior technology. The ACTD will develop supporting Concept of Operations (CONOPS) and Tactics, Techniques and Procedures (TTPs) for employment of the technology applications (Manned and Unmanned Ground Reconnaissance). The CUGR addresses the JRO-CBRND Joint Future Operational Capabilities (JFOCS) of NBC Reconnaissance, Chemical/Biological Standoff Detection and Point Detection.

Payoffs. The end-state of the CUGR ACTD is to provide an advanced sensor suite for near rear-time CBRN detection, sampling, and identification for manned and unmanned platforms. These new CBRN reconnaissance systems will increase the pace of operations and maneuver. In addition, the ACTD will introduce Raman technology with the Joint Contaminated Surface Detector (JCSD) in the manned reconnaissance vehicles. The JCSD can detect Chemical Warfare Agents (CWAs), Toxic Industrial Chemicals/Toxic Industrial Material (TICs/TIMs) and Non-Traditional Agents (NTAs). This system will not degrade existing CBRN sensors on the JNBCRS. CUGR will provide detection capability to

DTO JA.40 CBRN Unmanned Ground Reconnaissance (CUGR) ACTD
investigate urban terrain and integrate NBC detection while keeping crews/systems out of the contamination and minimizing the exposure to hostile direct fire weapons. **Challenges.** Significant progress has been made in both the biological and chemical standoff detection arenas. Despite this, significant challenges remain in terms of developing a cost-effective approach for accurate surface contamination detection and identification, and real-time detection algorithms. The CUGV challenge includes the aforementioned plus integration of select CBRN/TIM sensors onto small robotic platforms. **Milestones/Metrics.** **FY2006:** JCSD Demonstration on CBRN Recon Platforms/CUGV prototype integration. **FY2007:** Field JCSD-equipped CBRN Recon platforms/CUGV Demonstration.

RADIATION DETECTION (RADIACS)

FIELDED AND PRODUCTION ITEMS

AN/VDR-2

The AN/VDR-2 measures gamma dose rates from 0.01 µGy/hr (micro-Grays per hour) to 100 Gy/hr and beta dose rates from 0.01 µGy/hr to 5 cGy/hr. The unit functions simultaneously as a dose rate meter and dose meter with independent adjustable alarms that can be set at any level over the entire range. Dosage data is independently stored in non-destructive memory for display on command and may be retained when the unit is turned off. The unit is powered by three 9 volt batteries.

AN/PDR-75 Radiac Set

The AN/PDR-75 measures dose from 0 to 999 cGy (centi-Gray). The Radiac Set consists of a dosimeter and a reader. It provides the capability to monitor and record the exposure of individual personnel to gamma and neutron radiation. Each individual will be issued a DT-236/PDR-75 dosimeter. This device, worn on the wrist, contains a neutron diode and a phosphate glass gamma detector. When a determination of exposure is required, the dosimeter is inserted into a CP-696/PDR-75 reader, which then displays the cumulative neutron and gamma dose. The reader is issued at the company level and the dosimeters are issued to all combat, combat support, and combat service support personnel. The reader can be powered by a BA-5590 lithium battery, vehicle battery, or external power supply via adapter cables provided.

AN/PDR-77 Radiac Set

The AN/PDR-77 Radiac Set is a set of portable radiation detection equipment for detecting alpha, beta, gamma, and x-ray radiation. The set consists of a radiacmeter to which one of three radiation probes can be attached for measuring particular types of radiation. The probes are part of the set. The set includes accessories and basic test and repair parts for unit maintenance

including a carrying pouch with shoulder straps capable of holding the radiacmeter, alpha probe, and beta/gamma probe for field use. The entire set is contained in a carrying case (large briefcase) for easy portability and storage.

AN/UDR-13 Pocket RADIAC

The AN/UDR-13 Pocket RADIAC is a compact, hand-held, tactical device capable of measuring the gamma dose-rate and gamma and neutron cumulative dose in a battlefield environment. Its pocket size permits convenient use by troops on foot. Alarm pre-sets are provided for both the dose-rate and total dose modes. A push-button pad enables mode selection and functional control. Data readout is by liquid crystal display. It replaces the obsolete IM-93 quartz fiber dosimeter and the PP-1578 Dosimeter Charger.

AN/PDQ-1 Multi-Function RADIAC /RADIAC Detector Group OA-9449

The AN/PDQ-1 RADIAC Set (MFR) consists of an IM-265/PDQ RADIAC Meter, an operator's manual, headset, carrying strap, spare batteries and the CY-8716/PDQ carrying case. The OA-9449/PDQ RADIAC Group consists of DT-680/PDQ Gamma-Beta Probe, connecting cable assembly and CY-8717/PDQ carrying case. As a stand-alone instrument, the IM-265/PDQ measures gamma radiation using an internal gamma probe. When connected to ancillary probe DT-680/PDQ it will measure beta and gamma radiation. The Navy has a requirement to produce a training simulator for the MFR. The intent is to provide realistic training capabilities for the fleet by procuring equipment that physically and functionally mirrors the MFR. The Navy is in the process of developing detailed requirements for this product. Vendor selection is expected to be complete in 2006 with simulator fielding expected in 2007.

ADM-300A Multifunction Survey Meter

The ADM-300A is a battery-operated, self-diagnostic, multi-function instrument. It is used alone to locate and measure low and high intensity radioactivity in the form of gamma rays or beta particles. It is used with external probes to locate and measure alpha, beta, gamma, and x-rays, and neutron radiation.

Annex B

Biological Defense Programs

Table B-1 Biological Defense Research, Development, & Acquisition (RDA) Efforts

Category	Nomenclature	Status	USA	USAF	USMC	USN
Point and Stand-Off Detection and Remote/ Early Warning	- Biological Integrated Detection System (BIDS NDI and P3I)	Fielded	*Rqmt*			
	- Detection System, Biological Agent: Joint Portal Shield	Production	Joint	Joint		Joint
	- Joint Bio Point Detection System (JBPDS) -- Block I	Production	Joint	Joint	Joint	Joint
	- DOD Biological Sampling Kit	Fielded	Joint	Joint	Joint	Joint
	- Dry Filter Unit (DFU)	Production	Rqmt			Rqmt
	- Joint Bio Stand-off Detection System (JBSDS)	RDTE	Joint	Joint		Joint
	- CB.35 Standoff Biological Aerosol Detection	DTO				
	- CB.70 Femtosecond Adaptive Spectroscopy Techniques for Remote Agent Detection (DARPA)	DTO				
	- CB.72 Biological Warfare Defense Sensors (DARPA)	DTO				

Joint = Joint Service requirement
Rqmt = Service requirement
Rqmt Interest = requirement or interest in sub-product
LRIP = Low Rate Initial Production
Fielded = Fielded Capability (Sustained by Services)
Joint* = Draft Joint Service requirement
Interest = Service interest, no imminent requirement
* = Sub-product(s) of a Joint project
DTO = Defense Technology Objective (Science & Technology Base Program)
RDTE = Research, Development, Test & Evaluation (Advanced Development program)

AUTOMATIC DETECTORS AND MONITORS

FIELDED AND PRODUCTION ITEMS

M31 Biological Integrated Detection System (BIDS) Non-Developmental Item (NDI) & Pre-Planned Product Improvement (P3I)

BIDS uses a multiple technology approach, both developmental and off-the-shelf materiel, to detect biological agents with maximum accuracy. BIDS is a vehicle-mounted, fully integrated biological detection system. The system is a collectively-protected, HMMWV-mounted S788 shelter and is modular to allow component replacement and exploitation of "leap ahead" technologies. The BIDS is a Corps level asset. The Non-Developmental Item (NDI) BIDS (M31) (*shown*) is capable of detecting and presumptively identifying four BW agents simultaneously in less than 45 minutes. Thirty-eight M31 BIDS were fielded to the 310th Chemical Company (U.S. Reserve) during FY96. This gave DOD its first credible, rapidly deployable biological detection capability. The Preplanned Product Improvement (P3I) BIDS (M31A1) is capable of detecting and presumptively identifying eight BW agents simultaneously in 30 minutes. The suite is semi-automated and contains several technologies, including the Ultraviolet Aerosol Particle Sizer (UVAPS), Chemical Biological Mass Spectrometer (CBMS), Mini-Flow Cytometer, and the Biological Detector (BD). Fielding of 38 M31A1 BIDS to the 7th Chemical Company, in Ft.

Polk, Louisiana, was completed in October 1999. In 4QFY03, the third BIDS Company, 13th Chemical (P3I), began fielding at Ft. Hood, Texas and was completed in 3QFY04. Concurrent with the production of this second company of M31A1 BIDS was the expedited testing and production of the third generation of BIDS (M31E2). This BIDS model utilizes the Joint Biological Point Detection System (JBPDS) (see separate description below), the Force XXI Battle Command, Brigade and Below (FBCB2) for digital communication, and an on-board 10kw generator for power. Fielding of 35 M31E2 JBPDS Biological Integrated Detection Systems to the 375th Chemical Company began in June 2003 and was completed in November 2003. Through October 2005, four companies of M31E2 BIDS have been fielded, and fieldings are scheduled to continue through FY11.

Joint Portal Shield (Biological Agent Detection System)

Joint Portal Shield (JPS) is an interim Joint Service biological detection system used to protect high value fixed assets. The system uses an innovative network of sensors to increase probability of detecting a biological warfare attack while decreasing false alarms and consumables. The JPS system consists of a variable number of biological sensors forming a network under the command and control of a centralized command post computer (CPC). The CPC communicates with and monitors the operation of each sensor. The sensor is modular in design and can detect and presumptively identify up to ten BW agents simultaneously in less than 25 minutes. In addition the system has a chemical sensor interface (M22 ACADA) and a radiological sensor interface (VDR2), which provides an integrated chemical, biological and radiological sensor network capability. The system successfully attained MSIII and systems were provided to support a Joint Staff "Directed Buy". The JPS has been deployed to a total of ten sites in Northeast Asia and 12 sites in the Middle East.

In June FY03 CENTAF consolidated missions and ceased operations at four sites resulting in a total 18 JPS sites worldwide. Contractor Logistics Support personnel are on-site at these deployed locations in the CENTCOM and PACOM theaters of operation to maintain and sustain equipment. In FY03/04 JPS was provided to four Joint Service Installation Pilot Project (JSIPP) sites for a one year pilot test. In FY03 the JPS System design was upgraded with the JBPDS collector, BAWS UV trigger, and a new identifier. Independent Developmental and Operational testing has been completed. The upgrades enable JPS to have similar performance characteristics to JBPDS. The previously deployed fleet was upgraded worldwide in FY04. Maintenance is lifecycle Contractor Logistic Support and managed by JPEO-CBD. System consumables were transitioned to Rock Island Arsenal in FY03.

Joint Biological Point Detection System (JBPDS)

JBPDS provides fully automated point biological detection capabilities for all four services throughout the battlespace. The system, which at end state will replace all "current force" detection systems (*i.e.*, JPS, BIDS-NDI and BIDS P31), is more affordable and effective. The sensor suite detects and presumptively identifies ten BW agents simultaneously in less than 20 minutes. This program has developed a standard biological detection suite that is highly maintainable and its modular design is suitable for integration on Service designated platforms. The detection suite is common across multiple configurations (*i.e.*, the XM96 Portable, the XM97 Shelter, the XM98 Shipboard, and the XM102 Trailer Mounted for airbase, vehicle, surface combatant, Stryker and JSLNBCRS). The system may be operated locally or remotely,

and fully automates the functions of: *collection* (capturing samples of the suspect aerosol for systems and confirmatory analysis), *detection* (interrogating and broadly categorizing the contents of the aerosol), *identification* (providing presumptive identification of the suspect BW agent), and *warning* (providing visual and audible alert to local and remote control units). The acquisition strategy allows for significant economies throughout the RDA process, integrating efforts among the Services, and providing greater logistic supportability in joint operations. The modular design strategy also offers the fastest possible fielding of these systems to meet urgent requirements, as well as the flexibility needed to improve the system continuously with the latest advances in the biological detection, collection, identification, information processing, and engineering sciences.

One modular design variant, referred to as the Homeland Defense Trailer (HDTR), was deployed as part of a network of eight JBPDS systems in the National Capital Region on November 28, 2001 and was fully operational on December 3, 2001. These HDTR systems are deployed in a commercial trailer configuration that was jointly developed and produced. The First Unit Equipped and Initial Operational Capability was the 375th Chemical Company. Fielding of 35 M31E2 JBPDS Biological Integrated Detection Systems began in June 2003 and was completed in November 2003. The shelter configuration of the JBPDS is currently being fielded as a component of the M31E2 BIDS to Army Chemical Companies. The Navy is also currently installing and operating JBPDS systems on surface ships. As of the end of FY05, 150 JBPDS systems have been fielded to the Services. An additional 108 systems are scheduled for fielding in FY06.

Dry Filter Unit (DFU)

The Dry Filter Unit is a stand-alone collector that can be used to collect internal and external ambient air samples for subsequent analysis using Hand Held Assays (HHA) and/or Polymerase Chain Reaction (PCR) assays. It is simple, has an exceptional concentration factor, is inexpensive, and extremely flexible. It is complementary to and does not replace the role or need for more robust detection systems such as JBPDS, JPS and BIDS. The system was developed in response to critical needs identified after the conventional and anthrax terrorist attacks in 2001. System development was originally funded through the Defense Emergency Response Fund (DERF). In FY 2003 it was further procured and fielded based on an Umbrella Urgent Need Statement by the Joint Requirement Office to support Combatant Commander's needs in support of Operation Iraqi

Freedom and other initiatives. To date over 1700 DFUs have been fielded to units, sites (including six JSIPP sites), ships, and select U.S. cities to provide for BW attack monitoring.

DOD Biological Sampling Kit

The DOD Biological Sampling Kit, with its associated HHAs, provides a presumptive identification capability for BW agents in environmental samples and are employed for: field screening suspect munitions or munitions fragments for presence of BW agents; screening envelopes or packages that display suspicious liquids, powders or suspensions; screening suspect terrorist laboratory or weapons materials that might be associated with the manufacture or delivery of BW agents; or as a contamination identification kit for indoor areas where it is suspected a BW agent has been released in fairly high concentrations. The DOD Biological Sampling Kit contains a panel of 8 HHAs, a blue-capped tube containing a bottle of buffer solution and cotton tipped swabs, and a basic instruction card. Training DOD Biological Sampling Kits are also available as well as an interactive, multimedia training CD-ROM. The DOD Biological Sampling Kit must be stored at 4ºC, has a one-time use only capability, and is not for diagnostic use.

AUTOMATIC DETECTORS AND MONITORS

RDTE ITEMS

Joint Biological Tactical Detection System (JBTDS)

Key Requirements:

- Lightweight biological detection system
- Capable of being integrated into warning and reporting network
- Be field upgradeable to detect new and/or additional biological threat agents

Description:

The JBTDS will be developed to provide warfighters a lightweight sensor with biological agent detection, warning and sample isolation capabilities. The detector will be networked to provide a cooperative detection capability to increase the probability of warning personnel and reduce the probability of false alarm. Each JBTDS will be capable of acting in two modes: a biological agent detector mode and/or a command module. The command module will be capable of receiving data from the arrayed detectors (three or more) while being able to control the detectors and track information generated within the network. Control capability will consist of remotely resetting, enabling and disabling the detectors on the network and tracking information generated within the network. The capabilities of the network will include both hardwire and wireless interfaces to provide maximum flexibility in fixed site and remote application. The required throughput of the system will be consistent with the alert data exchange and archiving requirements. The sample isolation feature will collect and preserve a sample for evacuation and analysis. JBTDS will have the flexibility to warn automatically or to permit for manual intervention in the detection-to-alarm process. JBTDS will be employed remotely or in an unattended configuration, on platforms to include vehicles, aircraft, and by foot-mobile forces.

STAND-OFF DETECTION AND REMOTE/EARLY WARNING

RDTE ITEMS

Biological Remote/Early Warning

The Joint Biological Standoff Detection System (JBSDS) program is intended to give the warfighting commander a significantly shortened decision cycle regarding biological attacks; that is, the commander will see and be able to react to a biological attack much faster, thereby allowing many more personnel to take protective measures before they become exposed to the biological warfare agents. This means that fewer people will become casualties, and fewer people will have to take post-attack medical treatments.

Joint Biological Standoff Detection System (JBSDS)

Key Requirements:

- Detect and track aerosol clouds out to 5 km
- Discriminate biological clouds from non-biological clouds at 1 km
- Operationally eye and skin safe

Description:

The JBSDS uses an IR laser to detect (5 km) and discriminate (1 km) aerosol clouds at operationally significant concentrations. The Increment 1 JBSDS is being developed in response to an urgent demand identified in a Joint Staff Statement of Urgency and will be fielded to the U.S. Army and the U.S. Air Force. The Increment 1 JBSDS provides 120 degree scanning while operating from fixed sites or mobile platforms in a stationary mode. The next generation system will provide 360 degree scanning while operating on-the-move and will be fielded to all four Services. The Increment 1 JBSDS underwent a combined Production Qualification Test during FY03 and a Milestone B in FY03. A Milestone C was completed in FY04. An MIOT&E will be completed in FY06 and a FUE in FY07. A MS B for the next generation system is planned for FY08.

DTO CB. 35 Standoff Biological Aerosol Detection

Objectives. This DTO will develop and demonstrate technology by the end of FY05 for an advanced standoff biological detection capability to both detect and discriminate biological aerosol clouds at operationally significant concentrations.

Metrics. The system enhancements for standoff biological aerosol detection is to reduce the false alarm rate to one per week for a sensitivity of 1000 ACPLA at a range of 1 km and to expand the usability of the system from only nighttime operations to include daytime operations.

Payoffs. This DTO addresses Joint Future Operational Capability Contamination Avoidance: Biological Early Warning Detection/Discrimination and Identification. The development of this technology would permit the rapid detection, discrimination, and location of biological aerosol clouds. This technology would also be capable of being used on various platforms for the purpose of air or ground biological reconnaissance and contamination avoidance. Technology developed under this effort is intended to address operational requirements of the Joint Biological Standoff Detection System. In FY02, system performance parameters were established through coordination with users, and downselection of candidate technologies based on weighted criteria including performance, logistics, platform, operational concerns, maturity, and cost was conducted. Experimental data were generated to support downselect. Downselected technologies include long-wave and mid-wave infrared (LWIR and MWIR), Differential Scattering/Differential Absorption Lidar, Passive LWIR Spectroscopy, and Spectral Resolution Ultraviolet Laser Induced Fluorescence. In FY03, modifications and laboratory characterization of seven breadboard systems were initiated for biological detection testing. In FY04, field environment data collection on the breadboards was initiated.

Challenges. Significant progress has been made recently in both active and passive standoff detection arenas with respect to biological detection. Despite this, significant challenges remain. In addition to size, weight, and power, challenges exist with respect to sensitivity, specificity, false alarm rates, and daytime operations.

Milestones.

FY2006: Demonstrate the optimized system performance to detect and discriminate biological agents. Evaluate the feasibility of the demonstrated technology to meet chemical standoff detection requirements.

CB.70 Femtosecond Adaptive Spectroscopy Techniques for Remote Agent Detection

Objectives. The Femtosecond Adaptive Spectroscopy Techniques for Remote Agent Detections program will demonstrate the capability to detect biological agents at standoff distances. This will be accomplished by performing coherent nonlinear optical spectroscopy, laser pulse shaping techniques, and adaptive optics coupled with strategies that optimize the return signal. By using short pulse lasers with coherence effects, both the spectral and temporal information contained in the backscattered signal will be exploited. This will enable identification of specific agents and provide a mechanism to adapt the system to new agents.

Payoffs. U.S. and coalition forces face an uncertain operating environment in which opponents may employ biological weapons. The ability to detect biological agents at a standoff distance range of 3 km will provide early warning of biological and chemical attacks and an increase in response time. This directly supports the QDR goals of Protect Bases of Operation including Biological Defense, Chemical Defense, and Combating Terrorism.

Challenges. Challenges for this program include: 1) Establishing in the laboratory setting the signal to clutter and ROC curve for the detection of anthrax spores for a variety of nonlinear spectroscopies

CB.70 Femtosecond Adaptive Spectroscopy Techniques for Remote Agent Detection

including femtosecond adaptive coherent antistokes raman spectroscopy and multiphoton excitation fluorescence. This will be done by evaluating the impact of common atmospheric components, molecules of similar size, and molecules with similar physical and chemical properties on the ability to detect signal from anthrax spores. 2) Developing techniques for high-fidelity pulse shaping to deliver the pulse shape at the target through a dispersive and scattering atmosphere. 3) Demonstrating optimization of the backscattered S/N by adapting spectral content of the pulses, timing of the pulse sequence, and intensity of the pulse. 4) Transitioning the capabilities developed in the laboratory and conducting an experiment on an instrumented outdoor test range using retroreflectors at a standoff range of 3 km and the maturation of the technologies leading to a demonstration of remote agent detection without retroreflectors at a standoff range of 3 km.

Milestones/Metrics.

FY2006: Demonstrate the ability to detect anthrax or a chemical agent at a concentration of 1000 ACPLA in a cloud at distance of 3 km in the presence of confuser molecules.

CB.72 Biological Warfare Defense Sensors

Objectives. The Handheld Isothermal Silver Standard Sensor (HISSS) and the Spectral Sensing of Bio-Aerosols (SSBA) programs are developing fieldable systems that will detect biological weapons agent (BWA) on the battlefield using hand-held portable detect-to-protect sensors and stand-alone, standoff, detect-to-warn trigger sensors. The SSBA detect-to-warn trigger sensors will be developed for two biosensing areas; the first will be capable of stand-alone detection without consumables, the other will be semi-portable and readily interfaced with the HISSS handheld portable detect-to-protect sensor. The SSBA program addresses the urgent need for BWA detect-to-warn trigger sensors with fast response times and very low false alarm rates. The goal of this program is to develop point detection sensors with response times of less than one minute and with at least one order of magnitude reduction in false alarm rate relative to currently fielded sensors. The SSBA program will also evaluate whether any of the proposed sensors can provide detection and localization of a biological agent at useful standoff ranges. The HISSS program addresses the urgent need for BWA detect-to-protect sensors. They are based on isothermal techniques that replace today's laboratory silver standards such as polymerase chain reaction (PCR), reverse transcriptase PCR, and enzyme-linked immunosorbent assay. The goal of the program is to enable battlefield detection for the full biological spectrum of bacteria, viruses, and toxins using a handheld device at or beyond laboratory performance standards. The development of these sensors will support the DTO's biological defense operation through the detect-to-warn and detect-to-protection sensors for BWAs.

Payoffs. HISSS: Develop detection technologies that will enable accurate detection of a biological, specifically a bacteria, virus or toxin using a portable hand-held device. SSBA: Develop detection technologies that will enable accurate detection of a biological aerosol threat from a standoff position.

Challenges. HISSS: During the Phase II flow-through assay development, molecular adhesion and assay speed have been the main challenges. SSBA: Due to the early stage in Phase II, no challenges have yet been identified.

Milestones/Metrics.

FY2006: HISSS: Design for a single flow-through sensor validated in the flow-through testbed that is capable of conducting all three assays. SSBA: Sensor prototype must demonstrate at least 1 week of continuous operation and data collection to enable Phase III testing.

FY2007: Complete field testing and algorithm optimization with extended false alarm testing.

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Annex C

Information Systems Programs

Table C-1 Information Systems RDA Efforts

Category	Nomenclature	Status	USA	USAF	USMC	USN
Warning and Reporting	- Joint Warning and Reporting Network (JWARN)	RDTE	Joint	Joint	Joint	Joint
	- Multipurpose Integrated Chemical Agent Detector (MICAD)	Fielded*	*Rqmt*			*Rqmt*
Hazards Analysis	- Vapor, Liquid and Solid Tracking (VLSTRACK)	RDTE/Fielded	Joint*	Joint*	Joint*	Joint*
	- Chemical Warfare Naval Simulation (CWNAVSIM)	RDTE				Rqmt
	- MESO	RDTE	Joint*	Joint*		Joint*
	- CB Warfare Computational Fluid Effects (CBW-CFX)	RDTE	Joint*	Joint*		Joint*
	- Hazard Prediction and Analysis Capability (HPAC)	Fielded	Joint*	Joint*	Fielded	Joint*
	- Joint Effects Model (JEM)	RDTE	Joint*	Joint*	Joint*	Joint*
	- CB.42 Environmental Fate of Agents	DTO				
	- CB.62 Hazard Prediction with Nowcasting	DTO				
	- CB.55 Chemical and Biological Hazard Environment Prediction	DTO				
	- CB.51 Low-level CW Agent Exposure: Effects and Countermeasures	DTO				
Operational Effects Analysis	- Simulation Training and Analysis For Fixed Sites (STAFFS)	RDTE	Joint*	*Rqmt*		Joint*
	- Joint Operational Effects Federation (JOEF)	RDTE	Joint*	Joint*	Joint*	Joint*
	- Joint Medical NBC Decision Support Tool (JMNBCDST)	RDTE	Joint*	Joint*		Joint*
	- JA.28 WMD Combat Assessment	DTO				
Training Simulation	- Virtual Emergency Response Training System (VERTS)	RDTE	Joint*	Joint*		Joint*
	- Training Simulation Capability (TSC)	RDTE	Joint*	Joint*		Joint*

Joint= Joint Service requirement
Rqmt= Service requirement
* = Sub-product(s) of a Joint project
Fielded = Fielded Capability (Sustained by Services)
Joint*=Draft Joint Service requirement
Rqmt = sub-product requirement or interest
Rqmt Interest = requirement or interest in sub-product
RDTE = Research, Development, Test & Evaluation (Advanced Development program)
DTO=Defense Technology Objective (Science & Technology Base Program)

WARNING AND REPORTING

FIELDED AND PRODUCTION ITEMS

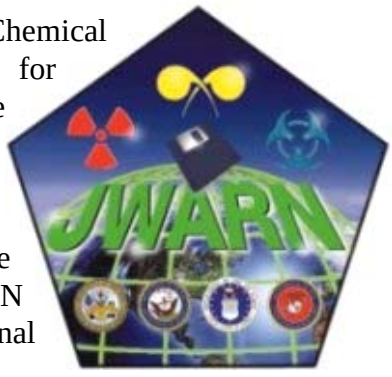
Joint Service Warning and Reporting Network (JWARN) Block I (FUE FY99)

Key Requirements:

- Capable of generating NBC reports
- Capable of automatic transmission of NBC alarm and data

Description:

JWARN Block I is an automated Nuclear, Biological, and Chemical (NBC) Information System. JWARN Block I is essential for integrating the data from NBC detectors and sensors into the Joint Service Command, Control, Communication, Computers, Information and Intelligence (C^4I^2) systems and networks in the digitized battlefield. JWARN Block 1 provides the Joint Force an analysis and response capability to predict the hazards of hostile NBC attacks or accidents/incidents. JWARN Block I will also provide the Joint Forces with the operational



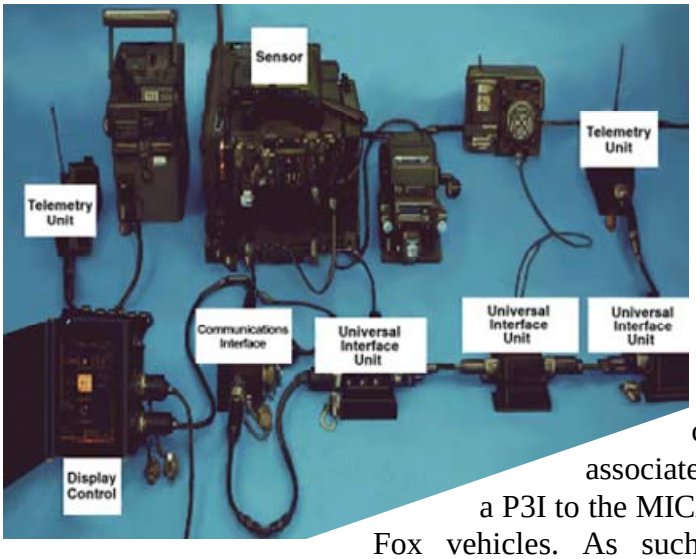
capability to employ NBC warning technology that will collect, analyze, identify, locate, report and disseminate NBC threat and hazard information. JWARN Block I is located in command and control centers at the appropriate level defined in Service-specific annexes and employed by NBC defense specialists and other designated personnel. It allows operators to provide commanders with analyzed data for decisions for disseminating warnings to the lowest echelons on the battlefield. It provides additional data processing, production of plans and reports, and access to specific NBC information to improve the efficiency of NBC personnel assets. Block II is planned to integrate this capability into Command and Control centers so that it will be a segment on existing and future C4ISR systems, and to integrate the sensor outputs directly and automatically with the NBC warning and reporting tools so that sensor data automatically feeds the information system.

Multipurpose Integrated Chemical Agent Detector (MICAD) Embedded Common Technical Architecture (ECTA) Pre-Planned Product Improvement (P3I)

Key Requirements:

- Capable of interfacing with all NBC detectors and sensors
- Capable of interoperability with all service command and control systems
- Capable of generating NBC reports
- Capable of automatic transmission of NBC alarm and data
- Capable of vehicle (Fox, M93A1) operation

Description:



ECTA completely meets the JWARN ORD requirements for a fully automated CBRN Information System for vehicles, shelters and ships where data is taken directly from the CBRN sensors to generate warning and reporting information directly to and on the host C4ISR system. ECTA provides the Joint Force a legacy analysis and response capability to predict the hazards associated with any CBRN event. ECTA is a P3I to the MICAD system deployed on the Army's Fox vehicles. As such, the ECTA will take MICAD functions such as control of NBC sensors which is performed through direct, hard wire connections, operator initiated analysis using legacy tools such as the Vapor Liquid Solid Tracking (VLSTRACK) and Hazard Prediction and Analysis Capability (HPAC), and automatic generation of NATO Standard warning reports using JWARN Block 1 software, and imbed the control functionality within the host C4ISR system. Initial target C4ISR systems are the Maneuver Control System (MCS) used by the Army for Fox vehicles, the GCCS-M system used on Navy ships, and the Theater Battle Management Core Systems (TBMCS) used by the Air Force.

WARNING AND REPORTING

RDT&E ITEMS

Joint Service Warning and Reporting Network (JWARN) Block II (FUE FY08)

Key Requirements:

- Capable of interfacing with all NBC detectors and sensors
- Capable of interoperability with all service command and control systems
- Capable of generating NBC reports
- Capable of automatic transmission of NBC alarm and data

Description:

JWARN Block II will meet the JWARN ORD requirements for a fully automated CBRN Information System for stationary, vehicular, mobile and dispersed sensor applications that takes data directly from the CBRN sensors and generates warning and reporting information directly to the host C4ISR system. JWARN Block II will provide the Joint Force a comprehensive analysis capability with the use of the Joint Effects Model (JEM), which is currently under development to replace legacy analysis tools. JWARN will also provide the Joint Forces with the operational capability to employ evolving warning technology that will collect, analyze, identify, locate, report and disseminate NBC threat and hazard information. JWARN will be located in command and control centers and hosted as a segment on C4ISR systems at the appropriate level defined in Service-specific annexes and employed by NBC defense specialists and other designated personnel. The JWARN system will transfer data automatically via hard wire or other means from and to the actual detector/sensor/ network nodes and provide commanders with analyzed data for decisions for disseminating warnings to the lowest echelons on the battlefield. It will provide additional data processing, production of NBC reports, and access to specific NBC information to improve the efficiency of NBC personnel assets.

HAZARDS ANALYSIS

FIELDED AND PRODUCTION

Vapor, Liquid and Solid Tracking (VLSTRACK)

VLSTRACK is a chemical and biological agent hazard assessment model that predicts the behavior of agents and the resulting hazards from a chemical or biological weapons attack. This model has been verified and validated against data concerning passive defense against biological and chemical weapons and is the only model accredited by the Department of Defense for this purpose. It supports operational decisions, operational contingency planning, hazard assessment doctrine, acquisition program studies, and requirements generation. VLSTRACK Version 3.1 is available and fielded but is no longer supported as an active acquisition program. This technology is being transitioned to the Joint Effects Model (JEM) Acquisition Program.

Hazard Prediction and Assessment Capability (HPAC)

HPAC provides the means to predict the effects of hazardous material releases into the atmosphere and its impact on civilian and military populations. It models incidents involving nuclear, biological, chemical and radiological (NBCR) weapons, nuclear reactor accidents, Toxic Industrial Chemicals, Toxic Industrial Materials and high explosive collateral effects resulting from conventional weapon strikes against enemy weapons of mass destruction (WMD) production and storage facilities. HPAC has been verified and validated against data for active offense, active defense and passive defense against WMD weapons, production facilities and storage structures. It has well documented independent verification and validation including peer-reviewed journal publication. HPAC is accredited by DOD for active defense against NBCR facilities, approved as the SHAPE NBCR Modeling Capability and NATO Allied Technical Publication 45 (ATP) Standard, and accredited by USSTRATCOM for its NBCR planning. HPAC supports operational decisions, operational contingency planning, hazard assessment doctrine, acquisition program studies, and requirements generation. HPAC Version 4.04 is currently available and fielded directly from the Technology development program conducted by the Defense Threat Reduction Agency (DTRA). Training is also available from the developer, US Army Chemical School, DTRA's Nuclear Weapons School, and the NATO/SHAPE School at Oberamergau. This technology is being transitioned to the Joint Effects Model (JEM) Acquisition Program.

HAZARDS ANALYSIS

RDTE ITEMS

CWNAVSIM (Chemical Warfare Naval Simulation)

Key Requirements:

- Predict ship system degradation resulting from a chemical attack
- Predict Mission Oriented Protective Posture (MOPP) resulting from a chemical attack
- Predict shipboard chemical agent detection system effectiveness

Description:

CWNAVSIM was developed to address specific Naval acquisition program decisions regarding chemical weapons defensive systems, specifically the Tactics, Techniques and Procedures (TTP) needed to defend the ship and the placement of detection devices. The CWNAVSIM model is comprised of three modules: Deposition and Weathering of a Chemical Attack on a Naval Vessel (DAWN), Ship Chemical Warfare Ventilation Model (VENM) and the Naval Unit Resiliency Analysis (NURA). DAWN simulates Gaussian puff vapor and liquid clouds (primary cloud) interacting with the ship surfaces using potential flow equations. The DAWN module allows deposition and off gassing (secondary cloud) of the contaminant from the ship's external surfaces. The primary and secondary clouds are then entrained into the ship and transported throughout by the ship's HVAC system. VENM traces the vapor movement internally keeping track of concentrations and dosages in each compartment using a zonal model. VENM can simulate attack scenarios without input from the DAWN module. NURA provides casualty assessments and ship's mission degradation. NURA was developed primarily from the Army's AURA code. Currently the DAWN module is being replaced with CBW-CFX Computational Fluid Dynamic (CFD) code.

MESO (3D mesoscale meteorological model)

Key Requirements:

- Advance the state-of-the-art in use of Lagrangian particle transport and diffusion (T&D)
- Advance the state-of-the-art in characterization of the planetary boundary layer
- Address physical processes and hazard assessment capabilities of current standard models for CBD

Description:

MESO is developed to provide a T&D capability that is more accurate and more theoretically sound than Gaussian puff methodology but does not require the time and computer resources of a full Navier-Stokes Computational Fluid Dynamics (CFD) code. The development effort for the Department of Defense is also intended to provide advances in modeling important physical processes relevant to hazard assessment. MESO is currently not in distribution.

Chemical and Biological Warfare Computational Fluid Effects (CBW-CFX)

Key Requirements:

- Track threat from vapor, liquid, and solid CB agents around or within complex structures, *e.g.*, ships and buildings

Description:

CBW-CFX uses CFD code to model the transport, diffusion, deposition, and surface evaporation of chemical and biological agents in and around 3-D structures. CFX is a commercial code, which allows licensed users to develop subroutines that can be used within the code. CBW-CFX adds methodology for physical processes unique to chemical and biological agents. CBW-CFX is intended for use by researchers. To extend its utility it has been interfaced with other models, *e.g.*, VLSTRACK and the Ventilation Model (VENM).

Defense Technology Objective (DTO) CB. 42 Environmental Fate of Agents

Objectives. This DTO will measure and understand the physicochemical processes of chemical agents on surfaces in order to predict their persistence and residual agent concentration in operational scenarios via an agent fate model. Such data will be incorporated with CB environment models to enhance description of the CB Battlespace environment and its evolution in time.

Payoffs. This DTO addresses the Joint Future Operational Capability of Battle Management: Battlespace Analysis and Planning. This DTO establishes challenge levels and protection factors necessary for multi-service operating environments based on validated datasets and consistent analytical methodology, and develops a science-based understanding of the chemistry and physics of chemical warfare agents on surfaces. A surface evaporation module will be produced - validated against laboratory studies, wind tunnel tests, and field trials to reduce uncertainty for predicting chemical threat agent fate and persistence. Such a module, when addressing physical processes relevant to environment fate of agents on surfaces, serves as a key component -for addressing persistence analysis for future novel chemical and biological threat agents. Data developed by this effort, when incorporated with CB environment models, will decrease risk to operational commanders when faced with critical decisions in the CB battlespace. Such decisions have impact not only on the survivability of the warfighter, but also on the integrity of the mission in the face of disruptions due to chemical agent hazards. Results of

Defense Technology Objective (DTO) CB. 42 Environmental Fate of Agents
this program will directly support numerous decision tools such as the Joint Effects Model (JEM) and Joint Operational Effects Federation (JOEF). During FY04, lab scale wind tunnels for measuring the surface evaporation of chemical agents were developed and validated. The evaporation of HD on glass and the dissemination of thickened agents were accomplished. The Chemical Hazard Estimation Method & Risk Assessment Tool (CHEMRAT) and the surface evaporation module of VLSTRACK were updated with the most recent agent fate data. **Challenges.** Dispersing and measuring the surface evaporation of thickened agents on complex matrices such as concrete and asphalt. Scaling agent evaporation measurements from lab-size wind tunnels to outdoor conditions in an agent persistence and contact model. **Milestones/Metrics.** **FY2006:** Complete surface evaporation testing of HD, GD, and VX on concrete, asphalt, soil, and grass in both lab and outdoor environments. Complete agent (HD, GD, VX) secondary evaporation model for concrete, asphalt, soil and grass and make predictions of outdoor field test experiments; conduct validation experiments. Complete and document residual contact measurements.

Agent Fate, Model Validation, and Source Characterization Databases

Key Requirements:

- Provide the Joint Service with field trial data assembled within databases in spreadsheet format
- The spreadsheets will contain information needed to develop or validate any open terrain contaminant transport and fate model
- Evaluate the validity of source characterization parameters
- The databases will initially directly support the Joint Effects Model (JEM) program
- The databases will be used to validate M&S tools developed under the M&S CA and the Information Systems Technology Business Area (BA)

Description:

Agent Fate Database: Currently CB Modeling and Simulation capabilities do not adequately address the fate of chemical agents deposited onto various surfaces and the resulting vapor and liquid hazards. The ability to assess these risks is key to post attack recovery planning, developing new equipment performance specifications, and the general planning for operational performance degradation expected due to the presence of persistent chemical agents. The goal of the Agent Fate Database is to translate detailed laboratory and field acquired data to improve the behavior characterization of chemical agent liquid deposited onto materials sufficiently well that computer models can be developed to simulate the behavior and accurately predict the resulting contact and vapor hazards. Results from modeling studies and analyses can then be used to develop decontamination and restoration of operations doctrine and training and influence the acquisition of materiel needed to meet associated requirements.

Model Validation Database: Each of the three DOD standard models (VLSTRACK, HPAC, and D2PC) has been validated against field trial data. The source terms, meteorological conditions, and contamination levels will be collected from the field trial reports and the files used for model validation. All relevant information will be put into an Oracle database. Additional literature search of DTIC and Technical Libraries will be performed for field trial reports contain data for contaminant releases in open areas that can be used for model validation. The data will be extracted from these reports and added to the validation database in the same fashion as the original set of reports. Further literature searches will be done to locate reports containing data on the flow of contaminants around buildings and to collect data characterizing the behavior of chemical or biological agents under conditions representative of high altitudes. This additional data will be added to the validation database for use in validating the complex flow and missile intercept capabilities of JEM Blocks 2 and 3.

Source Characterization Database: The overall objective is to develop a source characterization database of CB agent delivery systems as part of M&S tools available to the operational CB community and in direct support to the HPAC program. A tool called CARREM has been developed to estimate a delivery system's initial source, in parameters needed by transport and diffusion models. Subject matter experts will evaluate the validity of these estimated parameters. When there is no consensus in the validity of the parameters or the experimental methods used to obtain them, a community accepted

value would be determined. In cases where there is a significant disagreement in a value and there is no clear indicator which is the more valid, the parameters will be identified as an estimate used pending further experimentation or investigation.

DTO CB.62 Hazard Prediction with Nowcasting

Objectives. The overall objective is to develop a high–resolution local, regional, and global atmospheric prediction system that describes and forecasts/nowcasts battlespace environment (BSE) parameters to support prediction of the fate of chemical and biological agents, smoke, toxic industrial materials, and other agents in the environment for all DOD applications; and incorporate these BSE parameters into improved chemical/biological (CB) dispersion models to more accurately describe dispersion under a wider range of atmospheric conditions (night time, stable, in complex terrain, at high altitudes, etc.), than current capabilities. This DTO matures emerging basic research (6.1) for direct applications to the Service (6.4) users. The work necessary to integrate the Joint Effects Model with mesoscale nowcasts constitutes the technical effort that will be done under this DTO.

Payoffs. CB dispersion models will be improved by investigating methodologies that more accurately represent turbulent fluctuations, and will be coupled to atmospheric models in a physically realistic (thermally and dynamically) manner.

Challenges. As time-critical decisions are necessitated, the forecast capability to support dispersion modeling should be tied to real-time observational nowcast and battlefield management systems such as JWARN (currently in development) for executing and managing prudent operations in the battlespace. Improved modeling of high-altitude and near-surface atmospheric physics and agent behavior, especially in environments containing interferents such as smoke, fog, and dust, will require significant effort to validate. Considerable effort is required for the operational test and evaluation of the capability, exercise support, and development of concepts of operations, tactics, techniques, and procedures.

Milestones/Metrics.

FY2006: Enhance near-surface environmental characterization and demonstrate improvements using the Joint Effects Model. Develop data assimilation techniques to improve forecasts of near-surface characteristics important for hazard prediction.

FY2007: Demonstrate transitionable telescoping environmental prediction capability using a combination of global and mesoscale data assimilation systems coupled with real-time nowcast update in support of the JEM.

DTO CB.55 Chemical and Biological Hazard Environment Prediction

Objectives. The objective of this effort is to develop an improved capability to predict the behavior of chemical and biological agents in the environment. It will address the physical and biological processes that effect chemical and biological agents after they have been released into the environment. These processes include transport, diffusion, deposition, evaporation, biological decay, and reaerosolization and will incorporate new methodology developed under DTO CB.42 (Environmental Fate of Agents) that describes agent fate and persistence. This DTO directly supports the Joint Effects Model (JEM) ORD.

Payoffs. This capability will allow the warfighter to assess potential hazards from the use of chemical or biological weapons on the battlefield. This information is an important consideration when evaluating possible courses of action and their associated risks. Since the Joint Operational Effects Federation (JOEF) makes use of the chemical and biological hazard environment predictions, improvements in the capabilities to make those predictions will likewise improve the results of the operational analyses performed by JOEF.

Challenges. The primary challenge to developing this capability is the scale of the problem domain (meters to many kilometers). There are a wide range of interacting processes involved and a variety of operational environments that must be addressed. Each of the modeled processes of transport, diffusion, deposition, surface adsorption, surface desorption, evaporation, and biological decay is addressed through mathematical calculations that are valid over a specific range of conditions but may be unsuitable outside that range. For example a fast-running Gaussian model (designed for flat terrain) might be applied to transport and diffusion in an urban environment for rapid analysis, but the results will be very inaccurate compared to a full computational fluid dynamics analysis that requires greater computing resources. Computer code implementation also represents a continuing challenge. The need for faster codes that execute on available and affordable computer platforms will be an ongoing issue for the foreseeable future. New methodology on agent persistence, surface evaporation, reaerosolization (produced under DTO CB.42) will need to be integrated into this broader modeling framework of hazard prediction tools.

Milestones/Metrics.

FY2006: Transition the complex terrain and flow around structures modeling capabilities to JEM Block III program.

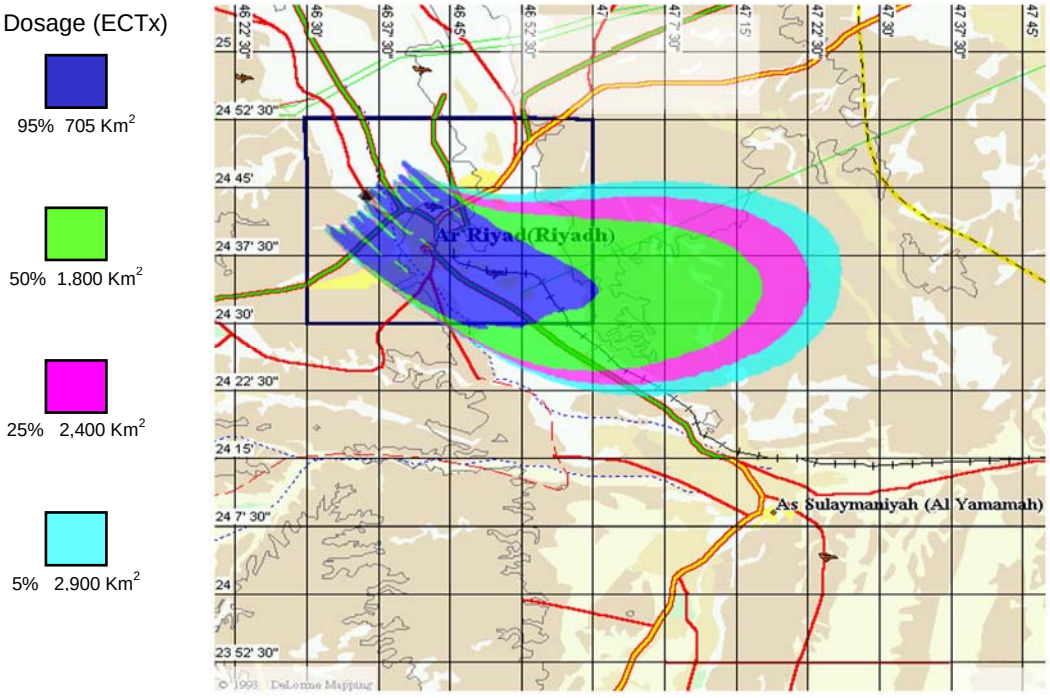
Joint Effects Model (JEM) (FUE FY06)

Key Requirements:

- Predict hazard areas and contamination effects from nuclear, chemical or biological attack
- Predict hazard areas and contamination effects from nuclear, chemical or biological agent releases and releases of toxic industrial materials

Description:

JEM is the acquisition program that will transition the science and technology capabilities of VLSTRACK, HPAC, and D2PC/D2PUFF. Once fielded, JEM will be the standard DOD NBC hazard prediction model. JEM will be capable of modeling hazards in a variety of scenarios including: counterforce, passive defense, accident or incidents, high altitude releases, urban NBC environments, building interiors, and human performance degradation; some of these capabilities will be included following release of Block 1. JEM will support defense against NBC and Toxic Industrial Material (TIM) weapons, devices, and incidents. JEM will be verified, validated, and accredited (VV&A) in accordance with the applicable DOD VV&A directives. When used operationally, JEM will reside on and interface with command, control, communications, computers, and intelligence (C4I) systems. Warning systems on those C4I systems will use JEM to predict hazard areas and provide warning to U.S. forces within those areas. When used analytically, JEM will assist DOD components to train jointly, develop doctrine and tactics, and assess warfighting, technology, and materiel development proposals, and force structuring. JEM (unclassified version) may also support homeland defense through use by Civil Authorities and Allies.



Research thrust: ***Low-Level CW Agent Exposure***

- Identified biomarker(s) to indicate low level chemical exposure.
- Continued studies of neurotoxic effects of low dose chemical agent exposure.
- Examined the potential for immunological deficits following nerve agent exposures.
- Identified potential medical countermeasures for low level chemical warfare nerve agent and HD exposure.
- Assessed short-term behavioral, physiological, and neuropathological effects of VX nerve agent in rodents following low-dose exposures for varying durations and their potential impact on human operational readiness.
- Initiated studies on the effects of current prophylactic and therapeutic treatments on the maximum tolerated dose for repeated chemical warfare agent exposures and on other indices of chemical agent toxicity.
- Evaluated the efficacy of the FDA-approved oxime treatment, pralidoxime chloride (2-PAM), against biochemical and behavioral effects induced by repeated low level exposure to chemical warfare nerve agents in guinea pigs.

The following DTO is a key effort in addressing the issues of Low-Level CW Agent Exposures. This research is being conducted with coordination between the medical and non-medical research communities.

DTO CB. 51 Low-Level CW Agent Exposure: Effects and Countermeasures

Objectives. This DTO will deliver data sets on operationally relevant health effects of exposures to sub-lethal concentrations of Chemical Warfare Agents (CWAs). These data sets will, in turn, support development and refinement of risk assessment tools. Specific objectives are to extrapolate relevant experimental effects to determine post-exposure health problems that may impact subsequent operational readiness; and design and execute studies to generate scientifically valid data to serve as a basis for reducing the error in health risk assessment predictions useful for military Operational Risk Management (ORM) decisions.

Payoffs. This DTO addresses deficiencies in the current understanding of the consequences of CWA exposure that may be encountered by military personnel across a range of deployment settings. For even as clear a toxicological endpoint as lethality, historical assumptions used to extend the prediction of exposures out in time have been shown to be overly conservative for the best studied agent, GB. The major goal of this effort is to understand the dose-response relationship for traditional CWAs (G-series, V-series and HD) with an object to identify the most appropriate endpoint to use for determining response actions. For example, a quantitative description of nerve agent-induced pupil effects (miosis) could serve as such a 'first noticeable effect', but less obvious changes in mental function could more significantly degrade operational performance at low-levels of exposures. Consistent and defendable data generated by this program will significantly reduce the error currently embedded in various estimates of toxicity and will provide a consistent and uniform basis for extrapolating information on health effects and potential short- or long-term performance decrements from exposure times and concentrations relevant to military operations. In addition, these data will be essential in creating requirements criteria for detector design, personal protective gear, and decontamination activities. Finally, the characteristics and magnitude of adverse health effects in these less-than-lethal exposure settings may suggest a need for novel medical protection or prophylaxis strategies.

DTO CB. 51 Low-Level CW Agent Exposure: Effects and Countermeasures

Challenges. Significant technical hurdles must be addressed to create and maintain stable exposure conditions for some agents. Cross-validation of inhalation, parenteral and dermal routes of exposure conditions must be addressed in a series of integration studies. Selection of appropriate animal model systems must be carefully designed to reduce the difficulty of extending such data to human exposures and to permit optimal detection of performance-degrading health effects. Collation of all results into a unified Operational Risk Management (ORM) framework will require novel approaches to traditional treatments of scientific data.

Milestones/Metrics.

FY2006: Deliver inhalation dataset to define longer time, lower level operational effects for VX in swine and GD in rodents that refine operational human health risk assessments. Complete and deliver assessments of the long-term and delayed effects of CWA nerve agents on behavior and physiology following a range of low-dose exposures for varying durations, and assess potential impacts on human operational readiness in subsequent deployments.

FY2007: Deliver inhalation data set to define longer time, lower level operational effects for HD in swine.

OPERATIONAL EFFECTS ANALYSIS

RDTE ITEMS

Simulation Training and Analysis for Fixed Sites (STAFFS)

Key Requirements:

- Determines operational effects of CB warfare environment on military fixed site operations
- Interfaces with key NBC models, simulations, and data bases

Description:

STAFFS is a general-purpose simulation model which represents the operations of large fixed-site facilities such as air bases, aerial ports of debarkation (APODs) and seaports of debarkation (SPODs), with the capability to represent chemical and biological warfare (CBW) attacks and their effects on operations. No other capability currently exists within DOD to assess the operational impact of CBW attacks on critical fixed-site targets. Due to their fixed location and essential combat support roles to forces in the theater of operation, these rear-area facilities can be expected to be high priority targets to aggressor forces and thus one of the most likely targets to encounter CB weapons and their effects. These sites may be particularly susceptible to repeated CBW attacks, which could significantly degrade logistical throughput and hamper combat operations. STAFFS is currently in use and being further developed in two major functional areas: (1) support of wargaming and operational exercises including distributed interactive environments, and (2) support of operational and requirements analysis. Wargame applications run interactively with STAFFS accepting input and providing output to other model applications running as a system. Man-in-the-loop games and simulations may be performed. Analysis applications typically involve the examination of many different simulation/analysis cases

(a case matrix) often involving parametric representation of unknown system data. Different user interfaces are provided specific to the application. STAFFS wargaming applications utilize an interactive graphic user/system interface while analysis applications typically utilize file base batch processing.

STAFFS utilizes spatial and temporal CB challenge data calculated by other standard CB hazard assessment models including VLSTRACK and HPAC. CB equipment and agent effects represented in high resolution include detectors, protective gear, decontamination, toxic and infective agent effects, collective protection, medical treatment, equipment induced thermal effects, equipment induced encumbrance, and doctrinal procedures such as work-rest cycles. These effects are represented by engineering level sub-models, which can be easily changed to represent different equipment capabilities and levels of availability. Basic operational tasks are modeled using a task-network approach that is adaptable to any desired level of resolution. STAFFS is developed by AFRL. Limited training is currently available.

Joint Operational Effects Federation (JOEF) (FUE FY09)

Key Requirements:

- Analyzes operational issues and doctrine through the interrelation and effects of various elements within the overall system.
- Evaluates the performance of particular equipment based on material characteristics.
- Assesses individual Warfighter ability to perform mission essential tasks.
- Aggregates individual performance parameters into unit effectiveness.
- Integrates existing transport/diffusion models for CB agent hazards.

Description:

The JOEF will provide the operational community with the federated models and simulations specific to their operational environment required to predict or immediately respond to the need for operational effects information relative to any nuclear, radiological, chemical, or biological event. JOEF will include both fixed site and mobile forces simulation capabilities that, when married to specific data bases, will simulate all nuclear, radiological, chemical and biological defense processes, forces, and battlespace environments. In addition, the Federation will address both personnel degradation and medical processes and resources. JOEF will be used by both the operational commander and operational analyst to make rapid course of action analysis effects- based operational decisions, logistics decisions, CBD asset location decisions, and develop TTPs for CBD operations. The JOEF will be utilized by: (1) operational planners and decision makers in support of course of action assessment and plan evaluation; (2) the analysis community in support of high level concept assessments and system effectiveness studies and (3) Joint exercises and experiments in support of planning, execution, and analysis. The JOEF vision is of a set of validated low-to-medium resolution warfare entity models, certified data, appropriate simulation services, and related user support tools in a framework suitable for modeling multi-warfare scenarios.

Joint Medical NBC Decision Support Tool

Key Requirements:

- Provide the capability to support deliberate planning, crisis action planning, exercises/training, and execution of medical support for operational missions, both on the battlefield and in urban environments.
- Interface with current and co-developmental medical planning tools such as the Medical Analysis Tool (MAT), Command and Control systems, medical informatics including the Defense Medical Surveillance System (DMSS) database, and Joint Warning and Reporting Network (JWARN) for discretionary transmission of data.

Description:

The Joint Medical NBC Decision Support Tool will enable the Service/medical planner/operator to model and analyze the NBC battlefield both to identify Service/Joint Force agent exposures on military and civilian populations and to estimate NBC casualties. It will also relate treatment protocols (time, task, treater files) to these casualties to determine: medical materiel requirements, medical personnel requirements, medical evacuation requirements and for hospital bed requirements at Levels 3-5. As such, it supports operational decisions, operational contingency planning, threat assessment doctrine, acquisition program studies, and requirements generation.

DTO JA.28 WMD Combat Assessment*

*This DTO is funded by DTRA (under PE 0603160BR) in coordination with the CBDP

Objectives. This DTO will develop and demonstrate the capability to perform combat assessment of counterforce strikes conducted on enemy chemical, biological, and nuclear-related targets. Systems that perform weapons of mass destruction (WMD) combat assessment are intended to provide the Combatant Commander with timely indication of the magnitude and severity of adverse consequences (e.g., assessment of atmospheric release of chemicals, biological agents, or radiological materials) resulting from U.S./coalition combat action against WMD targets. Combat assessment may be conducted by sensors mounted on deployable systems such as unmanned vehicles or with expendable sensors that are emplaced either pre- or post-strike. Sensors may consist of material collectors and collector-identifiers, with real-time or near-real-time reporting capability. Technological solutions may also include development and weaponization of materials to tag effluent plumes released from targets as a result of combat action to provide cueing for remote detection systems (and advanced warning of potential downwind WMD contamination). Sensor systems/host vehicles may also egress a target area to facilitate recovery and forensic analysis of collected material.

Payoffs. This effort will provide the warfighter with the capability to rapidly assess the results of planned strikes on enemy WMD targets, providing indication of hazards to friendly forces, population centers, etc., as well as the capability for real-time bomb impact assessment/bomb damage assessment for the WMD target set.

Challenges. Challenges include standoff detection of WMD agents and tracking of post-strike plumes/clouds from chemical, biological, and radiological agent-related targets; developing sensors for point collection and real-time identification of chemical, biological, and radiological agents in plumes containing post-strike interferents such as sand, dust, explosive by-products, and corrosive materials; miniaturizing and packaging sensor systems for militarily deployable systems; integrating technology into existing U.S./Coalition C4ISR architectures; and developing taggant material compatible with U.S./Coalition weapons and tactical/strategic sensors.

DTO JA.28 WMD Combat Assessment*
Milestones/Metrics. **FY2006**: Spiral 1 (SP 1): Initiate development of prototype airborne BCAS collection system. **FY2007**: SP 1: Demonstrate prototype airborne BCAS collection system. **FY2008**: Spiral 2 (SP 2): Initiate development of prototype airborne BCAS collection and identification system. **FY2009**: SP 2: Demonstrate prototype airborne BCAS collection and identification system.

TRAINING SIMULATION SYSTEMS

RDTE ITEMS

Virtual Emergency Response Training System (VERTS)

Key Requirements:

- Visually immersive training environment for specialized missions of the US Army National Guard Weapons of Mass Destruction Civil Support Teams—WMD CST.
- Must represent not only the deploying military units' personnel and equipment, but also the civil first responders and their equipment with which the CSTs will work.
- Detailed visual and structural databases required for each city/site.

Description:

The VERTS is being developed to enhance the training of WMD CSTs. WMD response requires significant training demands for individual and collective tasks. Soldiers and airmen must be proficient on a wide array of government and commercial equipment for NBC protection, detection and medical response. The WMD CSTs, in particular, are required to master a variety of equipment and procedures. The VERTS is required to support both individual and collective training. VERTS supports training in all tasks for the CST. It allows training on procedures for response to dangerous NBC agents, procedures that are difficult if not impossible to recreate in a live training environment. VERTS also allows mission rehearsals in actual and realistic urban settings. Training in the virtual cities of VERTS allows these teams to learn to navigate in actual cities, in actual buildings and to do so without the threat of being observed by adversaries, criminals and terrorists. VERTS, by being distributable over a network, allows teams to train together without having to travel long distances. Once validated for CSTs, VERTS offers the promise to train other DOD response elements and first responders as well. The simulation system will consist of a network of PC-based modules that will serve as Survey Team Stations (Desk-Top), a Chief Trainer/Battlemaster Station, Immersive Station, Medical Station, Network Server Station, AAR Station, and Data Logger Station.

Training Simulation Capability (TSC)

Key Requirements:

- Provide an integrated and consistent training tool for warfighters to prepare for operations in a NBC environment
- Integration with and have access to current and planned individual service C^4I^2RS systems
- Provide ability to gather and store lessons learned and identified failure/error incidents in order to provide after action review
- Provide capability to use NBC effects models and mission data to perform mission rehearsals using a simulation federation.

Description:

The TSC will provide the ability to simulate NBC attacks using NBC defense assets and Command, Control, Communications, Computers, Intelligence, Information, Reconnaissance, and Surveillance (C^4I^2RS) systems for training and exercises. It will allow for exercise planning, execution, and capturing lessons learned for after action review (AAR). It will provide the capability to use or simulate the use of NBC sensors, Tactical Engagement Simulation (TES) gear, and simulators for training and exercises. The TSC will provide the capability to simulate NBC environments and effects under live, virtual, and constructive simulations. It will provide the capability to use training and simulations in both Command Post Exercise (CPX) and Field Training Exercise (FTX) environments. It will operate in conjunction with the Joint Warning and Reporting Network (JWARN), future Joint NBC Information Systems, and the other Modeling and Simulation capabilities developed to support NBC defense requirements.

The TSC will be used at all levels of NBC defense decision-making to train for and simulate NBC attacks against friendly forces. It will provide for the training and use of simulation capability by all NBC defense personnel and commanders related to NBC threats and scenarios. When fully fielded, the TSC will provide capabilities from individual and team trainers up through large unit battle staff training capabilities.

Annex D

Non-Medical Protection Programs

Table D-1 Protection RDA Efforts

	Category	Nomenclature	Status	USA	USAF	USMC	USN
		- M45 Aircrew Protective Mask (ACPM)	Fielded	Rqmt			
		- M45 Land Warrior Mask	Fielded	Rqmt	Rqmt		Rqmt
		- M40A1/M42A2	Fielded	Rqmt		Fielded	Rqmt
		- MCU-2A/P/MCU-2P	Fielded		Rqmt		Rqmt
		- Joint Service Aircrew Mask (JSAM)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
		- Joint Service General Purpose Mask (JSGPM)	Production	Rqmt	Rqmt	Rqmt	Rqmt
		- Joint Service Chemical Environment Survivability Mask	RDTE	Interest	Rqmt		
	Universal Com-	- Protection Assessment Test System (PATS)	Fielded	Rqmt	Rqmt	Fielded	
	mon Individual	- Voice Communication Adapter	Fielded	Rqmt	Rqmt	Fielded	Rqmt
	Protective Equipment	- Joint Service Mask Leakage Tester	Production	Interest	Rqmt	Rqmt	Rqmt
	Aviation/ Surface Protection Ensembles	- Modified CPU (mCPU)	Production	Rqmt			
		- CMU-34P and CMU-35P (USN modified CPU)	RDTE	Rqmt		Rqmt	Rqmt
		- Joint Service Lightweight Integrated Suit Technology					
		-- Overgarment	Prod.*	Rqmt	Rqmt		Rqmt
		-- Boots (MULO)	Prod.* RDT&	Interest	Rqmt		
		- Alternative Footwear Solutions (AFS)	RDT&E			Rqmt	
		- Integrated Footwear System (IFS)	RDT&E			Rqmt	
		- JSLIST Block 2 Glove Upgrade (JB2GU)	RDT&E	Rqmt	Rqmt		Rqmt
		- JSLIST CB Coverall for CVC (JC3)		Rqmt			
		-Battledress Overgarment (BDO)	Fielded	Rqmt	Rqmt		Rqmt
		Joint Protective Aircrew Ensemble (JPACE)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
		- CB.45 Self-Detoxifying Materials for Chemical/Biological Protective Clothing	DTO				
	Specialty Suits	- STEPO	Fielding	Rqmt			
		- EOD Ensemble	Production		Rqmt		
		- Improved Toxicological Agent Protective (ITAP)	Production	Rqmt			
		- Joint Firefighter Integrated Response Ensemble (JFIRE)	Fielded	Rqmt	Rqmt		
		- Suit Contamination Avoidance Liquid Protective (SCALP)	Fielded	Rqmt			
COLLECTIVE PROTECTION	Tentage and Shelter Systems	- M20A1 Simplified CP Equipment (SPE)	Fielded	Rqmt	Rqmt		Rqmt
		- M28 CP Equipment (CPE)	Fielded	Rqmt	Rqmt		Rqmt
		- CB Protective Shelter (CBPS) (Medical)	Production	Rqmt	Interest		
		- CP Expeditionary Medical Shelter System (CP EMEDS)	Production	Interest	Rqmt		Interest
	Collective Protection (CP) Systems	- Shipboard Collective Protection System (CPS)	Production	Interest	Interest		Rqmt
		- Modular Collective Protection System (MCPE)	Fielded	Rqmt	Interest		Interest
		- M8A3 Gas-Particulate Filter Unit (GPFU)	Fielded	Rqmt			
		- M13A1 GPFU	Fielded	Rqmt	Rqmt		Rqmt
		- Joint Collective Protection Equipment (JCPE)	RDTE	Rqmt	Rqmt	Interest	Rqmt
		- CB.61 Advanced Air Purification System Model	DTO				
	Generic Filters	- M48/M48A1 (100 cfm) Gas-Particulate Filter	Fielded	Rqmt		Rqmt	Rqmt
		- M98 (200 cfm) Gas-Particulate Filter Set	Fielded	Rqmt	Rqmt	Interest	Rqmt
		- Fixed Installation Filters	Fielded	Rqmt	Rqmt		Interest

Rqmt = Product requirement
Interest = Product Interest
Int-NIR = Product Interest, No Imminent Requirement

* - Sub-Product(s) of a Consolidated Joint Service Project
Rqmt, Interest = Sub-Product requirement or Interest
DTO = Defense Technology Objective (Science & Technology Base Program)

INDIVIDUAL PROTECTION EQUIPMENT

SURFACE RESPIRATORY PROTECTION FIELDED AND PRODUCTION ITEMS

MCU-2/P and MCU-2A/P Protective Mask

The MCU-2/P and MCU-2A/P provides eye and respiratory protection from all chemical and biological (CB) agents as well as radioactive particulate material. The mask uses a replaceable, standard NATO filter canister, which is mounted on either side of a wide-view optical quality visor. The mask provides improved fit, comfort, and visibility relative to earlier masks, and includes a drinking tube for attachment to the standard canteen, and electronic voicemitter connections for improved communications. The MCU-2A/P designed to meet needs of the Air Force ground crews and the MCU-2/P Navy Shipboard and shore-based support units.

M40/42 Series Protective Mask

The M40/42 series protective masks provide eye-respiratory face protection from CB warfare agents, toxins and radioactive fallout particles. Each mask consists of a silicone rubber face piece with an in-turned peripheral face seal and binocular rigid lens system. The facepiece is covered with a chlorobutyl/ EPDM second skin to provide optimum liquid agent protection for the masks. It accommodates NATO standard canisters, which can be worn on either cheek of the mask. The M40 series (*left*) is designed for the individual dismounted ground warrior, while the M42 series (*right*) is designed for combat vehicle crewmen. Recent improvements include a universal second skin, making the mask compatible with JSLIST and Saratoga overgarments, and ballistic/laser protective eye lens outserts. The mask facepiece has been made a spare part, which has resulted in a significant operation and support cost savings. Use of modular parts permits the M40 series facepiece to be used in both the M40 and M42 configuration. This has resulted in significant operational and support cost savings.

Voice Communication Adapter

The Voice Communication Adapter (VCA) is a low risk program providing additional capability to the M40/42 mask. The VCA provides effective voice communication between masked personnel enhancing Command and Control on the Nuclear, Biological, Chemical (NBC) contaminated battlefield. The VCA is a joint program between the USMC and U.S. Army.

Universal Second Skin

The Universal Second Skin is one of the components of a Pre-planned Product Improvement (P3I) in the M40/M42 series mask. The Universal second skin provides liquid agent protection for the mask faceblank material. This program is a Joint U.S. Army/U.S. Marine Corps effort. The Air Force is fielding a second skin for the MCU 2A/P. The Navy is fielding a related second skin for naval variants of the protective masks.

SURFACE RESPIRATORY PROTECTION R&D ITEMS

XM50/51 Joint Service General Purpose Mask (JSGPM)

Key Requirements:

- Provide the wearer above-the-neck protection from CB agents, radioactive fallout particles, and Toxic Industrial Chemical/Toxic Industrial Materials (TICs/'TIMs)
- 24-hour CB protection
- Lower breathing resistance and reduced weight and bulk than currently fielded protective masks

Description:

The JSGPM (*prototypes shown*) will be a lightweight protective mask system consisting of mask, carrier, and accessories incorporating state-of-the-art technology to protect U.S. forces from all anticipated CBRNE threats. The mask will be designed to minimize the impact on the wearer's performance and to maximize the ability to interface with current and co-developmental Service equipment and protective clothing.

The Joint Service General Purpose Mask was designed for use by all four Services covering a multitude of environments and missions, and the mask has to work in variety of ground, shipboard and combat vehicle operations. Mask designers have achieved several significant milestones with the JSGPM, including increasing overall protection by 150%, lowering breathing resistance by 37% and increasing material resistance by 300%. The JSGPM will be the first military mask that is NIST/NIOSH approved and as such could be used by civilian first responders, which would increase interoperability between user communities and reduce production costs of the mask.

Joint Service Chemical Environment Survivability Mask (JSCESM)

Rationale:

- Joint Service Special Operations Command (SOCOM), Navy, and Air Force requirement

Key Requirements:

- One size fits all
- For low threat area usage
- Disposable
- Limited protection
  (2 hours, Aerosol agent concentrations)

Description:

The JSCESM will be a lightweight complement to the JSGPM. It will provide commanders at all levels with greater options for protection, especially in Military Operations Other Than War (MOOTW). The JSCESM will provide a disposable, emergency egress mask for use in NBC situations confronting the Services operating in low NBC threat conditions and military medical care providers and patients in certain instances when using the standard service mask is not practical. Warfighters in special operations or other combat/non-combat roles will carry JSCESM (on the uniform attached to the belt loop) or while in civilian clothing (concealable) during deployment when an NBC threat is possible, but unlikely. Additionally, other missions exist for the JSCESM such as use in collective protection shelters if the shelter filtration system fails or emergency evacuation of a shelter is required when contamination is present.

AVIATION RESPIRATORY PROTECTION FIELDED AND PRODUCTION ITEMS

M45 Protective Mask

The M45 Protective Mask supports requirements for the Land Warrior program and the Air Crew Protective Mask (ACPM). The ACPM (*shown*) is specially designed to meet the requirements of Army helicopter pilots and crews (except for the Apache helicopter). It does not require power or forced air to provide CB protection; it provides compatibility with helicopter optical systems, aircraft displays and night vision devices; and has reduced weight, cost and logistical burden when compared to the M43 series of mask. The ACPM has close fitting eyelenses mounted in a silicone rubber facepiece with an in-turned peripheral seal, a detachable hood system, and utilizes the standard NATO canister. The M45 will replace the M43 (Type II) and the M24 aviator's mask. The M45 fits a higher percentage of the extra-small and extra-large population, and is used as a mask for personnel who do not get an adequate face seal in the M40 or MCU-2A/P masks. It will be used to phase out the extra-small M17 masks currently being used for some hard-to-fit

personnel. The M45 is also used for specific ground force applications where close eye compatibility is required for unique equipment such as the Land Warrior system.

M48 Protective Mask

The M48 is the third generation M43 series masks. The M48 mask replaced the M43 Type I mask and is the only mask for the Apache aviator until the Joint Service Aircrew Mask – Apache Variant is produced. The M48 mask consists of a lightweight motor blower, a new hose assembly, a web belt, the mask carrier, facepiece carrier, eyelens cushions, and facepiece. The motor blower is aircraft mounted with a quick disconnect bracket on the pilot's seat during flight operations.

Aircrew Eye/Respiratory Protection (AERP)

The AERP, MBU-19/P (replaces the MBU-13/P system for aircrews) is a protective mask that enables aircrews to conduct mission operations in a chemical-biological environment. The AERP system includes a protective hood assembly with a standard MBU-12/P mask, an intercom for ground communication, and a blower assembly that provides de-misting. The blower is stowed during flight operations on a bracket that is mounted inside the aircraft.

CB Respiratory Assemblies (A/P22P-14(V) 1, 2, 3, & 4) NDI

The CB Respiratory Assembly is a self-contained protective ensemble designed for all forward deployed rotary-wing and fixed-wing aircrew members. Respirator assemblies are provided in the following configurations: A/P22P-14(V)1 Helo (self contained), A/P22P-14(V)2 LOX, A/P22P-14(V)3 OBOGS, and A/P22P-14(V)4 Panel Mounted Regulator. The design incorporates a CB filter, dual air/oxygen supply and a cross-over manifold with ground flight selector switch to provide filtered air for hood ventilation, and filtered air for oxygen for breathing. The system provides enhanced protection and offer anti-drown features.

AVIATION RESPIRATORY PROTECTION R&D ITEMS

Joint Service Aircrew Mask (JSAM)

Rotary Wing

Apache Variant

Description:

JSAM will be a lightweight CB protective mask that will be worn as CB protection for all Army, Air Force, Navy, and Marine rotary and fixed-wing aircrew members. It will be the first and only CB protective mask in the DOD inventory that can provide anti-G protection, up to 9 Gz, for aircrew in high performance aircraft. JSAM will be compatible with CB ensembles, ensembles and existing aircrew life support equipment. It will include a protective hood assembly, CB filter, blower assembly, and an intercom for ground communication. It will provide flame and thermal protection, provide hypoxia protection to 60,000 feet, demist/emergency demist and anti-drown features and some versions will be capable of being donned in flight.

UNIVERSAL COMMON INDIVIDUAL PROTECTIVE EQUIPMENT

FIELDED AND PRODUCTION ITEMS

M41 Protection Assessment Test System

During the issuing process for Protective Masks it is absolutely essential that the mask be properly fitted to the individual to ensure the highest protective value. The M41 Protection Assessment Test System (PATS) validates proper fit of a mask to the face of the individual. It tests all current military and several commercial masks. The system provides a visual display of the fit achieved by the mask when worn by the individual and requires calibration every 18 to 24 months. The M41 PATS has been acquired by the Air Force, and Marines.

MQ1A Mask Tester

The MQ1A mask tester also validates proper fit of a mask to the face of the individual. It tests currently fielded AF MBU-5/P and MBU-12/P aviator masks and the MBU-13/P and MBU-19/P aviator NBC protective masks. The system provides a visual display of the fit achieved by the mask when worn by the individual. The MQA1 Mask Tester is currently in use by the Air Force at units supporting the MBU-5/P, MBU-12/P, MBU-13/P and MBU-19/P.

UNIVERSAL COMMON INDIVIDUAL PROTECTIVE EQUIPMENT

RDTE ITEMS

Joint Service Mask Leakage Tester

The Joint Service Mask Leakage Tester (JSMLT) is a portable test system capable of testing the serviceability of a protective mask in the field. It will have expanded capability compared to the M41 PATS by allowing component level testing of the mask as well as system level testing with added components. It will provide a capability for an overall mask serviceability and fit factor validation of protective masks in the field.

SURFACE PROTECTIVE ENSEMBLE FIELDED AND PRODUCTION ITEMS

Battle Dress Overgarment (BDO)

The BDO is a camouflage patterned (desert or woodland), two-piece, air-permeable overgarment typically worn over the duty uniform. The overgarment material consists of an outer layer of nylon cotton, and an inner layer of activated charcoal impregnated polyurethane foam. The BDO provides protection against chemical agent vapors and liquid droplets, biological agents (to include toxins), and radioactive alpha and beta particles. The BDO is issued in a sealed vapor-barrier bag that protects the garment from rain, moisture, and sunlight. The BDO provides 24 hours of chemical agent protection once contaminated and has a field durability of 22 days (extendable).

Joint Service Lightweight Integrated Suit Technology (JSLIST) Overgarment

The JSLIST Overgarment will provide 24-hour protection with up to 45 days of wear and 6 launderings. The 24-hour protection and 45 days of wear applies for a period of up to 120 days after the garment is removed from its vacuum packaging. The liner is based upon activated carbon bead technology, replacing the bulky activated carbon foam technology in previous garments. The JSLIST Overgarment is a two-piece jacket and trouser design with an integrated hood compatible with respective Service masks and second skins. It will be worn as an overgarment for the duty uniform or as a primary garment over underwear depending upon the environment and mission.

Chemical Protective (CP) Suit, Saratoga (USMC)

Like the JSLIST, the SARATOGA CP Suit is an air-permeable, camouflage patterned overgarment. The SARATOGA uses spherical, activated carbon adsorbers immobilized in the liner fabric. This system allows for a lighter, cooler garment, which is launderable. The Saratoga provides a 24-hour protection period and has a durability of 45 days of wear.

SURFACE PROTECTIVE ENSEMBLE
RDTE ITEMS

CWU-66/P Aircrew Ensemble

The CWU-66/P, a one-piece flightsuit configuration, provides 16-hour protection against standard NATO threats. It uses spherical, activated carbon adsorbers immobilized in the liner fabric and is less bulky than prior ensembles. It offers a reduced thermal load burden and is compatible with aircrew life support equipment.

Chemical Protective Undergarment (CPU)

The CPU is a one-time launderable two-piece lightweight undergarment made of a non-woven fabric containing activated carbon. When worn under a combat vehicle crewman coverall, battle dress uniform, or aviation battle dress uniform, the CPU provides 12 hours of both vapor and liquid protection and is durable for 15 days.

SURFACE PROTECTIVE ENSEMBLES
RDTE ITEMS

Joint Service Lightweight Integrated Suit Technology (JSLIST)

The JSLIST program is a fully cooperative Joint Service RDT&E and Procurement effort chartered to develop and field new CB protective clothing for all Services. The program will yield a family of garments and ensembles developed for Joint Service mission needs and tested to Joint Service standards. The JSLIST will provide enhanced CB protective ensembles with reduced physiological heat burden and will be generally lightweight and launderable. There are six JSLIST clothing item components: 1) overgarment, 2) lightweight garment, 3) undergarment, 4) socks, 5) boots, and 6) gloves. Each of the Services' requirements are incorporated by these six JSLIST components.

In April 1997, the JSLIST program type classified and began fielding the JSLIST Overgarment and Multi-purpose Overboot (MULO). Current JSLIST RDT&E includes programs intended to field a chemical protective glove to meet U.S. SOCOM requirements (JSLIST Block 1 Glove Upgrade), a follow-on chemical protective glove program (JSLIST Block 2 Glove Upgrade) intended to field a chemical protective glove to meet Joint Service requirements (found in both the JSLIST and Joint Protective Air Crew Ensemble Operational Requirements Documents (ORD)) and Alternative Footwear Solution (AFS) Integrated Footwear System (IFS) program, which will field footwear items (overboots and sock/liner) to meet the requirements found in the JSLIST ORD.

The JSLIST Additional Source Qualification (JASQ) was initiated to qualify additional sources of JSLIST materials and to conduct field wear tests and laboratory chemical tests on commercial JSLIST suit candidates. The JASQ candidates that perform as well as, or better than the current JSLIST garment will be considered for placement on a JSLIST qualified products list and may be authorized as additional JSLIST material sources.

Joint Protective Aircrew Ensemble (JPACE)

Key Requirements:

- Provides below-the-neck protection for rotary and fixed wing aircrew
- 30 day wear time with 16 hours of protection within a contaminated environment
- Launderable
- Compatible with aircrew mounted aviation life support systems
- Ejection safe and water survivable

Description:

JPACE (*concept shown*) will be a CB protective ensemble for all Services' aviation communities. It will be a replacement for the Navy and Marine Corps MK-1 undergarment, Army Aviation Battledress Uniform (ABDU)-BDO and/or CPU system and AF CWU-66/P overgarment. JPACE will provide aviators with improvements in protection, reduced heat stress in CB environments, extended wear, and service life. In addition, it will be compatible with legacy aviation mask systems and co-developmental masks, such as the Joint Service Aircrew Mask (JSAM). This ensemble will be jointly tested with JSAM and will be used as a technical insertion to the Army Air Warrior program. JPACE will provide the fixed and rotary wing aviator with below-the-neck protection against CB threats.

Modified Chemical Protective Undergarment (mCPU)

A modified CPU (mCPU) is being developed to include a pass-through for microclimate cooling unit tubing. The mCPU worn with the ABDU will be used as interim chemical protection for Army aviators until the development and fielding of JPACE.

DTO CB.45 Self-Detoxifying Materials for Chemical/Biological Protective Clothing

Objectives. Agent reactive catalysts and biocides will be directly incorporated into CB protective clothing and their capability to self-detoxify agents in a cost-effective clothing system will be demonstrated.

Payoffs. This DTO addresses the Joint Future Operational Capability of Individual Protection (Respiratory and Percutaneous) by reducing the probability of skin, eye, or respiratory contact with NBC agent hazards. This effort will simplify personal decontamination and provide an increased level of protection to CB protective clothing through the added capability of self-detoxification. The most efficient and cost-effective agent reactive catalysts and biocides that neutralize chemical/biological warfare (CW/BW) agents will be incorporated into fibers, coatings, and membranes, resulting in increased protection and a substantially reduced hazard when donning and doffing, as well as disposing of contaminated clothing. Reactive nanoparticles in fibers have been shown to break down nerve gas VX simulant and mustard. Hyperbranched compounds that float to surfaces have been synthesized to increase the effectiveness of reactive compounds by concentrating reactive nanoparticles and other decontaminating catalysts near protective fabric surfaces. Surface enrichment of hyperbranched materials has been demonstrated in coatings. Undergarments have been treated with chloramines to kill biological warfare agents, and N-halamine chemistry has been applied to nylon/cotton fabrics, polyesters, and polyurethane coatings. Aerosol "catch and kill" mechanisms have been shown to work for antimicrobially treated electrospun fibers.

DTO CB.45 Self-Detoxifying Materials for Chemical/Biological Protective Clothing

Challenges. The addition of agent reactive catalysts and biocides to advanced CB clothing systems must strike a balance between the new self-detoxifying capability and the extra weight of additives to the garments. Since CB clothing is burdensome to wear, any extra weight must result in additional benefit to the warfighter. In this case, the additional benefit is increased protection. Agent reactive catalysts are specific in their behavior. Catalysts have been developed that are effective against mustard, for example, while other catalysts have been shown to be effective against nerve agents. It is not practical at this time to expect universal agent neutralization. In general, biocides are more universal in their activity.

Milestones/Metrics.

FY2006: Fabricate prototype garments. Demonstrate activity of treated fabric systems. Measure chemical/aerosol breakthrough of garments. Conduct field-testing of chemically self-detoxifying fabric systems. Collect user assessments. Field test biocidal-treated ensemble for durability and persistence of reactivity. Conduct Chemical Weapon Agent (CWA) simulant and live CWA testing on worn garments to assess durability. Develop transition plan.

FY2007: Optimize garment designs and manufacture optimized prototype garments. Demonstrate durability and overall cost-effectiveness of scaled-up electrospun self-detoxifying membranes, N-halamine-treated textiles, and materials containing reactive nanoparticles. Measure chemical/aerosol breakthrough of optimized garments. Conduct field testing and assessments. Downselect candidates. Transition to JSLIST upgrade.

PROTECTIVE ACCESSORIES FIELDED AND PRODUCTION ITEMS

Chemical Protective Sock

This sock is the first generation Air Crew Chemical Defense Equipment. It is plastic and disposable. The sock comes in one size at 500 each per roll, 21 inch long, 4 mils thick and 8 inch wide flat extruded tubing with 1/8 inch wide heat-seal closure. This sock is to be worn over the regular sock.

Disposable Footwear Cover

Plastic over-boots are worn over the flyer's boot. They protect the user from chemical contamination en-route from the shelter and the aircraft. They come in one size and are removed before entering the aircraft or shelter.

Green Vinyl Overboots/Black Vinyl Overboots (GVO/BVO)

The GVO/BVO are fitted vinyl overshoes that are worn over the combat boots to provide chemical agent protection and/or moisture vapor protection during wet weather. The impermeable GVO/BVO provide protection against chemical agents for 24 hours and are durable for up to 60 days.

Multipurpose Overboot (MULO) *(JSLIST Boots)*

The MULO is a joint service program under the auspices of the JSLIST program. It is made of an elastomer blend and is produced by injection molding. It is designed for wear over the combat boot, jungle boot, and intermediate cold/wet boot and provides 24 hours of protection from chemical agents with a wear-life of up to 60 days. The MULO provides more durability,

improved traction, resistance to Petroleum, Oil, and Lubricants (POLs), flame protection, decontaminability, and has better donning and doffing characteristics over standard footwear.

AirBoss Lightweight Overboot (ALO)

The ALO is being procured and issued as the interim replacement for the Chemical Protective Footwear Cover (CPFC) - which is no longer available through the supply system. The ALO is operational and functionally equivalent to the CPFC and is interchangeable with the CBR-D ensemble. ALOs are worn over the standard issue shoes or work boots and provide protection against exposure to chemical agents. The ALO is a lightweight compounded butyl rubber overboot designed to provide a minimum of 24 hours protection from chemical agents in liquid and vapor form. The overboot has an anti-slip, ridged tread pattern, is anti-static, and all seams are vulcanized and completely sealed. The ALO is approximately 13 inches high and has three sets of buttons and a butyl rubber securing strap for each set of buttons. The adjustable securing strap is symmetric and can be released from either side of the overboot. The ALO is issued in four sizes. The overboots are packaged in pairs and folded in a vacuum packed plastic bag. Once contaminated, the ALO can be decontaminated and reissued.

Chemical Protective (CP) Gloves

The CP butyl glove set consists of a butyl-rubber outer glove for protection from chemical agents and a cotton inner glove (25 mil glove only) for perspiration absorption. CP outer gloves come in three thicknesses: 7, 14, and 25 mil. The 7 mil glove is used by personnel who require a high degree of tactility, such as medical personnel, personnel engaged in electronic equipment repair, and aircrews. The 14 mil glove is used by personnel such as aviators and mechanics, in cases when good tactility is necessary and stress to the glove is not too harsh. The 25 mil glove is used by personnel who require a durable glove to perform close combat tasks and heavy labor. The 14 and 25 mil glove sets provide protection for at least 24 hours. The 7 mil glove set should be replaced within 6 hours of exposure to a chemical agent.

Joint Block 1 Glove Upgrade Program (JB1GU)

The JB1GU supports the USSOCOM urgent requirement to provide an interim glove with increased tactility and durability. The JB1GU will provide hand protection from liquid, vapor, and aerosol Chemical/Biological (CB) hazards better than or equal to the current glove. It will provide enhanced tactility, dexterity, and comfort and can be worn in all climates. The glove will offer 24 hours of protection in a contaminated environment and is durable up to 14 days. The JB1GU is a system that will achieve most of the requirements outlined in the JSLIST requirements document and will serve as an evolutionary approach to the JB2GU. The JB1GU may be either a liner intended to be worn under existing U.S. military gloves, a glove that will be worn in

place of existing hand wear, or a combination of a new glove shell and liner that together provide both chemical agent protection and the functionality of the glove(s) it replaces. It will be used with the JSLIST ensemble and chemical protective mask.

Glove Inserts

These gauntlet cotton inserts are worn under the chemical protective (CP) butyl rubber gloves. They provide perspiration absorption. They can be worn in either hand and are available in three sizes (small, medium and large).

Chemical Protective Helmet Cover

The Chemical Protective Helmet Cover is intended to provide any standard helmet with protection from chemical and biological contamination. It is a one-piece configuration made of butyl coated nylon cloth and gathered at the opening by elastic webbing enclosed in the hem. The covers come in one size and are of olive green color.

Aircrewman Cape

This disposable cape is a one size fits all plastic bag (74 in x 23 in) worn over the entire body to provide additional protection against liquid contamination. The cape should be worn if aircrews have to walk around liquid contaminated areas and if aircraft are not sheltered. If worn, the cape is removed before entering the aircraft.

SPECIALTY SUITS

FIELDED AND PRODUCTION ITEMS

Joint Firefighter Integrated Response Ensemble (JFIRE)

JFIRE is a joint effort between the Air Force (lead agency) and the Army. The JFIRE Program has developed an ensemble that will protect military firefighters providing CB protection during firefighting operations in a CB environment. JFIRE leverages the JSLIST overgarment for chemical protection, to be worn under aluminized proximity firefighting outergear. Additionally, a switchable filtered/supplied air mask with chemical warfare kit and self contained breathing apparatus provide respiratory protection. A commercial off-the-shelf glove that can be used for both fire and CB protection has replaced the need for CB gloves to be worn under standard proximity gloves. JFIRE meets several key requirements, including (1) providing 24 hours of CB agent protection against 10 g/m^2 liquid agent, (2) providing firefighters CB protection in both structural and crash fire fighting/rescue operation, (3) allowing firefighters to use mission essential tools and equipment in a CB environment, (4) providing resistance to water and all standard fire fighting chemicals (foam, CO_2, aircraft POL), and (5) is capable of being donned in 8 minutes. A limitation of the ensemble is that it does not meet National Fire Protection (NFPA), NIOSH or OSHA standards. The ensemble is designed as military unique and is designed primarily for wartime environments. The USAF is currently modernizing the JFIRE with the goal of meeting NFPA and other national standards.

Suit Contamination Avoidance Liquid Protection (SCALP)

The SCALP can be worn over standard chemical protective garments to provide one hour of protection from gross liquid contamination. The SCALP, which consists of a jacket with hood, trouser and booties, is made from a polyethylene-coated Tyvek™ impermeable material.

Self-Contained Toxic Environment Protective Outfit (STEPO)

STEPO (*shown left*) provides Occupational Safety and Health Administration (OSHA) level A protection for Army Chemical Activity/Depot (CA/D), Explosive Ordnance Disposal (EOD) and Technical Escort Unit (TEU) personnel. The STEPO is currently being fielded to CA/D, TEU and EOD. The STEPO is a totally encapsulating protective ensemble for protection against CB agents, missile/rocket fuels, POL, and TICs for periods up to four hours. The ensemble incorporates two types of National Institute for Occupational Safety and Health (NIOSH) approved self-contained breathing systems (one hour and four hour configurations) and a tether/emergency breathing apparatus option, a battery powered Personal Ice Cooling System (PICS), a hands-free communications system, and standard M3 Toxicological Agent Protective (TAP) boots and gloves. The suit is capable of being decontaminated for reuse up to 5 times after chemical vapor exposures. STEPO shares common, modular components with the ITAP and JFIRE ensembles simplifying logistics and reducing costs.

Improved Toxicological Agent Protective (ITAP) Ensemble

ITAP replaces the M3 TAP ensemble. ITAP enhances existing capabilities by increasing personal protection and reducing the thermal burden on the wearer. ITAP also provides skin and respiratory protection both during peacetime and wartime for short term operations in Immediately Dangerous to Life and Health (IDLH) toxic chemical environments (up to 1 hour), emergency life saving response, routine Chemical Activity operations and initial entry and monitoring. ITAP shares common, modular components with the STEPO and JFIRE ensembles, simplifying logistics and reducing costs.

ITAP provides splash and vapor protection against potential exposure to liquid agent when worn as a system requirements: 10g/m^2 HD, VX, GB, L agent challenge for 1 hour. It provides an optional Personal Ice Cooling System (PICS) and is functional as a system where temperatures range from 0° to 100°F when used with the cooling system. The ITAP suit and overhood are capable of being decontaminated for a minimum of 5 reuses, 2 hours per use (1 hour at IDLH), after vapor and particulate contamination. After liquid contamination, the ITAP suit will be decontaminated and held for disposal.

The ITAP fabric is self-extinguishing meeting NFPA 1991. The fabric is also static dissipative and does not hold a charge sufficient to set off munitions and explosives in accordance with current Explosive Safety Board requirements. The fabric is light in color to reduce operator solar

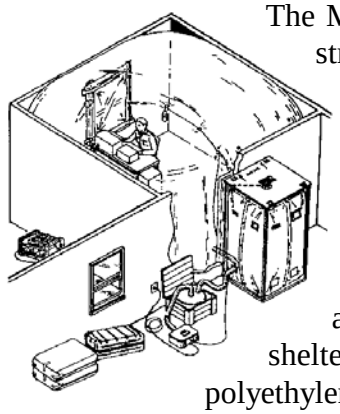
heat load and is capable of being stored within the temperature range of 0° to 120°F. The ITAP has a minimum shelf life of 5 years.

COLLECTIVE PROTECTION EQUIPMENT

TENTAGE AND SHELTERS

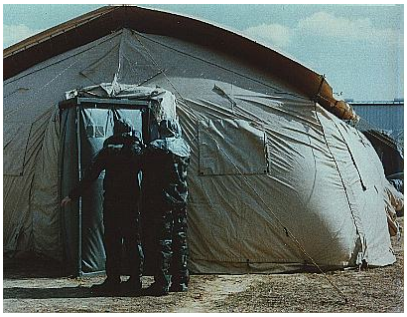
FIELDED AND PRODUCTION ITEMS

M20/M20A1 Simplified Collective Protection Equipment (SCPE)



The M20/M20A1 SCPE is used to convert an interior room of an existing structure into a positive overpressure, NBC collective protection shelter where individuals can perform assigned missions without wearing the protective mask and overgarment. The M20 SCPE system consists of a liner, protective entrance, filter canister, and support kit. The SCPE is a low cost method of transforming a room in an existing structure into an NBC collective protection shelter for command, control and communication (C^3), medical treatment, and soldier relief functions. M20A1 is a room liner for existing shelters. The M20A1 components include a CB vapor resistant polyethylene liner that provides a protected area in an existing structure; a collapsible, protective entrance that allows entry to/exit from the protected area; a hermetically sealed filter canister, which provides filtered air to both the liner and the protective entrance; and a support kit, which contains ducting, lighting, sealing and repair material and an electronically powered blower.

M28 CPE



The M28 CPE is a low cost method of transforming existing tentage into an NBC collective protection shelter for command, control and communication (C^3), medical treatment, and soldier relief functions. M28 is a liner for the TEMPER tent. M28 CPE components include a CB vapor resistant polyethylene liner that provides a protected area in an existing structure; a collapsible, protective entrance that allows entry to/exit from the protected area; a hermetically sealed filter canister, which provides filtered air to both the liner and the protective entrance; and a support kit, which contains ducting, lighting, sealing and repair material and an electronically powered blower. A pre-planned product improvement (P^3I) program building upon the M20 SCPE design, resulted in the improved M20A1 SCPE and the M28 CPE models which, in addition to a vapor agent resistance capability, they also provide a liquid agent resistance capability, protective liners for tents, interconnections, and an interface with environmental control units. These improved models also remove the restriction imposed on the M20 SCPE with respect to exit/entry procedures therefore, meeting the mission requirement as outlined in the M20 SCPE Letter Requirement by allowing 150 or more people to enter and exit the shelter over a 24 hour period.

Chemically Protected Deployable Medical System (CP DEPMEDS)

The Army's CP DEPMEDS program is a Joint effort to insert environmentally controlled collective protection into currently fielded hospital shelters. The requirement is to be able to sustain medical operations for 72 hours in a chemical contaminated environment. Environmentally controlled collective protection is provided through the integration of M28 CPE, chemically protected air conditioners, heaters, water distribution and latrines, and alarms systems. M28 CPE provides protection to existing TEMPER tents and passageways within the hospital. DEPMEDS ISO shelters are protected through the replacement of existing shelter seals with those that are CB protected. The Field Deployable Environmental Control Unit provides CB protective air conditioning and the Army Space Heater provides CB protective heating. Both environmental control units are chemically protected through the addition of a CB kit. To sustain approximately 500 patients and staff, chemically protected latrines and water distribution systems have been developed. The Department of the Army is converting the deployable medical force structure from the current Medical Force 2000 (MF2K) Combat Support Hospital (CSH) configuration to the new Medical Reengineering Initiative (MRI) Force Design Update. The CP DEPMEDS is also converting from MF2K CSH, Hospital Unit Base (HUB) to the MRI CSH that will establish the issue plan for the 84- and 164-bed Corps and Echelon Above Corps (HAC) hospitals. The MRI configuration requires that each CP DEPMEDS be modified to allow split hospital operations (current 236 bed hospital may operate in two locations of 164 beds and 84 beds each). The acquisition strategy for CP DEPMEDS MRI is to procure those components necessary to transform 11 CP DEPMEDS systems. These components will be procured using existing contracts and assembled in the MRI configuration at Pine Bluff Arsenal for shipment to final end destination(s).

Collective Protection for Expeditionary Medical Support (CP EMEDS)

The Air Force's CP EMEDS program is an effort to insert environmentally controlled collective protection into currently fielded hospital shelters. The role of CP EMEDS, as part of the Air Force Theater Hospital (AFTH), is to provide individual bed-down and theater-level medical services for deployed forces or select population groups within the entire spectrum of military operations. CP EMEDS Small Portable Expeditionary Aeromedical Rapid Response (SPEARR), +10, and +25 configurations are modular packages, tailored to meet theater requirements, by providing a flexible hospitalization capability. The CP EMEDS +25 has the capability to provide 24-hour sick call, 25 inpatient beds, & emergency medical care to a population at risk of 3,000–5,000. The following capabilities are also available: medical command and control, preventive medicine, trauma resuscitation and stabilization, general and orthopedic surgery, critical, urgent,

and primary care, aeromedical evacuation coordination, aerospace medicine, dental, and limited ancillary services. The CP EMEDS is used in a CB threat area and permits operation in CB active environments while minimizing impact to the AFTH mission. The CP EMEDS provides a contamination free environment where medical treatment can be rendered to personnel without the encumbrance of individual protective equipment.

Chemical Biological Protected Shelter (CBPS)

CBPS is a highly mobile, rapidly deployable shelter system designed to be used for Level I and II forward area medical treatment facilities and forward surgical teams. CBPS also replaces the M51. The system is self-contained and self-sustaining. The CBPS consists of a dedicated M1113 Expanded Capacity Vehicle (ECV), a Lightweight Multipurpose Shelter (LMS) mounted onto the vehicle, a 300 square foot air-beam supported CB protected shelter, and a High Mobility Trailer with a towed 10kw tactical Quiet Generator Set. The ECV and LMS transports a crew of four and their gear. All medical equipment required for the shelter is transported in the LMS or on the trailer. The CB shelter is rolled and carried on the rear of the LMS during transport. The CBPS is operational within 20 minutes with a crew of four. All power required to support operations is provided by the ECV engine or with the 10kw generator for limited power. The system is environmentally conditioned by a hydraulically powered environmental support system, which provides filtered air, heating, air conditioning, and electrical power. This system is presently in full rate production. Pre-planned product improvements are underway to improve operational suitability and reliability of the current version for forward deployed light divisions. A Self-Powered Electrical Support System (SP-ESS) is being developed to eliminate the need for using the HMMWV engine for primary power.

COLLECTIVE PROTECTION SYSTEMS

FIELDED AND PRODUCTION ITEMS

Shipboard Collective Protection System

Shipboard CPS is an integral part of the HVAC systems on new construction ships. CPS provides each protected zone on the ship with filtered air at an overpressure of 2.0 inches water gauge. CPS is modular and is based on the 200 cubic feet per minute (CFM) M98 Gas-Particulate Filter Unit (GPFU) Set. CPS includes filters, filter housings, high-pressure fans, airlocks, pressure control valves, low-pressure alarm system, and personnel decontamination stations. These systems are being installed through both new ship construction and the CPS Backfit program.

COLLECTIVE PROTECTION SYSTEMS

RDTE ITEMS

Joint Collective Protection Equipment (JCPE)

Key Requirements:

- Rapid insertion of technology improvements to existing equipment
- Increased number of shelters for command/control, medical, and rest/relief areas
- Improved shipboard systems
- Standardization of equipment

Description:

JCPE provides needed improvements and cost saving standardization to currently fielded collective protection systems by using the latest technologies in filtration, shelter materials, and environmental controls to provide affordable, lightweight, easy to operate and maintain equipment. Inserting improved technology into currently fielded systems will result in improved performance with reduced operating costs. Standardization of individual system components across Joint Service mission areas will reduce logistics burden while maintaining the industrial base. Taken both individually and collectively, these tasks will improve NBC defense readiness for Joint Services by providing state-of-the-art, off-the-shelf solutions for currently fielded equipment deficiencies.

GENERIC NBC FILTERS AND COLLECTIVE PROTECTION FILTRATION SYSTEMS

FIELDED AND PRODUCTION ITEMS

Generic, high volume airflow NBC filters, and CP filtration systems exist that are currently installed on a wide variety of applications. These CP systems are modular and have been applied to numerous vehicles, vans, mobile shelters, and fixed sites.

GENERIC NBC FILTERS

NBC filters are used to remove Nuclear and Biological particulates and Chemical aerosols and vapors from the air supplied to collective protection systems.

M48/M48A1 Gas-Particulate Filter

The 100 CFM filter is used in the M1A1/A2 Abrams tank, M93 GPFU, CBPS, and Paladin Self Propelled Howitzer.

M98 Gas-Particulate Filter Set

The 200 CFM filter is used as the basic filter set in the Modular Collective Protective Equipment (MCPE) and in Naval applications. It can be stacked to obtain filtration of higher airflow rates.

600 CFM and 1200 CFM Stainless Steel Fixed Installation Gas Filters

These filters are used in fixed site applications where high volumes of airflow are required. They can be stacked to provide higher NBC filtered airflow rates. Particulate filter would be procured separately.

GENERIC NBC CP FILTRATION SYSTEMS

The following are NBC CP filtration systems, which are applied to a wide variety of applications. They consist of an NBC filter, motor/blower unit, housings, and integration housings/ductwork. Some can be integrated into environmental control equipment.

M8A3 Gas Particulate Filter Unit (GPFU)

The 12 CFM system provides air to armored vehicle crew member ventilated facemasks, *i.e.*, M42A1/A2. Used in M113 Armored Personnel Carrier variants and USMC AAVP7A1 amphibious vehicle.

M13A1 GPFU

The 20 CFM system provides air to armored vehicle crew member ventilated facemasks, *i.e.*, M42A1/A2. Used on the M1A1/A2 Abrams tanks, Bradley Fighting Vehicles, Multiple Launch Rocket System (MLRS), tank transporter, Stryker vehicles, and other vehicles.

Modular Collective Protection Equipment (MCPE)(100, 200, 400, 600 CFM Systems)

MCPE consists of a family of related end items from which modules can be chosen and combined to meet the unique demands of individual systems. These end items employ common parts and mountings and interchangeable connections and accessories to the greatest extent possible. MCPE provides collective overpressure to a wide variety of mobile shelters and vans. It uses the M48A1 Gas-Particulate Filter in the 100 CFM system and the M98 Gas-Particulate Filter Set in the others.

DTO CB.61 Advanced Air Purification System Model
Objectives. The effort will develop a model, database, and design concepts for Advanced Air Purification systems that incorporate emerging and mature technologies for the purpose of providing: 1) broader protection against an expanding chemical and biological threat that is more universally adaptable and 2) reduced logistical burden as compared to current single pass filter technology. This will be accomplished by developing a model for Advanced Air Purification systems that can address wide application requirements by providing the optimal mix of technologies. Enhanced protection capabilities will result as well as improvements in weight, cube, logistics and cost.
Payoffs. This DTO addresses three Joint Future Operational Capabilities for Transportable, Mobile, and Fixed Site Collective Protection. Advanced Air Purification systems for improved protection

DTO CB.61 Advanced Air Purification System Model
against chemical, biological, radiological, and nuclear (CBRN) agents and toxic industrial materials (TIM) will provide smaller, lighter weight systems with reduced power and logistical requirements. The Advanced Air Purification Systems Model will be employed as a tool by the platform development community to configure an optimized air purification system (air conditioning, aerosol/particulate, and chemical removal processes) for the application. The model will permit the rapid, confident, tradeoff of competing characteristics (weight, volume, power, consumables, threat, performance, unit cost, life cycle cost, etc.) to ensure the best possible system configuration to meet user requirements. The Advanced Air Purification Systems Model will also be useful to the procurement community to assess proposed systems and for identification of technological gaps by the S&T community to focus R&D. Applications include Deployable Medical System (DEPMEDS), and Chemical Biologically Protected Shelter (CBPS), mobile systems [e.g., Advanced Amphibious Assault Vehicle (AAAV), C-17 transport, Future Combat Systems (FCS), and Ship Collective Protection Equipment (SCPE) Program], and for fixed sites. Benefit to the warfighter is an air purification system optimized to meet user need (threat protection, size, weight, power requirements, etc.). **Challenges.** Currently, there is no known system of technologies that offers near universal protection against all threats. The goal of this effort is to identify the air purification technology or combination of technologies (hybrid) that most optimally meets the needs of the application. Many of these technologies when considered as stand alone systems are capable of removing CBRN agents and TIMs. However, each technology may have limitations that need to be overcome. For example, single-pass filters cannot effectively remove some of the TIC vapors, regenerative filtration systems produce toxic levels of agent in the purge gas for extended periods of time and catalytic systems require consumable acid-gas scrubbers. The objective of this effort is to utilize the advantages of each of these approaches to develop a system that maximizes chemical/biological protection while minimizing size, weight, energy, and logistics burden. A considerable challenge will be development of appropriate standard test and evaluation methodology. Incorporating all of the parameters into a single, validated model will also be a significant challenge. **Milestones/Metrics.** **FY2006:** Configure laboratory-scale systems; define test and evaluation methodology, and measure the required design and system integration data (characterize unit processes). Develop initial version of Advanced Air Purification System Model. Measure laboratory-scale design and application integration data to evaluate these configurations. **FY2007:** Develop several potential system configuration designs. Fabricate system demonstrators. Initiate test and validation of the Advanced Air Purification System Model, then optimize for design concepts. Complete test and validation of Advanced Air Purification System Model. **FY2008:** Modify Advanced Air Purification System Model as dictated by test and validation results. Complete final version Advanced Hybrid Air Purification System Model and transition.

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Annex E

Decontamination Programs

Table E-1 Decontamination RDA Efforts

Category	Nomenclature	Status	USA	USAF	USMC	USN
Personnel	- M291 Skin Decontamination Kit	Production	Rqmt	Rqmt	Rqmt	Rqmt
	- M295 Individual Equipment Decontamination Kit	Production	Rqmt	Rqmt		Rqmt
	- M100 Sorbent Decontamination System	Production	Rqmt	Interest	Fielded	Interest
	- Joint Service Personnel/Skin Decontamination System (JSPDS)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
Combat Equipment, Vehicles, and Aircraft	- M17A2/A3 Lightweight Decontamination System (LDS)	Production	Rqmt	Rqmt	Fielded	Rqmt
	- M17 MCHF Lightweight Decontamination System (LDS)	Production		Int-NIR	Fielded	Rqmt
	- Joint Service Sensitive Equipment Decontamination (JSSED)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
	-Joint Platform Interior Decontamination System (JPID)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
	- Joint Portable Decontamination System (JPDS)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
	- Joint Service Transportable Decontamination System-Small Scale (JSTDS-SS)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
	- Joint Service Transportable Decontamination System-Large Scale (JSTDS-LS)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
	- CB.71 Self-Decontaminating Surfaces	DTO				
	- M12A1 Power Driven Decontamination Apparatus	Fielded	Rqmt			

Rqmt = Product Requirement
Interest = Product Interest
Int-NIR = Product Interest, No Imminent Requirement
* = sub-Product(s) of a Consolidated Joint Service Project
Rqmt, Interest = Sub-Product Requirement or Interest
Defense Technology Objective (Science & Technology Base Program)
** This ACTD support more than the decontamination functional area, but is placed in only one annex to prevent redundancy.

PERSONNEL

FIELDED AND PRODUCTION ITEMS

M291 Skin Decontamination Kit

The M291 consists of a wallet-like flexible carrying pouch containing six individually sealed foil packets. Each packet contains a folded non-woven fiber applicator pad with an attached strap handle on one side. The pad contains a reactive and sorptive resin polymer mixture. The kit enables warfighters to remove, neutralize, and destroy chemical and biological warfare agents on contaminated skin. The kit is carried in a pocket of the battlefield protective suits.

M295 Individual Equipment Decontamination Kit

The M295 kit consists of four individual wipedown mitts. Each wipedown mitt in the kit is comprised of a decontaminating sorbent powder contained within a non-woven polyester material and a polyethylene film backing. In use, sorbent powder from the mitt is allowed to flow freely through the non-woven polyester pad material. Decontamination is accomplished through sorption of contamination by both the non-woven polyester pad and by the decontaminating sorbent powder. The M295 enables the warfighter to perform basic decontamination to remove, neutralize, or destroy CB warfare agents and toxins on contaminated personal and load bearing equipment.

M100 Sorbent Decontamination System

The reactive sorbent decontamination system provides a simple, rapid, and efficient system to decontaminate small and individual issue items of equipment. It is effective in all environments, is less corrosive, and presents a lowered logistics burden through improved shelf life and reduced special handling and storage needs. The M100 system uses a catalytic component that reacts with the chemical agents being adsorbed; this eliminates the potential hazard created by the off-gassing of agents from used adsorbents.

PERSONNEL

RDT&E ITEMS

Joint Service Personnel/Skin Decontamination System (JSPDS)

Key Requirements:

- Provide Food and Drug Administration (FDA) approved decontaminant for use on skin
- Decontaminate better than the M291 Skin Decontaminating Kit

Description:

The JSPDS will provide the warfighter with the ability to decontaminate skin and limited individual equipment. Reactive Skin Decontamination Lotion (RSDL) is the commercial product selected to meet the requirements. RSDL has been approved by the FDA and is undergoing additional testing to ensure that the product is safe and effective in the operational environment.

COMBAT EQUIPMENT, VEHICLES, AND AIRCRAFT

FIELDED AND PRODUCTION ITEMS

M12A1 Power Driven Decontamination Apparatus (PDDA); Skid-Mounted

The M12A1 consists of three main components: a pump unit, a 500 gallon tank unit, and a 600 gallon per hour liquid fuel water heater. The M12A1 is a flexible system that can be used for purposes such as de-icing, fire fighting with water or foam, water pumping and transport, and personnel showering in addition to equipment and area decontamination. The M12A1 can pump 50 gallons of decontaminating solution per minute through both of its hoses. The integral shower assembly provides 25 shower heads. The M12A1 is typically mounted on a 5 ton truck for tactical mobility, but can be dismounted to facilitate air transport. The Marine Corps has replaced the M12A1 PDDA with the M17 MCHF Lightweight Decontamination Apparatus.

M17 A2/A3 Series Lightweight Decontamination System (LDS)

The M17 series Lightweight Decontamination System (LDS) is a portable, lightweight, compact engine driven pump and water heating system. The system is used during decontamination operations. The LDS is capable of drawing water from any source and delivering it at moderate pressure and controlled temperatures. The system has an accessory kit with hoses, spray wands, and personnel shower hardware. It also includes a collapsible water bladder.

M17 MCHF Lightweight Decontamination System (LDS)

The M17 Marine Corps Heavy Fuel (MCHF) LDS is a portable, lightweight, compact, engine-driven pump and multifuel-fired water heating system. The system is capable of performing the same hasty and deliberate decontamination procedures as required of the M17 series LDS. All components can be moved by a four-man crew, and can be operated using Military Standard Fuels (diesel fuel, JP-8, *etc*.) It can decontaminate both sides of a vehicle or aircraft simultaneously, and can decontaminate personnel, equipment, and other materiel without an external power source and in coordination with a water tank or natural water resource.

COMBAT EQUIPMENT, VEHICLES, AND AIRCRAFT

RDTE ITEMS

Joint Service Sensitive Equipment Decontamination (JSSED)

Key Requirements:

- Non-aqueous based decontamination systems for sensitive equipment and vehicle interiors
- Capable of being used in both mobile and fixed-sites
- Decontaminated equipment will retain tactical mission capability following decontamination

Description:

Provide a first ever capability to decontaminate chemical and biological warfare agents and toxins from sensitive electronic, avionics, and electro-optic equipment. Its use must be compatible with and not degrade sensitive materials or equipment. It must be operator safe and offer protection from off-gassing and direct liquid exposure during decontamination.

Joint Platform Interior Decontamination (JPID)

Key Requirements:

- Provide decontamination systems for platform (vehicle/aircraft/ship) interiors
- Decontaminated equipment will retain tactical mission capability following decontamination

Description:

The JPID system will provide the capability to decontaminate CB warfare agents within interiors of aircraft, vehicles, ships and buildings (to include avionics, electrical, electronic, and environmental systems equipment) and the associated cargo without damaging surfaces or sensitive equipment within the platforms. The JPID will provide immediate, operational, and thorough decontamination capabilities in hostile and non-hostile environments. Currently, no standard methods of decontamination of platform interiors exist. The JPID system will significantly enhance the warfighter's ability to remain mission capable in a CBRN environment.

Joint Portable Decontamination System (JPDS)

Key Requirements:

- Require no more than one person to transport, operate and refill
- Provide restoration capability at fixed site and mobile locations
- Provide non-hazardous and environmentally safe chemical and biological decontaminants

Description:

The JPDS will consist of a decontaminant(s) and an applicator for use primarily in immediate and operational decontamination operations. The target items for decontamination will be small non-sensitive equipment and key areas on large non-sensitive equipment. The JPDS will decontaminate threat agents to lower levels than current portable systems used for these operations.

Joint Service Transportable Decontamination System – Small Scale (JSTDS-SS)

Key Requirements:

- Decontaminate agents to below tactical detector levels
- Not require a dedicated vehicle and/or trailer
- Be able to apply decontaminant and hot soapy water
- Provide non-hazardous and environmentally safe CBRN decontaminants

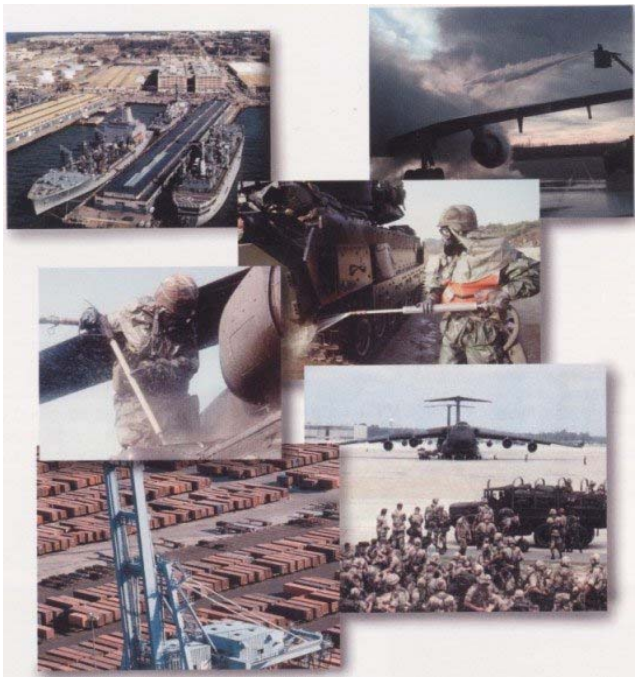
Description:

The JSTDS Small Scale system will consist of a decontaminant, applicator module and accessories to decontaminate tactical vehicles, crew-served weapons, small aircraft (operational decontamination only), shipboard surfaces, and limited facilities and terrain. This system will replace the M17 Series LDS and the M17 MCHF LDS and provides the added capability to apply the decontaminant with the system rather than manually through the use of mops and brushes. The JSTDS Small Scale applicator will reduce the manpower intensive decontamination processes.

Joint Service Transportable Decontamination System – Large Scale (JSTDS-LS)

Key Requirements:

- Decontaminate agents to below tactical detector levels
- Provide for decontamination "on the move"
- Be able to apply decontaminant and hot soapy water
- Decontaminate large non-sensitive equipment, such as large vehicles, aircraft and facilities
- Provide non-hazardous and environmentally safe CBRN decontaminants



Description:

This mobile (tactical) system provides the capability to conduct operational and thorough decontamination of medium to large non-sensitive equipment (mobile or fixed), aircraft, facilities, terrain, seaports of debarkation (SPODs) and aerial ports of debarkation (APODs). The JSTDS Large Scale system will replace the M12A1 Power-Driven Decontamination Apparatus. The JSTDS Large Scale applicator will reduce the manpower intensive decontamination processes.

CB.71 Self-Decontaminating Surfaces.

Objectives. The objective of this DARPA program is to explore, identify, and develop creative new material technologies for the ultimate purpose of providing a surface treatment that is biocidal and exhibits self-cleaning/renewal behavior. The approach will involve innovative ways to incorporate biocides into various surface treatments. Research includes combinatorial studies for new compounds as well as silver nanoparticles, antimicrobial polypeptides, and singlet oxygen producing porphyrins. These compounds will be used with a mechanism of self-cleaning that explores the use of hierarchical surface morphology.

Payoffs. Surface decontamination is and will continue to be an important problem for military and civilian platforms. The contamination of everything from circuit boards to table tops is a problem that can be addressed with creative approaches to surface treatments and coatings. The threat of bio-contamination such as anthrax spores, tularemia, plague, and cow pox can cause serious problems in remediation and clean-up. A surface that self-cleans and kills bacteria and spores would be of high interest. In FY2005 self decontamination surfaces against anthrax spores, tularemia, plague, and cow pox were demonstrated.

Challenges. The main objective of this program is to develop and demonstrate innovative coatings and surface modifications that exhibit efficient biocidal activity against bacteria, bacterial spores, and are self-cleaning. The main technical challenges include developing compatible biocidal/sporicidal surfaces that are hyperactive against B. anthracis. It is well known that the endospores of B. anthracis are

CB.71 Self-Decontaminating Surfaces.
stubbornly resistant to standard decontamination processes; therefore their destruction requires a unique approach, such as getting the spore in a vegetative state where they are vulnerable. This type of approach requires that germinates be incorporated in the coating to induce the vegetative state and improve the sporicidal efficacy. In addition, these coatings must be foul resistant and capable of self-renewal, thus allowing for continuous decontamination. Strategies for self-cleaning surfaces must be compatible with the biocidal/sporicidal mechanisms being utilized. Many decontaminating approaches require that the bacteria or spore reside on the surface for some period of time in order for the biocidal/sporicidal to be effective; therefore the kill kinetics must match the residence time for a contaminant on the surface. Finally, the coatings developed under this phase must be environmentally stable and compatible with current military surface cleaning procedures. **Milestones/Metrics.** **FY2006:** Demonstrate self-cleaning surface properties while maintaining biocidal/sporocidal behavior. **FY2007:** Deliver a fully functional biocidal/sporicidal coating system with self-cleaning properties.

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Annex F

Joint Medical Chemical and Biological Defense Research, Development and Acquisition Programs

Joint medical chemical and biological defense research, development and acquisition (RDA) programs are addressed in two sections of this annex:

- Section F.1 medical chemical defense,
- Section F.2 medical biological defense,

The organization of this annex is intended to correspond to the organization of budget documents, as this report is intended to supplement the President's Budget Submission in accordance with 50 USC 1523. The organization of this information does not correspond directly to the management structure of organizations within the Chemical and Biological Defense Program (CBDP). Notably, the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD) address medical research in four capability areas: pre-treatments, therapeutics, diagnostics, and emerging threats. In order to facilitate cross-walk between the budget documents and the organizational structure within the CBDP Medical S&T program in this annex, each of these four capability areas are addressed within the rubric of medical chemical and biological defense. Advanced development and acquisition efforts managed by the Joint Executive Office for Chemical and Biological Defense (JPEO-CBD), Joint Project Manager for Chemical and Biological Medical System (JPM-CBMS) are also described in these sections.

The primary repository of medical radiological defense expertise in FY05 was the Armed Forces Radiobiology Research Institute (AFRRI). While these efforts may support the requirements of the warfighter as developed by the JRO-CBRND, AFRRI programs are funded by the Defense Health Program separately from the DOD CBDP. In FY06 and FY07, an initiative was funded within JSTO-CBD to explore options for radioprotectants and related medical radiological defense countermeasures.

Table F-1. Medical Chemical and Biological Defense RDA Efforts

Capability Area	Nomenclature	Status	USA	USAF	USMC	USN
Therapeutics	- Antidote Treatment – Nerve Agent Autoinjector	Fielded	Joint	Joint	Joint	Joint
	- Convulsant Antidote for Nerve Agents	Fielded	Joint	Joint	Joint	Joint
	- Advanced Anticonvulsant System	AD	Joint	Joint	Joint	Joint
	- Medical Aerosolized Nerve Agent Antidote	Fielded	Joint	Joint	Joint	Joint
	- Improved Nerve Agent Treatment System (INATS)	RDTE	Joint*	Joint*	Joint*	Joint*
	- CB.54 Therapy for smallpox and other Pathogenic Orthopoxviruses	DTO				
	- CB.59 Therapeutic Strategies for Botulinum Neurotoxin	DTO				
	- CB.63 Therapeutic Strategies for Treating Filovirus (Marburg and Ebola Viruses) Infection	DTO				
	- CB.67 Therapeutics for Ebola and Marburg Virus Infections (follow-on to CB.63) (approved for FY07)	DTO				
Pretreatments	- Soman Nerve Agent Pretreatment Pyridostigmine	Fielded	Joint	Joint	Joint	Joint
	- Skin Exposure Reduction Paste Against Chemical Warfare Agents (SERPACWA)	Fielded	Rqmt			
	- Chemical Agent Prophylaxes (Bioscavenger)	AD	Joint*	Joint*	Joint*	Joint*
	- Anthrax Vaccine Adsorbed (BioThrax™)	Fielded	Joint	Joint	Joint	Joint
	- Smallpox vaccine (Dryvax vaccine (1:1))	Fielded				
	-Vaccinia Immune Globulin Intravenous	Fielded				
	- Improved Plague Vaccine	AD	Joint*	Joint*	Joint*	Joint*
	- Tularemia Live Vaccine (NIAID)	AD	Joint	Joint	Joint	Joint
	- Venezuelan Equine Encephalitis Vaccine	AD	Joint*	Joint*	Joint*	Joint*
	- Ebola/Marburg Vaccine	RDTE				
	- CB.46 Recombinant Ricin Vaccine	DTO				
	- CB.58 Western and Eastern Equine Encephalitis (WEE/ EEE) Vaccine Constructs for a Combined Equine Encephalitis Vaccine	DTO				
	- CB.60 Vaccine Technologies for Protection Against Filovirus (Marburg and Ebola viruses) Exposure	DTO				
	-CB.65 Multi-agent (molecular) vaccines for bio-warfare and genetically engineered agents	DTO				
Diagnostics	- CB.56 Methodology to Facilitate Development of Biological Warfare Threat Agent Detection and Medical Diagnostic Systems	DTO				
	- Joint Biological Agent Identification and Diagnostic System	Fielded	Joint	Joint	Joint	
Emerging Threats	- CB.57 Non-Traditional Nerve Agent Medical Countermeasures	DTO				
	- CB.64 Rapid Detection, Threat Assessment and Attribution of Genetically Engineered Biothreat Organisms Using Microarray-Based Resequencing Technologies	DTO				
	- Critical Reagents Program (CRP)	RDTE	Joint	Joint	Joint	

Joint= Joint Service requirement Joint*=Draft Joint Service requirement
Rqmt= Requirement AD= In Advanced Development
DTO = Defense Technology Objective (a Science and Technology Base Program)
RDTE = Research, Development, Test & Evaluation (Advanced Development program)

F.1 MEDICAL CHEMICAL DEFENSE RESEARCH

F.1.1 FIELDED PRODUCTS

Advances in medical research and development (R&D) significantly improve the warfighting mission by sustaining unit effectiveness through conserving the fighting strength of our forces and supporting the nation's global military strategy, which requires the ability to effectively deploy and operate. Medical R&D products (materiel and non-materiel solutions) provide the foundation that ensures the fielding of a flexible, sustainable, modernized force across the spectrum of conflict and in the full breadth and depth of the battlefield. Overcoming medical threats and extending human performance have provided a significant increase in military effectiveness in the past and present the potential for future enhancement of military operational effectiveness. Following are fielded medical chemical defense items, including pharmaceuticals, materiel, and technical information and guidance (with initial fielding date shown).

Pharmaceuticals:

- Nerve Agent Antidote Kit (Mark I), 1983
- Skin Decontamination Kit (M291), 1990
- Convulsant Antidote for Nerve Agent (CANA), 1991
- Medical Aerosolized Nerve Agent Antidote (MANAA), 1994
- Soman Nerve Agent Pretreatment Pyridostigmine, 2003
- Antidote Treatment Nerve Agent Autoinjector (ATNAA), 2003
- Skin Exposure Reduction Paste Against Chemical Warfare Agents (SERPACWA), 2003

Materiel:

- Test Mate® ChE (Cholinesterase) Kit, 1997
- Resuscitation Device, Individual, Chemical, 1990
- Decontaminable Patient Litter (NSN 6530-01-380-7309), 1991
- Chemical Warfare (CW) Protective Patient Wrap (NSN 8415-01-311-7711), 1991
- Computer-Based Performance Assessment Battery, 1993

Technical Information and Guidance:

- Medical Planning Guide of NBC Battle Casualties Chemical, AMedP-8(A), Vol. III, Ratification Draft.
- Field Manual (FM) 8-285, *Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries*, 1995.
- *Field Management of Chemical Casualties Handbook*, Second Edition, July 2000.
- Technical Bulletin (TB) Medical (MED) 296, 1996: *Assay Techniques for Detection of Exposure to Sulfur Mustard, Cholinesterase Inhibitors, Sarin, Soman, GF, and Cyanide.*
- Compact Disk - Read-Only Memory (CD-ROM) on "Management of Chemical Warfare Injuries," 1996.
- *Medical Management of Chemical Casualties Handbook*, Third Edition, July 2000.

F.1.2 MEDICAL CHEMICAL DEFENSE R&D ACCOMPLISHMENTS

The medical chemical defense R&D technical barriers and accomplishments are grouped by the major medical chemical defense strategy areas, which are:

- *Nerve Agent Defense*
- *Vesicant Agent Defense*
- *Chemical Warfare Agent Defense*

Today's chemical threat is not restricted to commonly accepted classical agents, such as vesicants [sulfur mustard (HD)], nerve agents (soman, sarin, tabun, and VX), respiratory agents (phosgene), or blood agents (cyanide). Potential adversaries may develop novel threat agents. Additionally, the potential for transient or sustained systemic toxicity from low dose exposure(s) to chemical warfare agents must be thoroughly investigated to determine the potential effect on Service members. The ability to provide timely and effective medical countermeasures to new threats depends upon maintaining a high level of technological capability. Sustaining and enhancing this technological capability is dependent upon the continued support of a robust program investigating basic pathophysiological mechanisms which, in turn, contributes to the knowledge upon which new, innovative, and improved diagnostics, pretreatments, and therapies are based.

Countermeasure strategies to the classical and novel threats include pharmaceuticals, medical equipment, specialized materiel or medical procedures, and concepts for training, doctrine, and organization. Medical countermeasures are designed not only to prevent lethality but also to preserve and sustain combat effectiveness in the face of combined threats from chemical and conventional munitions on the integrated battlefield by:

- Rapid diagnosis of chemical agent exposure.
- Prevention of the effects of chemical agents (*e.g.*, prophylaxes or pretreatment).
- Chemical casualty care

Medical chemical defense research was managed by the JSTO-CBD in FY05. Following are FY05 technical accomplishments by the DOD laboratories conducting research in the CBDP S&T medical program in FY05. U.S. Army Medical Research and Materiel Command (USAMRMC) laboratories participating in the JSTO-CBD's medical CB research program are the U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID), U.S. Army Medical Research Institute of Chemical Defense (USAMRICD), and the Walter Reed Army Institute of Research (WRAIR). These laboratories were the principle science and technology base performer for the JSTO-CBD. Contributing Navy laboratories were the Naval Research Laboratory (NRL) and the Naval Medical Research Center (NMRC). The contributing Air Force laboratories were the Air Force Research Laboratory (AFRL) and the USAF School of Aerospace Medicine 311th Human Systems Wing (USAFSAM/311 HSW). The Armed Forces Institute of Pathology (AFIP), a joint DOD research institute, also conducts research for the medical S&T program. The research is organized by threat area with subsequent arrangement of specific research thrusts into the JSTO-CBD capability areas.

Research Category: Nerve Agent Defense

Overarching Research Objective: Explore the development of medical countermeasures (i.e., prophylaxes/pretreatments and treatments) against chemical warfare nerve agents. Research studies range from basic and applied research in nerve agent countermeasures and associated scientific disciplines to research nearing the point of maturity for elevation to Defense Technology Objective (DTO) status. DTO research efforts are designed so that data generated from these efforts meet requirements for transition out of the technology base and are consistent with technical information required by the advanced developer to support the preparation of an Investigational New Drug (IND) application.

The countermeasures, technical barriers, and accomplishments in the medical chemical defense research category of nerve agent defense are outlined below.

Countermeasures:

- Pretreatment and treatment regimens that protect against rapid action and incapacitating effect of nerve agents and non-traditional agents.
- Pharmaceutical and biological pretreatments, treatments, and antidotes.

Technical Barriers:

- Lack of pretreatments and/or antidotes that are quick acting, long lasting, easy to carry and use on the battlefield.
- Lack of appropriate experimental animal model systems to predict pretreatment or treatment efficacy and safety in humans, as required by FDA's animal efficacy rule.
- Lack of detailed molecular models of all threat agents to understand the mechanism of their unique chemical properties and their effects.
- Potential performance decrements with pretreatments and treatments.

Accomplishments:

The detailed accomplishments that follow are drawn from the basic research, applied research, and advanced technology development investments in research on nerve agent defense. They are organized under JSTO capability areas and major research thrust areas that comprised this portion of the medical chemical defense research portfolio in fiscal year 2005.

Pre-treatment Capability Area

Research thrust: *nerve agent bioscavenger (chemical warfare agent prophylactic):*

- Initiated preparation of technical data package for transition of recombinant butyrylcholinesterase (Bioscavenger Increment II) out of the technology base.
- Continued to evaluate purification protocols for large scale isolation of human plasma-derived butyrylcholinesterase (Bioscavenger Increment I).
- Completed development of transgenic animal models that can produce sufficient amounts of recombinant enzyme scavengers for clinical trials.
- Completed evaluation of human protein recombinant bioscavenger as a nerve agent countermeasure.
- Continued pretreatment intervention studies of vectors to deliver bioscavenger genes.
- Completed feasibility testing of vector/gene combinations to validate the concept of gene therapy for bioscavengers.

Therapeutics Capability Area

Research thrust: *support for advanced development of an advanced anticonvulsant*

- Evaluated efficacy of combinations of midazolam with selected anticholinergic compounds against nerve agent seizures in rodent (guinea pig) and other relevant animal models.
- Developed analytical method to detect therapeutic levels of scopolamine in blood and tissue.
- Continued to develop a method to directly assay atropine levels in blood.
- Assessed application of emerging therapy for organophosphate insecticide poisoning to nerve agent exposure.
- Continued testing of drug combinations against seizures and lethality produced by all current threat agents.
- Initiated pharmacokinetic (PK) evaluations of most promising anticonvulsants; determined relationship between successful seizure control and therapeutic blood levels.

Research thrust: *development of an improved neuroprotectant to protect from exposure to nerve agents*

- Identified and tested several potential neuroprotective compounds in both rat and guinea pig seizure models.
- Tested putative neuroprotectants in animal models. Investigated potential markers for neuroprotectant effects (e.g., EEG power spectrum, pulse oximetry, neuroimaging). Developed and validated a neurobehavioral model for change in ability to carry out complex behavior after recovery from nerve agent toxicity.
- Initiated PK evaluations of selected neuroprotectants.
- Tested intracellular calcium modulators as potential neuroprotectants.
- Continued testing Food and Drug Administration (FDA)-approved drugs shown to be neuroprotective in both anatomic and behavioral studies.
- Continued to assess potential neuroprotectant treatments for nerve agent-induced brain pathology in the guinea pig model.
- Developed tools to evaluate both overt and subtle neurobehavioral impacts of nerve agents.

Emerging Threats Capability Area

Research thrust: *medical countermeasures for non-traditional agents*:

- Completed assay development and stability studies for the improved oxime.
- Completed the identification and characterization of a surrogate marker for efficacy of candidate oxime(s) for use against traditional nerve agents and non-traditional agents (NTA).
- Determined efficacy of oximes against selected NTAs and traditional nerve agents in non-human primates (NHPs).
- Completed correlation of oxime efficacy with pharmacokinetics and AChE reactivation in guinea pigs.
- Completed pharmacokinetics of candidate oximes in guinea pig and determined pharmacokinetics in non-human primate.
- Completed safety/toxicity studies of candidate oximes in mice and guinea pigs.
- Received Milestone A decision approval and transitioned lead candidate oxime to advanced development.

- Evaluated the efficacy of candidate bioscavengers for protection against non-traditional nerve agents in multiple animal models.

The following DTOs are key efforts in addressing the issues of medical countermeasures for exposure to non-traditional agents.

DTO CB. 57 Non-Traditional Nerve Agent Medical Countermeasures

Objectives. This DTO will enable the development of medical countermeasures against non-traditional nerve agent (NTA) intoxication by identifying and characterizing compounds or medical strategies using laboratory and animal models that demonstrate the ability to prevent, interrupt, or terminate the action of NTAs.

Payoffs. The number and type of chemical warfare agents (CWAs), beyond the conventional CWAs, has significantly increased. NTAs have the potential of being used as chemical weapons against U.S. military forces and it is critically important to determine the toxicity of these agents and the effectiveness of current medical countermeasures against their acute toxicity. The research efforts will be conducted to identify the mechanism of action of the NTAs and any differences in the absorption, distribution, and metabolism of these agents, to evaluate current medical countermeasures for their efficacy against NTAs, to identify new candidate medical countermeasures that are effective against NTAs, to develop animal models that facilitate research for countermeasures to NTAs, and to characterize candidate countermeasures. The major outcome of this research will be to increase the knowledge base on NTAs and provide the scientific basis for identifying medical products that have the potential for effectively countering NTA exposure, thereby enabling their future development and eventual licensure by the Food and Drug Administration (FDA). Effective countermeasures for NTA exposure would substantially reduce the number of casualties or degree of injury among exposed joint service members, deter their use as chemical warfare agents and enable joint forces to sustain operational tempo.

Challenges. Major technical challenges include: determine the mechanism of action, determine the *in vivo* time-course of NTAs to ensure the duration of action of medical countermeasures exceeds the *in vivo* persistence of NTAs, develop a therapy that works effectively for all non-traditional nerve agents and conventional nerve agents, and develop non-human primate models to extrapolate efficacy test results from animals to man.

Milestones/Metrics.

FY2006: Complete evaluation of efficacy of human serum butyrylcholinesterase as a bioscavenger for protection against known NTAs in non-human primates. Compare NTAs and conventional nerve agents for induction of neurochemical changes and conduct studies of NTAs on vascular performance and contractility. Evaluate the pharmacokinetics of improved candidate medical countermeasures for comparison to the *in vivo* persistence of NTAs. Information generated by this research will be used to (1) develop a strategy, in concert with the advanced developer, for development of NTA medical Countermeasures; (2) influence current medical doctrine for countering NTA exposure and (3) to produce a technology development plan for future nonclinical development and FDA licensure of lead candidate.

Research Category: Vesicant Agent Defense

Overarching Research Objective: Explore the development of medical countermeasures (i.e., pretreatments and treatments) against chemical warfare vesicant (blister) agents. Research studies range from basic and applied research in vesicant agent countermeasures and associated scientific disciplines to research nearing the point of maturity for elevation to DTO status. DTO research efforts are designed so that data generated from these efforts meet requirements for transition out of the technology base and are consistent with technical information required by the advanced developer to support the preparation of an IND application.

The countermeasures, technical barriers, and accomplishments in the research category of vesicant agent defense are outlined below.

Countermeasures:

- Products that moderate or improve healing of vesicant injury.
- Medical countermeasures to minimize lethality, morbidity, and incapacitation caused by chemical warfare agents (CWAs). Focus is on functional mechanisms of intervention.
- Establish models of ocular injury as tools for screening potential therapeutic interventions.
- Optimize drug doses and delivery to reduce tissue injury.

Technical Barriers:

- Need for quick-acting and long-lasting pretreatments, treatments and antidotes that are deployable.
- Lack of appropriate experimental model systems for pretreatment and treatment efficacy and safety in humans. Ocular injury models are a particular challenge in development of therapeutics.
- Need for identification of specific molecular mechanisms of injury by vesicant agents to develop broadly effective therapeutic interventions.

Accomplishments:

The detailed accomplishments that follow are drawn from the basic research, applied research, and advanced technology development investments in research on vesicant agent defense. They are organized under JSTO capability areas and major research thrust areas that comprised this portion of the medical chemical defense research portfolio in fiscal year 2004.

Research thrust: *medical countermeasures for vesicant exposure*

- Characterized pathophysiological endpoints for injury by vesicants. Continued elucidation of pathophysiological schema, and identified points within the schema for potential pharmacologic intervention.
- Evaluated intracellular causes of injury and cell death as targets for therapeutic intervention.
- Delineated mechanisms of free radical production in vesicant-caused tissue injury using electron paramagnetic spectroscopy, and screened potential therapies targeting free radical production.
- Collated available industrial documentation. Strengthened technology transfer mechanisms. Developed *in vivo*/*in vitro* models. Procured compounds for screening modules. Initiated screening procedures. Prioritized screened compounds. Selected compounds for further safety and efficacy evaluation.

- Initiated PK evaluations of selected antivesicants.

Research thrust: *cutaneous therapeutics*

- Continued efficacy testing of promising treatment strategies.
- Evaluated the efficacy of bioengineered skin to promote rapid healing from HD burns.
- Completed development of a superficial dermal vesicant injury model in weanling pigs.
- Began development of a sulfur mustard cutaneous wound healing model using African green monkeys for advanced efficacy studies of promising treatment regimens.
- Completed development of an *in vitro* wound healing model using human epidermal keratinocytes to screen pharmacological interventions for the effective treatment of cutaneous sulfur mustard injuries.
- Began development of an *in vitro* wound healing model using porcine epidermal keratinocytes for use as a bridge between *in vitro* studies using human epidermal keratinocytes and *in vivo* studies using weanling pigs.
- Evaluated additional commercially available wound healing products, such as bioengineered skin, for their efficacy in promoting improved healing of superficial dermal sulfur mustard injuries using a validated weanling pig model.

Research Category: Chemical Warfare Agent (CWA) Defense

Overarching Research Objective: Explore the development of medical countermeasures (i.e., pretreatments and treatments) against CWAs, to include investigating the potential for transient or sustained toxicity of single, repeated, or sustained low dose exposure(s). Develop effective, field-deployable diagnostic equipment; decontamination products; pharmaceutical treatments; and practical clinical strategies to aid in the clinical management of chemical warfare agent casualties. Research studies range from basic and applied research in CWA countermeasures and associated scientific disciplines to research nearing the point of maturity for elevation to DTO status. DTO research efforts are designed so that data generated from these efforts meet requirements for transition out of the technology base and are consistent with technical information required by the advanced developer to support the preparation of an IND and/or Investigational Device Exemption (IDE) application.

The countermeasures, technical barriers, and accomplishments in the medical chemical defense research category of CWA defense are outlined below.

Countermeasures:

- Medical countermeasures to minimize lethality, morbidity, and incapacitation caused CWAs.
- Specific casualty management techniques to improve survival and minimize lost duty time.
- Pharmaceutical/biological antidotes, or decontaminants/protectants.
- Diagnostics for the effects of exposure to rapidly acting nerve agents, vesicants, and non-traditional agents.

Technical Barriers:

- Need for quick-acting and long-lasting pretreatments, treatments and antidotes that are deployable.
- Lack of appropriate experimental model systems for treatment efficacy and safety in humans.

- Need for detailed molecular models of agents to understand the origin of their unique chemical properties.
- Lack of simple and sensitive field-portable diagnostic assays for CWA exposure.

Accomplishments:

The detailed accomplishments that follow are drawn from the basic research, applied research, and advanced technology development investments in research on CWA defense. They are organized under JSTO capability areas and major research thrust areas that comprised this portion of the medical chemical defense research portfolio in fiscal year 2004.

Therapeutics Capability Area

Research thrust: *effective methods for removing chemical warfare agents from exposed skin*

- Developed genetically engineered enzymes to detoxify organophosphate nerve agents.
- Completed the efficacy evaluation and determined the protective ratios for Reactive Skin Decontamination Lotion (RSDL), M291SDK, 0.5% bleach, and soapy water challenged with GD, VX, and two non-traditional agents in the haired guinea pig model.
- Completed the efficacy evaluation and determined the protective ratio for Skin Exposure Reduction Paste Against Chemical Warfare Agents (SERPACWA) challenged with GD, VX, and two non-traditional agents in the haired guinea pig model.

Research thrust: *inhalation therapeutics*

- Identified and solicited for scientifically plausible animal and non-animal exposure models to investigate mechanisms of toxicity on pulmonary related function and to establish in-house and collaborative research programs within the confines of the approach. Identified and solicited scientifically plausible animal and non-animal exposure models to investigate mechanisms of toxicity on pulmonary related function.
- Evaluated inhaled antisense compounds as molecular therapeutics for pulmonary injury by vesicating agents.
- Test antioxidant and anti-apoptotic pharmaceutical agents to reduce lung injury caused by vesicants.
- Continued to screen clinically available drugs for potential efficacy against HD using the mouse model.
- Established in-house and collaborative research programs to investigate therapy for multiple agent exposure.

Diagnostics Capability Area

Research thrust: *develop chemical diagnostic technologies*

- Performed basic research experiments aimed at developing detection methods in clinical samples for metabolites, adducts and/or relevant biomarkers resulting from chemical warfare exposure.
- Performed study examining the potential for detecting sulfur mustard exposure by cleavage of adducts formed with blood proteins
- Initiated assessment of a non-invasive immunodiagnostic test detecting sulfur mustard skin exposure before the onset of vesication.
- Assessed gas chromatography mass spectrometry (GC-MS)/solid phase micro-extraction as a simple and quick clinical screen to verify exposure to CWAs.

- Performed applied research experiments aimed at improving detection methods in clinical samples for metabolites, adducts and/or relevant biomarkers resulting from chemical warfare exposure.
- Applied assessment of a non-invasive immunodiagnostic test detecting sulfur mustard skin exposure before the onset of vesication to the proven dermatological practice of skin tape stripping.
- Compared alternate sample/collection technologies; initiated research examining gas chromatography-mass spectrometry (GC-MS)/solid phase micro-extraction as a simple and quick screen to verify exposure to CWA using simulated urine.
- Completed laboratory validation of a DOD developed whole blood cholinesterase assay for organophosphate exposure and accumulated data comparing this method to classical standard techniques.
- Performed advanced research aimed at transitioning detection methods in clinical samples for metabolites, adducts and/or other relevant biomarkers resulting from CW agent exposure.
- Followed-up studies to adapt DOD-developed whole blood cholinesterase assay for organophosphate exposure to automation/high throughput.

F.1.3 ADVANCED DEVELOPMENT PRODUCTS

In advanced development, the goal is to obtain FDA approval/licensure of drugs, vaccines, and devices. The JPEO-CBD, through the Joint Project Office for Chemical and Biological Medical Systems (JPM-CBMS) are the materiel developers. Medical chemical defense products now in the advanced development phase are the following:

Product: Advanced Anticonvulsant System (AAS)

After development and FDA approval, the AAS is intended to provide an intramuscular administration of the drug, midazolam, for treatment against nerve agent induced seizures and subsequent neurologic damage. Exposure to nerve agents may produce long lasting convulsions even after treatment with atropine and 2-PAM. Untreated, these convulsions will produce permanent neurological damage in survivors. The AAS will be a replacement for the currently fielded Convulsant Antidote Nerve Agent (CANA) that uses diazepam. Midazolam is more water-soluble than diazepam (for quicker absorption into the blood stream) and, in animal models, terminates nerve agent-induced seizures more quickly than diazepam. AAS will not eliminate the need for other protective and therapeutic systems. During FY05, pre-clinical investigations and preparation for an IND application continued.

Product: Chemical Agent Prophylaxes (Bioscavenger)

Currently, there is no prophylaxis against nerve agent poisoning. Soman Nerve Agent Pretreatment Pyridostigmine (SNAPP) is the current FDA approved pretreatment for soman poisoning. SNAPP must be administered every eight hours as a pretreatment and requires administration of atropine sulfate and 2-pralidoxime after exposure to be effective. The bioscavenger system is a prophylactic regimen that will protect the warfighter from incapacitation and death caused by organophosphorus nerve agents (e.g., soman, sarin, VX). The plasma-derived and recombinant forms of butyrylcholinesterase (BChE), a protein that can bind organophosphorus nerve agents, and the current candidates, for increments I and II respectively, for Bioscavenger. Increment I will be developed through a Phase 1 clinical study and then

transitioned to the Department of Health and Human Services; increment II will be developed through FDA approval. In FY04, a Milestone A decision was approved, and in FY05, the program developed a viable, reproducible, and scalable manufacturing process. The current goals of the research are to demonstrate animal efficacy to meet the requirements of the FDA's animal efficacy rule, and to conduct Phase I human safety trials. In FY05, a contract was awarded to conduct these phases and work is currently proceeding on schedule.

Product: Improved Nerve Agent Treatment System (INATS)

INATS is an enhanced treatment regimen against the devastating effects of nerve agent poisoning. Components of INATS are a new oxime to replace the currently fielded oxime (2-pralidoxime chloride or 2-PAM) and use of pyridostigmine bromide (PB), the component of SNAPP, against additional nerve agents. Nerve agents inhibit the enzyme, acetylcholinesterase (AchE), disrupting the routine transmission of messages. PB protects some of the AChE against nerve agent-induced inhibition. Oximes are compounds that reactivate nerve agent-inhibited AChE to restore normal enzymatic activity. The goal of INATS is to develop a treatment system that offers optimal protection against a broad spectrum of nerve agents. INATS will be licensed by the FDA and will be issued to service members performing military operations where there is risk of nerve agent attack. The new oxime component of INATS will be a replacement of the currently fielded oxime (2-PAM) in the ATNAA. It will not eliminate the need for other protective and therapeutic systems. The new oxime candidate (MMB4) transitioned to advanced development in FY05. In FY05, initial pre-clinical studies were completed and cGMP manufacturing efforts continued.

F.2 MEDICAL BIOLOGICAL DEFENSE RESEARCH

F.2.1 BIOLOGICAL DEFENSE PRODUCTS

Advances in DOD medical R&D significantly impact the warfighting mission by sustaining unit effectiveness through conserving the fighting strength of our forces and supporting the nation's global military strategy, which requires the ability to effectively deploy and operate in all environments. Medical R&D products (materiel and non-materiel solutions) provide the foundation that ensures the fielding of a flexible, sustainable, modernized force across the spectrum of conflict and in the full breadth and depth of the battlefield. Overcoming medical threats and extending human performance have provided a significant increase in military effectiveness in the past and present the potential for future enhancement of military operational effectiveness. Only two biological defense vaccines are fully licensed by the Food and Drug Administration (FDA) and available for use—Anthrax Vaccine Adsorbed, sold under the trade name BioThrax™ and the smallpox vaccine (Dryvax ™). A Prime Systems Contract, which supports the Joint Vaccine Acquisition Program (JVAP) component of the Chemical and Biological Medical Systems office, is responsible for moving vaccine candidates from the technology base through advanced development to FDA licensure and procurement of baseline stockpiles. Section F.2.2 provides a description of biological defense science and technology base activities, and Section F.2.3. provides a description of medical biological defense advanced development activities. Currently licensed and IND vaccines/biologicals for use in medical biological defense R&D include the following:

Vaccines and Antisera:

- Anthrax Vaccine Adsorbed (licensed) (sold under the commercial name BioThrax™)
- Smallpox Vaccine (limited stockpile of licensed vaccine, Dryvax ™)
- Vaccinia Immune Globulin (licensed 2005)
- Botulinum Pentavalent Toxoid Vaccine Adsorbed (IND #3723)
- Botulinum Type F Toxoid Vaccine (IND #5077)
- Equine Heptavalent F(ab')2 Botulinum Antitoxin (Types A, B, C, D, E, F, and G) (IND #3703)
- Botulism Immune Globulin, Human (IND #1332)
- Botulism Antitoxin Heptavalent Equine, Types A, B, C, D, E, F, and G (IND #7451)
- Q Fever Vaccine, Formalin inactivated, CM Extract, Gamma Irradiated (Henzerling Strain) (IND #3516)
- NDC (National Drug Company) (Salk) LVS Tularemia Vaccine (IND #157)
- The Salk Institute (TSI) smallpox Vaccine (Vaccinia Virus, Cell Culture-derived) (IND #4984)
- Venezuelan Equine Encephalitis Virus Vaccine (attenuated), TC-83 (IND #142)
- Venezuelan Equine Encephalitis Virus Vaccine (inactivated), C-84 (IND #914)
- Eastern Equine Encephalitis Virus Vaccine (IND #266)
- Western Equine Encephalitis Virus Vaccine (IND #2013)
- Vaccinia Immune Globulin, Intramuscular (IND #8429)
- Vaccinia Immune Globulin, Intravenous (IND #9141)
- Vaccinia Immune Globulin, Intravenous (IND#10351,emergency use protocol)

Technical Information and Guidance:

- *Medical Management of Biological Casualties Handbook*, fourth edition, February 2001.
- CD-ROM on "Management of Biological Warfare Casualties," 1999.
- NATO Handbook "Medical Aspects of NBC Defensive Operations, AMedP-6(B), Part II (Biological)," 1998.

F.2.2 BIOLOGICAL DEFENSE RESEARCH AND DEVELOPMENT ACCOMPLISHMENTS

Biological threat agents include bacteria, viruses, and toxins. The agents identified on the various biological threat agents lists published by DOD, HHS, and the Intelligence Community are for the most part well known, and include anthrax, smallpox, plague, encephalitis viruses, hemorrhagic fever viruses, and plant and bacterial toxins. In addition to these naturally occurring pathogens, some of which are known to have been weaponized, the U.S. may be faced with previously unknown emerging diseases as well as genetically engineered pathogens and toxins with novel and unexpected properties. The medical S&T research program goals include not only the applied research needed to develop candidate countermeasures for advanced development or fielding, but also more basic investigations to contribute to the knowledge base upon which new and improved biological agent countermeasures will be developed. Areas for biological agent research include understanding threat agent biology, pathogenic mechanisms that cause disease, specific and common host-pathogen interactions, biomarkers that signal exposure and infection, and the manner in which the immune system is engaged by and responds to biological agents and to various vaccine platforms and formulations.

The biological defense research and development technical barriers and accomplishments during FY05 are grouped by the following overarching medical defense thrust areas against biological warfare agents. Note that some thrust areas in pretreatments (molecular vaccines and multiagent vaccines) actually cross some of these broad groupings. For convenience molecular vaccines are discussed under viral vaccines, and multiagent vaccines under bacterial vaccines:

- Bacterial agent countermeasures
  - Bacterial vaccines
  - Bacterial therapeutics
- Viral agent countermeasures
  - Viral vaccines
  - Viral therapeutics
- Toxin Agent countermeasures
  - Toxin vaccines
  - Toxin therapeutics
- Diagnostic technologies

The Emerging Threats capability area cuts across Pretreatment, Therapeutic, and Diagnostic Capability area lines, and focuses on emerging, novel, or bioengineered threats, both chemical and biological.

Medical biological defense research was managed by the JSTO-CBD in FY05. Following are FY05 technical accomplishments by the U.S. Army Medical Research and Materiel Command (USAMRMC) laboratories (USAMRIID, USAMRICD, and WRAIR), and the contributing laboratories from the Navy (NRL, NMRC), Air Force (AFRL, USAFSAM/311

HSW) and Joint Service Institutions (AFIP). The research is organized by threat area with subsequent arrangement of specific research thrusts into JSTO-CBD capability areas.

Bacterial Agent Countermeasures

The countermeasures, technical barriers, and accomplishments in the Bacterial Agent Countermeasures area are outlined below.

Countermeasures:

- Vaccines that confer immunity against bacterial threat agents.
- Therapeutics for treatment of diseases and pathologies caused by exposure to and infection by bacterial threat agents.

Technical Barriers:

- Developing accurate and complete genetic information for all known bacterial threat agents.
- Developing appropriate animal model systems for investigation of some bacterial threats and countermeasures.
- Lack of suitable epidemiological situations in which to perform human clinical trials to evaluate efficacy of medical products.
- Difficulty in field testing rapid identification/diagnostic kits under natural conditions.
- Difficulty in defining appropriate surrogate markers of protection.
- Necessity to enhance the otherwise limited data on which to base rational drug design and antibody therapies for bacterial agents of interest.
- Necessity to establish and maintain capabilities to assess the known bacterial threats and provide a sufficiently robust technology base to perform research needed to develop countermeasures for new, emerging, and genetically engineered bacterial threats.

Pre-treatments Capability Area

Bacterial Vaccines

Overarching Research Objective: Explore the development of candidate vaccines against bacterial biological warfare threat agents. The principal bacterial threat agents addressed in this research area during FY05 are anthrax, plague, and the intracellular bacterial pathogens (i.e., Tularemia, Burkholderia, etc.) Research studies range from basic and applied research in bacterial vaccines and associated scientific disciplines to research nearing the point of maturity for elevation to Defense Technology Objective (DTO) status. DTO research efforts are designed so that data generated from these efforts meet requirements for transition out of the technology base and are consistent with technical information required by the advanced developer to support the preparation of an Investigational New Drug (IND) application.

Basic and Applied Research Accomplishments:

- Initiated project to develop a generic Bacillus vaccine, including identification of target antigens.
- Facilitated and consolidated research efforts in the study of intracellular bacterial pathogens (Brucella/Burkeholderia/Tularemia) to include identification of potential intracellular pathogen target antigens.
- Characterized novel virulence genes and gene products of selected bacterial threat agents to support discovery of new medical countermeasures.

- Continued to evaluate additional or enhanced vaccine candidates against plague.
- Continued technology base studies in support of the development and eventual FDA licensure of the recombinant plague F1-V vaccine candidates.
- Evaluated the role of capsule in the development of a generation-after-next anthrax vaccine.
- Investigated anthrax spore interactions with host cells and characterization of diverse *B. anthracis* strains for vaccine resistance.
- Continued to perform animal studies which support clinical trials of selected vaccine candidates against bacterial threat agents.
- Multiagent vaccines:
  - Identified bacterial multiagent vaccine target antigens.
  - Designed development of cloned and expressed chimeric vaccine constructs for multivalent toxin and bacterial vaccines by protein engineering are continuing.
  - Initiated effort on anthrax-plague combined vaccine development.
  - Established new animal efficacy models.
  - Explored genomics/proteomics-based high throughput approaches for identifying potential vaccine target antigens.
  - Began studies in anthrax/plague molecular vaccine development and evaluation.
  - Initiated Bacillus generic molecular vaccine construction.

Therapeutics Capability Area

Bacterial Therapeutics:

Overarching Research Objective: Identify and characterize candidate antibiotics and biologics using appropriate laboratory and animal models. Demonstrate their capability for reducing mortality or incapacitation in animal models exposed to predicted or presumed battlefield doses of aerosolized bacterial biological warfare agents, to include *Bacillus anthracis* (anthrax), *Yersinia pestis* (plague), *Burkholderia mallei* (glanders), and *Burkholderia pseudomallei* (melioidosis). Research studies range from basic and applied research in bacterial therapeutics to research nearing the point of maturity for elevation to Defense Technology Objective (DTO) status.

Basic and Applied Research Accomplishments:

- Evaluated efficacy of selected licensed and investigational products for efficacy in mice against bacterial threat agents.
- Maintained surveillance of new products in the U.S. so that these products can be evaluated for efficacy *in vitro* and *in vivo*.
- Initiated efficacy studies of Investigational New Drug (IND) antibiotics for inhalational anthrax in non-human primates (NHPs).
- Evaluated Heat Shock Proteins (HSPs) with candidate vaccines. Evaluated immunoglobulin therapies for bacterial threat agents.
- Performed therapeutic efficacy studies in non-human primate models using hollow fiber bridging data.
- Studied selected FDA-licensed antimicrobial compounds to support consideration for changing label indications for use against category A and B biological warfare (BW) threat agents.

- Assessed selected compounds for safety and efficacy against multiple bacterial threat agents in non-human primates.
- Developed enhanced aerobiology capabilities and developed animal model to facilitate bacterial therapeutics research.
- Evaluated novel lead antimicrobial compounds and immune modulators in small animal models for anthrax, plague, tularemia and glanders.
- Performed additional *in vivo* studies on efficacy of selected antimicrobial compounds against various bacterial threat agents in small animal models.
- Continued the assessment of selected compounds for safety and efficacy against multiple bacterial threat agents in small animal models.
- Developed membrane disruptors as broadly active compounds against bacterial agents, including genetically modified bacteria.
- Investigated novel small molecule "aptamer" compounds for efficacy in inhibiting the activity of anthrax toxin
- Begin development on additional resequencing microarrays for additional agents.
- Expanded bioinformatics efforts to generate data on strain differences in *B. anthracis* and other agents.

Toxin Agent Countermeasures

The countermeasures, technical barriers, and accomplishments in the Toxin Agent Countermeasures area are outlined below.

Countermeasures:

- Vaccines that produce long-term protective immunity against toxin agents.
- Drugs that can be administered prior to toxin exposure to protect against toxic effects of the agent.
- Therapeutics for treatment of diseases/symptoms caused by toxin agents.

*Technical Barrier*s:

- Development of appropriate model systems that emulate human aerosol exposure and intoxication.
- Methods for induction of respiratory and mucosal immune responses that produce long term protective immunity at the agent's port of entry.
- Development of markers of pulmonary inflammation in animal models.
- Identification and development of appropriate animal models for investigation of surrogate endpoints of human clinical efficacy.
- Retention of toxin antigenicity without toxic properties for vaccine candidates.
- Insertion of stable genetic alteration of toxin biological targets to produce toxin-resistant biological targets.
- Generic (broad-spectrum) protection from families of toxins with subtle alterations in toxic modes of action.
- Necessity to enhance the otherwise limited data on which to base rational drug design and antibody therapies for toxin agents of interest.
- Necessity to establish and maintain capabilities to assess toxin threats and provide countermeasures for new and emerging toxin threats.

Pre-treatments Capability Area

Toxin Vaccines

Overarching Research Objective: Develop candidate prophylactic medical countermeasures (vaccines and pre-treatments), using appropriate laboratory and animal models, and demonstrate their capability for preventing or reducing mortality and morbidity in animals exposed to predicted or presumed battlefield doses of aerosolized toxin biological threat agents. Research studies range from basic and applied research in toxin vaccines to research nearing the point of maturity for elevation to Defense Technology Objective (DTO) status. DTO research efforts are designed so that data generated from these efforts meet requirements for transition out of the technology base and are consistent with technical information required by the advanced developer to support the preparation of an Investigational New Drug (IND) application.

Basic and Applied Research Accomplishments:

- Identified new staphylococcal enterotoxin A/staphylococcal enterotoxin B (SEA/SEB) structural determinants as potential immunogens to protect against multiple SE serotypes.
- Conducted computational chemistry studies to develop next generation botulinum neurotoxin and recombinant ricin toxin A-chain (rRTA) vaccines.
- Continued studies on the ability of functional domains of botulinum neurotoxins (BoNT) to elicit protective immunity in animal models.
- Accelerated studies to increase immunogenicity of existing recombinant BoNT heavy chains (Hc) subunit vaccine candidates via adjuvants and/or method of delivery.
- Developed in-process and release assays for recombinant BoNT Hc vaccine candidates.
- Tested stability of staphylococcal enterotoxin (SE) vaccine candidate and recombinant ricin vaccine (rRTA) candidate.
- Developed surrogate endpoints of clinical efficacy for higher animal species in ricin vaccine adjuvant studies.
- Tested novel adjuvants with lead ricin vaccine candidate.
- Initiated technology base studies in support of the development and eventual FDA licensure of the ricin vaccine candidate.
- Initiated evaluation of inactivated BoNT light chain vaccine candidates as well as large-scale truncations of BoNT holotoxins in animal models.
- Initiated studies on multivalent vaccine candidates to protect against multiple BoNT serotypes, including cloning and expression of genes for novel multivalent vaccine candidates.
- Continued testing of next generation staphylococcal enterotoxin A (SEA)/ staphylococcal enterotoxin B (SEB) immunogens as vaccine candidates to protect against multiple SE serotypes *in vivo*.
- Evaluated stability and immunogenicity of SEB toxin vaccine in support of clinical trial.

Vaccine Defense Technology Objective (DTO) Research Accomplishments:

Research Toward Alternative Delivery Methods for Recombinant Protein Vaccines (DTO CB.32)

- Demonstrated proof-of-concept for lead alternate vaccine delivery system(s).
- Completed preclinical research studies and prepared recommendations to support transition of commercial technology for alternate vaccine delivery out of the technology base. This DTO concluded in FY05.

Research Toward the Development of a Recombinant Ricin Vaccine (CB.46)

- Completed a comprehensive review of results with lead candidate, including potency, efficacy, adjuvant studies, toxicity and pathology studies in rodents.
- Completed efficacy studies and pathology in higher animal species with the lead vaccine candidate.

DTO CB. 46 Recombinant Ricin Vaccine
Objectives. The objective of this DTO is to develop a safe and effective vaccine for protection against aerosol exposure to ricin toxin. A goal is demonstration of 80% (threshold, objective is 90%) survival of vaccinated animals exposed to aerosolized ricin toxin at levels comparable to hypothetical battlefield exposures. Novel ricin A-chain polypeptides produced by recombinant expression vectors will be evaluated as immunogens capable of protecting against ricin toxicity. **Payoffs.** No licensed vaccine, antidote, or other medical therapy is available to protect Service members against ricin toxin. A licensed ricin vaccine will enhance force protection and virtually eliminate the threat of aerosolized ricin as a biological weapon to U.S. forces. **Challenges.** Developing vaccine candidates that do not retain the undesirable characteristics of vaccines produced from the natural toxin (e.g., enzymatic activity), aggregation in the vial, and manufacturing process that did not meet current Good Manufacturing Practices (cGMP) standards. **Milestones/Metrics.** **FY2006:** Complete pathology studies in the NHP model. Provide technical data from completed vaccine research studies to the advanced developer for incorporation into an Investigational New Drug (IND) application.

DTO CB.65 Multi-agent (molecular) vaccines for bio-warfare and genetically engineered agents
Objectives. This DTO will focus on the development of a trivalent vaccine based on a prototype anthrax/ plague DNA vaccine platform. The nature of a bio-attack is such that an aggressor is likely to strike at a time and place calculated to induce maximum terror through mass casualties. In the absence of specific intelligence and integrated real time detection systems, the unpredictable nature of such events compels us to develop medical countermeasures capable of protecting the war fighter against multiple bio-threat agents. Anthrax and plague are considered prime bio-threat agents and as such considerable effort is currently being devoted to the development of new licensed vaccines. Research will focus on developing a trivalent vaccine prototype capable of conferring simultaneous protection against anthrax, plague and one other bio-threat agents such as smallpox or *F.tulerensis* in the shortest possible period following minimal dosing. **Payoffs.** The ability to remove the threat posed by bio-weapons from the battle space would enhance operational efficiency by reducing the medical footprint and would enable commanders to focus their energies on defeating the enemy. The development of a vaccine capable of protecting against three bio-threat agents would represent a considerable saving in terms of time and cost and would minimize the logistics footprint. Combining three agents in a single formulation would result in substantial savings in terms of cost and time. In addition, once developed this approach has the potential to be extended to include additional bio-threats, particularly those posed by genetically engineered strains. **Challenges.** (i) Optimization of anthrax/plague DNA platform and immunization schedule. Considerable work has already been undertaken in this area both at the Naval Medical Research Center, USAMRIID, and the larger research community. (ii) Identification of the third bio-threat agent vaccine target/targets and their subsequent expression from the vaccine platform. Possible targets which have

DTO CB.65 Multi-agent (molecular) vaccines for bio-warfare and genetically engineered agents
demonstrated efficacy in the past as DNA vaccines include Ebola and Marburg glycoproteins, Venezuelan equine encephalitis virus structural protein, and a number of smallpox structural proteins. It is envisaged that the platform developed at stage I will be used for this purpose. (iii) Demonstrate protective efficacy of individual and combined vaccine targets against injected and ultimately aerosol challenge in a relevant animal model system. Model systems already exist for both anthrax and plague, and have been developed or are being developed for the other major threat agents. **Milestones/Metrics.** FY2006: Develop the optimal backbone anthrax/plague vaccine platform. Particular focus will be on DNA vector delivery systems that stimulate protective immunity following minimal dosing. FY2007: Express the select bio-threat agent target from this platform system and assess its immunogenicity in animal models alone and in combination with the anthrax and plague elements. Characterize the underlying immune response FY2008: Determine protective efficacy against injected live agent challenge for each agent. FY2009: Determine protective efficacy against aerosol challenge

Therapeutics Capability Area

Toxin Therapeutics:

Overarching Research Objective: Develop candidate therapeutic countermeasures (therapeutic drugs and immunotherapies), using appropriate laboratory and animal models, and demonstrate their capability for preventing or reducing mortality and morbidity in animals exposed to predicted or presumed battlefield doses of aerosolized biological toxin threat agents, to include botulinum neurotoxins, staphylococcal enterotoxins (SE), and ricin toxin. Efforts target the respiratory tract and other portals of entry, and identification of parameters defining the efficacious performance of the therapeutic agent obtained in appropriate animal models of aerosol intoxication. Research studies range from basic and applied research in toxin therapeutics to research nearing the point of maturity for elevation to DTO status.

Basic and Applied Research Accomplishments:

- Assessed structural analogs of lead therapeutic compounds using high-throughput screening assays for toxins.
- Refined x-ray data for toxin-inhibitor co-crystal structures of most promising botulinum neurotoxin inhibitors.
- Initiated modeling time course of inhibitor effects. Performed computational chemistry studies to refine lead compound co-crystal structures.
- Tested FDA-approved drugs for septic shock as adjunct staphylococcal enterotoxin (SE) therapeutics *in vivo*.
- Continued development of lead monoclonal antibody systems against toxins as passive immunotherapeutics *in vivo*.
- Performed testing of lead compounds using cell-based model systems for assessment of therapeutic efficacy.
- Continued custom synthesis of structural analogs of lead compounds identified by high-throughput screening assays for botulinum and SE toxins.
- Assessed surrogate endpoints of human clinical efficacy for SE therapeutics.

- Identified two caspase inhibitors to counteract toxic effects of SEs tested and evaluated their therapeutic efficacy in the murine LPS-potentiated model.
- Produced homozygous transgenic mice expressing high levels of human MHC class II/human CD4 receptors.
- Found that aerosolized SEB could induce lung lesions in the HLA transgenic mice, similar to SEB lesions induced in nonhuman primates.
- Continued timing and dosage studies in mouse model with steroid candidate compound that prevents the lethality of Staphylococcal Enterotoxin type B (SEB).
- Investigated novel inhibitors of SE, such as monoclonal antibodies or specific blocking intracellular protein MyP88, using animal models for assessment of therapeutic efficacy.
- Standardized *in vivo* model systems for assessment of therapeutic efficacy and surrogate endpoints of human clinical efficacy.
- Screened and identified compounds which block a variety of toxins at the respiratory epithelial barrier
- Pursued the following studies: toxin virulence factors, broad spectrum anti-toxin compounds and common pathogenic mechanisms. Elucidated molecular targets and sought antagonists for each target .

Therapeutics Defense Technology Objective (DTO) Research Accomplishments:

Research toward the development of Therapeutic Strategies for Botulinum Neurotoxins (DTO CB.59)

- Developed recombinant human antibodies as passive immunotherapeutics against toxin A subtypes.
- Examined structural analogs of active site inhibitors identified by high-throughput screening.
- Identified candidate BoNT receptor antagonists as therapeutic candidates.
- Established a central database and compound repository.
- Initiated ex vivo evaluation of lead compounds in model systems for therapeutic efficacy.
- Standardized *in vivo* concept model systems for assessment of therapeutic efficacy and surrogate endpoints of human clinical efficacy for botulinum.
- Developed low molecular weight compounds to inhibit botulinum toxin by interference with toxin binding to intracellular targets.
- Continued evaluation of high affinity recombinant human antibodies against BoNT *in vivo*.
- Developed surrogate endpoints of human clinical efficacy for BoNT therapeutics.
- Initiated evaluation of neuronal drug delivery systems for leading BoNT treatment modalities *in vitro* and *ex vivo*.

DTO CB. 59 Therapeutic Strategies for Botulinum Neurotoxins
Objectives. This DTO will enable the future development of Food and Drug Administration (FDA)-licensed therapeutics against the validated biological warfare (BW) threat of botulinum neurotoxin (BoNT) by identifying and characterizing drugs and compounds that counteract the pathophysiological and biochemical effects of BoNT. Research will focus on pretreatment, treatment, and neuronal drug delivery strategies. **Payoffs.** BoNT is a potent toxin that is lethal by aerosol exposure. Deliberate exposure of joint service members to BoNT delivered as a BW agent would have severe consequences on mission effectiveness. Identification and characterization of compounds that counteract the effects of BoNT will enable the selection of lead candidates or treatment strategies for subsequent nonclinical and preclinical studies required to obtain FDA licensure. There are currently no FDA-licensed drugs against this toxin threat, and the standard post-exposure treatments for botulinum intoxication (i.e., antitoxins and support with mechanical ventilation) are not available in sufficient quantity to meet joint service requirements. Effective therapeutic countermeasures against BoNT will enhance the operational flexibility of joint forces and facilitate return to duty and restoration of operations. **Challenges.** Each serotype of BoNT is likely to require a tailored therapeutic strategy. Emphasis will be on development of countermeasures for BoNT serotypes A, B, E, and F. Other challenges are developing safe neuronal drug delivery systems for post-exposure therapies, and developing appropriate model systems for investigational purposes and extrapolating efficacy data from animal models to humans. **Milestones/Metrics.** **FY2006**: Develop lead mixtures of human antibodies against BoNT as passive immunotherapeutics *in vivo*. Complete *in vitro* testing of combinations of monoclonal antibodies against multiple BoNT serotypes and proof-of-concept studies with lead BoNT active site inhibitors and receptor antagonists (*in vivo*) using qualified surrogate endpoints of human clinical efficacy. Information generated by this research will be used to develop a strategy, in concert with the advanced developer, for development of BoNT therapeutic candidates, and will be used to develop a technology development plan for nonclinical studies of optimum therapeutic candidates/treatment modalities.

Viral Agent Countermeasures

The countermeasures, technical barriers, and accomplishments in the Viral Agent Countermeasures area are outlined below.

Countermeasures:

- Vaccines that confer immunity against viral threat agents.
- Antibodies and antiviral drugs for treatment of viral disease.

Technical Barriers:

- Limited infrastructure supporting work with live viral agents in high- and maximum-containment (BL3 and BL4) laboratories.
- Difficulty in optimizing and comparing different expression vectors for recombinant products (vaccines and antibodies).
- Development of rapid virus identification technology.
- Insufficient or incompletely understood animal model systems for investigation of viral threats and countermeasures.

- Necessity to develop and fully characterize animal models for eventual FDA licensure of vaccines under the Animal Rule.
- Development of multivalent vaccines and compatible vaccine platforms to protect against an array of unrelated viral agents.
- Difficulty in defining surrogate markers of protection.
- Necessity to enhance the otherwise limited data on which to base rational drug design and antibody therapies for viral agents of interest.
- Necessity to establish and maintain capabilities to assess threats and provide countermeasures for new, emerging, and genetically engineered hazardous viruses.

Pre-treatment Capability Area

Viral Vaccines:

Overarching Research Objective: Identify and characterize candidate vaccines, using appropriate laboratory and animal models, and demonstrate their capability to protect or significantly reduce morbidity in animals exposed to predicted or presumed battlefield doses of aerosolized viral BW threat agents, to include filoviruses (Ebola and Marburg viruses), orthopoxviruses (smallpox) and alphaviruses (equine encephalitis). Focus on molecular virology, applied immunology, and pathogenesis. Research studies range from basic and applied research in viral vaccines and associated scientific disciplines to research nearing the point of maturity for elevation to DTO status. DTO research efforts are designed so that data generated from these efforts meet requirements for transition out of the technology base and are consistent with technical information required by the advanced developer to support the preparation of an IND application.

Basic and Applied Research Accomplishments:

- Began investigating the role of cytotoxic T cells in the higher animal model of filovirus infection.
- Expanded development of animal models of aerosol infection with filoviruses.
- Determined the use of virus-like particles (VLP) and adenoviruses as antigen delivery platforms for vaccines against filoviruses.
- Completed studies on correlates of immunity that protect against disease from filoviruses and alphaviruses.
- Tested promising vaccine strategies in higher animal species for ability to protect against filoviruses.
- Evaluated promising EEE/WEE vaccine candidates in higher animal species against EEE or WEE virus challenge.
- Molecular Vaccines:
  - Explored use of VLP for multiagent vaccine development.
  - Evaluated DNA-based immunization against viral threat agents.
  - Used high throughput gene expression and sequencing technologies for a genomics/proteomics-based approach toward rapid vaccine development.
  - Tested oligonucleotide CpG as an adjuvant with live attenuated alphavirus vaccine candidates.
  - Evaluated the use of VLP as antigen for vaccines for filoviruses.
  - Began evaluation of a VEE replicon-based Marburg virus vaccine candidate.
- Evaluated poxvirus DNA vaccine.

Vaccine Defense Technology Objective (DTO) Research Accomplishments:

Research toward the Development of Western and Eastern Equine Encephalitis (WEE/EEE) Vaccine Constructs for a Combined Equine Encephalitis Vaccine (DTO CB.58)

- Continued to analyze mutants with various engineered attenuating mutations to determine their suitability for use as vaccine platforms.
- Enhanced studies to establish an eastern equine encephalitis (EEE) virus non-human primate efficacy model.
- Initiated applied research to define correlates of immunity that protect against disease from alphaviruses (EEE and WEE viruses).
- Continued testing candidates in available animal models for EEE vaccine. Determined the compatibility of vaccine candidate, V3526, and vaccine platforms in animals.

Research toward the Development of Vaccine Technologies for Protection Against Filovirus (Marburg and Ebola Viruses) Exposure (DTO CB.60)

- Incorporated antigen targets from earlier studies to improve vaccine candidates as determined from characterization studies and concurrent testing.
- Tested leading vaccine candidates in animals (viral challenge dose, route, pre-existing vector immunity, and variation in viral challenge strain).

DTO CB. 58 Western and Eastern Equine Encephalitis Vaccine Constructs for a Combined Equine Encephalitis Vaccine

Objectives. Enable the development of a Food and Drug Administration (FDA) licensed combined VEE/WEE/EEE vaccine by identifying and characterizing WEE and EEE vaccine constructs that would be appropriate to combine into a single vaccine with the already transitioned VEE vaccine candidate V3526, or with alternative VEE vaccine candidates made in the DNA- or replicon-based vaccine platforms. Leading technologies being evaluated under this enabling DTO include live-attenuated vaccines, with engineered attenuating mutations, replicon-based vaccines and DNA vaccines.

Payoffs. Clinical illness associated with VEE, EEE, and WEE includes headache, fever, chills, nausea, vomiting, mental confusion, sleepiness, and sometimes seizures and other neurological signs and symptoms. Mosquito vectors normally transmit these viruses to birds, horses, and humans; however, they are important biological warfare (BW) threats because of aerosol infectivity and stability when freeze-dried. There are no FDA-licensed vaccines for pretreatment protection against the BW threat imposed by the equine encephalitis viruses and treatment for post-exposure infection is limited to supportive therapy. Effective vaccines against the equine encephalitis viruses would decrease the threat of BW and enhance strategic mobility and force protection. An effective combined VEE/WEE/EEE vaccine would add important logistical advantages by reducing the number of vaccines required to obtain protection from the pathogenic equine encephalitis viruses from three to one.

Challenges. Technical challenges include developing appropriate model systems for investigational purposes and extrapolating efficacy data from animal models to humans. Other potential technical barriers include vaccine interference through nonspecific mediators such as interferon or specific immune mechanisms such as cross-reacting antibody. Competition for limited in-house animal resources must also be considered a resource challenge for this project.

Milestones/Metrics.

FY2006: Evaluate new EEE vaccine approaches in animal models in combination with WEE vaccine construct(s) and already transitioned VEE vaccine candidate V3526 or alternate VEE vaccine candidates made in the DNA- or replicon-based vaccine platforms.

DTO CB. 58 Western and Eastern Equine Encephalitis Vaccine Constructs for a Combined Equine Encephalitis Vaccine
FY2007: Initiate duration of immunity studies with lead candidates for each platform, comparing the individual constructs and trivalent formulations. **FY2008**: Complete analyses of duration studies. Upon demonstration of preliminary proof-of-concept for combining VEE/WEE/EEE vaccine components into a single vaccine, a technology development plan will be prepared for follow-on nonclinical studies of combined VEE/WEE/EEE vaccine formulations.

DTO CB. 60 Vaccine Technologies for Protection Against Filovirus (Marburg and Ebola Viruses) Exposure
Objectives. Enable the development of Food and Drug Administration (FDA) licensed vaccines against the filoviruses (Marburg and Ebola) by identifying and characterizing vaccine technologies using *in vitro* laboratory and animal models, and demonstrating their capability to reduce mortality and morbidity in animals exposed to predicted or presumed battlefield doses of filoviruses. **Payoffs.** Viral hemorrhagic fevers are a diverse group of illnesses caused by RNA viruses from four viral families, including the filoviruses (Marburg and Ebola). Marburg and Ebola viruses are of concern as potential BW threats since they have the potential for aerosol dissemination and weaponization. They are highly lethal and intensive supportive care is currently the only available treatment. Although clear evidence of their weaponization does not exist, the former Soviet Union is alleged to have had an effort to produce Marburg virus in quantities sufficient for weaponization as part of its offensive BW program. There are no FDA-licensed vaccines for protection against Marburg and Ebola viruses. Effective vaccines against the filoviruses would provide pre-exposure protection to joint forces, decrease the threat of filoviruses as biological warfare (BW) agents, and enhance strategic mobility. Scientific and technical information developed during the course of this research will enable the identification of lead vaccine strategies for future nonclinical studies designed to bring the optimum vaccine candidates forward for development. **Challenges.** Technical challenges include development of appropriate animal model systems and surrogate markers for investigational purposes, and the identification of appropriate immunogens for use in developing filovirus vaccine candidates. **Milestones/Metrics.** **FY2006**: Evaluate vaccine performance requirements (vaccine dose, route, number of doses, etc.,) in animal models. Determine if putative surrogate markers of protection reliably predict mitigation or prevention of disease. Information generated by these research efforts will be used to develop a technology development plan for future nonclinical studies of optimum vaccine candidates.

Therapeutics Capability Area

Viral Therapeutics:

Overarching Research Objective: Identify and characterize candidate therapeutics/ treatments, using appropriate *in vitro* laboratory and animal models, and demonstrate their capability to reduce mortality and morbidity in animals exposed to predicted or presumed battlefield doses against aerosolized viral biological warfare threat agents, to include filoviruses (Ebola and Marburg viruses) and orthopox viruses. Research studies range from basic and applied research

in viral vaccines and associated scientific disciplines to research nearing the point of maturity for elevation to DTO status.

Basic and Applied Research Accomplishments:

- Developed high-throughput *in vitro* drug screening assays for lethal human pathogenic viruses.
- Identified several lead small molecule therapeutics which protected animals against Ebola and Marburg lethal infections.
- Found that virus-like particles of Ebola activated the innate immune responses through natural killer cells and elicited protection against lethal Ebola challenge.
- Developed assays by identification of a suitable therapeutic target, cloning, expression and characterization of the therapeutic target proteins.
- Developed quantitative assays for variola and other orthopox viruses using dried-down chemistry to detect and discriminate the variola virus from other orthopox viruses simultaneously (in the same reaction tube).
- Developed heterologous VLPs containing GP and VP40 from Ebola and Marburg for testing them as therapeutic agents for treating filovirus infections in murine and guinea pig model systems.
- Tested and evaluated therapeutic action of pharmacological compounds provided by industry in mouse and non-human primate models of filovirus infection.
- Developed methods for whole genome sequencing and completed the genomic sequence of Monkeypox virus katako kombe; discovered new sequences to be used to design new therapeutic targets.
- Finished characterization of genes identified in random homozygous knock-out screening and their evaluation as drug targets.
- Finished screening for inhibitors of ribonucleic acid (RNA) polymerase.
- Evaluated novel targets obtained from proteomic studies.

Vaccine Defense Technology Objective (DTO) Research Accomplishments:

Research toward the Development of a Therapy for smallpox and Other Pathogenic Orthopox Viruses (DTO CB.54)

- Completed studies to evaluate drug efficacy of intravenous (IV) cidofovir in primate models that support the Food and Drug Administration (FDA) Animal Efficacy Rule.
- Evaluated activity in monkeypox primate animal model.
- Evaluated oral prodrug of cidofovir to determine if it is a replacement for IV cidofovir.
- Identified new molecular targets and developed assays specific for those targets.
- Evaluated antiviral activity of collections of compounds to identify lead structures for development into antiviral drugs, with emphasis on compounds acting through a different mechanism than inhibition of viral DNA polymerase.
- Identified and tested leading antivirals in appropriate animal models.
- Identified potential mediators of shock or toxemia and determined the basis for the pathogenesis of shock or toxemia in animal models.
- Performed a sequential sacrifice of variola in NHP and evaluating a monkeypox virus containing the green fluorescent protein in NHP for use in companion sequential sacrifice study.

- Continued to finish technical data package supporting FDA approval of a labeled indication for pre- and post-exposure treatment for smallpox with IV cidofovir by the drug license holder.

Research toward the Development of Therapeutic Strategies for Treating Filovirus (Marburg and Ebola Viruses) Infection (DTO CB.63)

- Evaluated preliminary effectiveness and identified possible mechanisms of protection by previously uncharacterized monoclonal antibodies specific for Marburg and Ebola viruses.
- Performed a study in Rhesus macaques challenged with Marburg virus (strain Ci67) to characterize the pathogenesis of Marburg virus in support of the FDA two animal efficacy rule.
- Determined therapeutic potential of candidate drugs in small animal models, including determination of the optimum dose, route and schedule (DRS) for delivery of the drug and the therapeutic window (latest time treatment can be initiated).

DTO CB.54 Therapy for smallpox and other Pathogenic Orthopoxviruses

Objectives. The objectives of this DTO are to develop medical countermeasures against smallpox and other orthopoxviruses, focusing on intravenous (IV) cidofovir (Vistide.) as the initial lead candidate but with planned product improvement to an orally active prodrug of cidofovir as the final product. The orally active prodrug will build on the systems developed for and data obtained from the IV cidofovir evaluation. Specifically, research will be performed to develop a therapeutic antiviral drug to treat smallpox and other naturally occurring or genetically modified pathogenic orthopoxviruses.

Payoffs. Smallpox is highly infectious by the aerosol route and causes severe disease with high mortality. It is highly contagious and release of smallpox would result in a worldwide epidemic unless countered by a combination of vaccinia vaccination, quarantine, and antiviral drug treatment of infected cases. Recent publications on genetically modified ectromelia (mousepox), that contains an inserted mouse cytokine gene expressing IL-4, indicate that the modified virus shows greater pathogenicity than wild type virus. Therapy (pre- and post-exposure) based on a drug that inhibits the viral DNA polymerase should still inhibit viral replication and might constitute a first line of defense against either an unmodified smallpox in unvaccinated individuals or genetically engineered smallpox or monkeypox in the entire population. An oral drug could be administered post exposure to large number of troops after a release of genetically modified smallpox, as well as protecting the large number of troops for whom vaccinia vaccination is counter-indicated prior to smallpox release.

Challenges. Developing appropriate model systems that emulate human aerosol exposure and infection; if such a demonstration can be made, it can be substituted for a human efficacy clinical trial by using the Food and Drug Administration (FDA) animal efficacy rule. Initial results show that disease can be produced in cynomolgous monkeys with authentic variola virus; however, model development has not been completed. An excellent model using the closely related orthopoxvirus monkeypox in cynomolgous monkeys has been utilized to demonstrate drug and vaccine efficacy. It will be necessary to correlate this model with the variola model. Under the FDA Animal Efficacy Rule, it would be highly desirable to obtain a clinical description of human monkeypox in order to provide correlation to the animal models. The disease is endemic in certain areas of Africa, such as the Democratic Republic of the Congo, and studies could provide the needed information.

DTO CB.54 Therapy for smallpox and other Pathogenic Orthopoxviruses

Milestones/Metrics.

FY2006: Conduct initial evaluation in variola primate model at the Centers for Disease Control and Prevention. Evaluate oral cidofovir prodrug therapeutic window against monkeypox and variola in primate models. Conduct initial studies to determine drug efficacy.

FY2007: Complete studies to evaluate drug efficacy in primate models that support the FDA Animal Efficacy Rule. Compile technical data to provide to the commercial partner to support consideration of the drug candidate for licensure for use as an oral smallpox therapeutic.

DTO CB.63 Therapeutic Strategies for Treating Filovirus (Marburg and Ebola Viruses)

Objectives. This DTO will enable the development of Food and Drug Administration (FDA)-licensed antiviral therapeutic drugs and treatments against the filoviruses (Marburg and Ebola) by identifying and characterizing candidate therapeutics/treatments using *in vitro* laboratory and animal models and demonstrating their capability to reduce mortality and morbidity in animals exposed to predicted or presumed battlefield doses filoviruses (Ebola and Marburg viruses).

Payoffs. Viral hemorrhagic fevers are a diverse group of illnesses caused by RNA viruses from four viral families, including the filoviruses (Marburg and Ebola viruses). Marburg and Ebola viruses are of concern as potential BW threats since they have the potential for aerosol dissemination and weaponization. They are highly lethal and treatment is limited to intensive supportive care for the most severely ill patients. Although clear evidence of their weaponization does not exist, the former Soviet Union is alleged to have produced Marburg virus in quantities sufficient for weaponization as part of its offensive BW program. There are no FDA-licensed antiviral therapeutic drugs or treatments for Marburg and Ebola virus infection, and none currently in human testing. Effective therapeutics or post-exposure treatments against the filoviruses would decrease the BW threat of filoviruses, enhance strategic mobility of joint forces, and facilitate return to duty and restoration of operations. Information developed during the course of this research will enable the identification of lead antivirals or treatment strategies for future nonclinical studies designed to bring the optimum therapeutic/treatment candidates forward for development.

Challenges. Technical challenges include development of appropriate animal model systems for investigational purposes and an incomplete understanding of the virus life cycle and viral-viral protein interactions and viral-host protein interactions, which are required for a productive infection.

Milestones/Metrics.

FY2006: Establish an assay to screen drugs that inhibit protein-protein interactions in filovirus infection. Testing lead antiviral drugs/therapeutic antibodies in nonhuman primates. Information generated by these research efforts will be used to develop a technology development plan for nonclinical studies of leading therapeutic candidates.

DTO CB.67 Therapeutics for Ebola and Marburg Virus Infections

Objectives. This DTO will develop antiviral therapeutics and treatments against one strain of Ebola virus and one strain of Marburg virus and provide supporting data to facilitate licensure by the FDA under the Animal Efficacy Rule. Work performed under this DTO will be aligned with the Defense Threat Reduction Agency product development group to better anticipate the practical aspects of moving the best technologies forward for advanced development.

Payoffs. Viral hemorrhagic fevers are a diverse group of illnesses caused by RNA viruses from four viral families, including the filoviruses, Marburg and Ebola. They are of concern as possible biological warfare threats because of their potential for aerosol dissemination and weaponization. They are highly lethal and intensive supportive care is currently the only available treatment. This effort will provide therapeutics against Ebola and Marburg viruses that will reduce service member morbidity and mortality and control the spread of infection. Also, scientific and technical information developed during the course of this research may identify and/or authenticate novel therapeutic platforms or targets with broad-spectrum applicability toward multiple biological threat agents. For example, development and validation of an operative and effective delivery system for siRNAs may have significant clinical utility ranging far beyond Ebola and Marburg viruses; and could then be exploited for rapid response to new emerging threats whether of natural or unnatural introduction.

Challenges. The primary technical challenge will be to demonstrate the safety and efficacy of a therapeutic technology in the stringent nonhuman primate models of Ebola and Marburg hemorrhagic fever. In tandem with efforts to evaluate these novel interactions, some emphasis may need to be placed on sufficient and timely development and characterization of animal models to provide confidence that they are faithful to the human disease and to ensure the validity of submissions to the FDA under the Animal Efficacy Rule. As an example, a recent outbreak of a particularly virulent isolate of Marburg virus in Angola may bring new challenges such as new strains and/or species of Ebola and Marburg viruses arising during the term of the DTO.

Milestones/Metrics.

FY2007: Further develop, characterize and compare the utility and potential of five novel intervention technologies *in vitro* and in animal models of Ebola and Marburg hemorrhagic fevers. Establish collaborative arrangements with industry partners as needed. In tandem with evaluation of interventions, improve animal models and continue molecular pathogenesis studies to improve and optimize interventions.

FY2008: Perform and complete pivotal studies to compare the utility and potential of five novel intervention technologies in nonhuman primate models of Ebola and Marburg hemorrhagic fevers. Analyze and evaluate data from all studies to downselect one or two of the five technologies for further optimization in FY09. In addition to a separate evaluation of each of these individual technologies, begin to explore the possibility of combining promising technologies to enhance overall efficacy in rodent models.

FY2009: Begin to optimize treatment regimens of one or two of the candidate technologies selected for possible advanced development. Transition studies to explore the possibility of combining promising technologies to enhance overall efficacy from rodents to nonhuman primates.

FY2010: Complete pivotal studies to optimize treatment regimens of selected technologies and/or multicomponent strategies.

Diagnostic Capability Area

Countermeasures:

- Portable common diagnostic systems for a broad range of biological threats.
- Field laboratory capability to identify biological threat agents.
- Reference laboratory for confirmatory identification of biological threat agents.

Technical Barriers:

- Development of identification technologies and reagents of sufficient sensitivity and specificity to support early disease diagnosis.
- Development of rapid processing methods that can be used with a broad array of possible clinical specimens, including whole blood, sputum, swabs, feces, and tissues.
- Reduction of laboratory methods to portable devices.
- Lack of available data on genetic variability pertaining to markers used for diagnostic development.
- Inability to type organisms specifically and determine geographic origin.

Diagnostic Technologies:

Overarching Research Objective: Perform research leading to the development of technology candidates (reagents, protocols and devices) for inclusion into a deployable state-of-the-art identification and diagnostic system that integrates multiple methods for the identification of potential biological warfare agents and the diagnosis of diseases they cause. The aim is to develop and integrate technologies so they will be capable of identifying multiple independent biomarkers from different agents simultaneously. The goal is to transition these technologies out of technology base to the advanced developer for development and fielding of a portable, integrated FDA-approved medical diagnostic system that can be used by medical personnel to identify and confirm health threats and rapidly diagnose disease.

Basic and Applied Research Accomplishments:

- Designed nucleic acid and immunoassays to detect biological threat agents in clinical samples.
- Assessed novel methods to develop immunodiagnostic assays.
- Initiated study to identify biomarkers of immunity in individuals vaccinated against biological warfare agents.
- Evaluated new chemistries for the identification of biological warfare agents.
- Identified markers correlating with early biomarkers of infection caused by selected biowarfare agents in *in vitro* animal studies.
- Continued assessing novel technologies (e.g., nucleic acid and protein microarray systems).
- Developed and evaluated nucleic acid and immunoassays to detect biological threat agents in clinical samples.
- Tested DOD developed assays, reagents and sample preparation techniques and platforms in field studies.
- Designed confirmatory tests for toxins.
- Directed research towards solving the technical problems associated with clinical sample preparation and rapid diagnostics.
- Demonstrated equivalence of a commercial kit and Joint Biological Agent Identification and Diagnostic System (JBAIDS), Block I DNA extraction kit thereby decreasing sample

volume required for testing and eliminating the need for a large piece of deployable instrumentation.
- Investigated recombinant DNA technologies for new immunodiagnostic approaches.
- Built database for a DARPA transitioned broad range pathogen detection (Tiger) system capable of identifying genetically engineered strains.
- Initiated development of protein microarrays targeting *Y. pestis*.
- Built bioinformatics database correlating with early biomarkers of infections caused by selected biological warfare agents.
- Initiated evaluation of components of systems compatible with future comprehensive integrated diagnostic system (JBAIDS III).
- Augmented field studies of assays, reagents and platforms for the diagnosis of potential biological warfare threat agents with animal studies.
- Transitioned assays in support of the JBAIDS acquisition program, Block I.
- Applied new technological approaches for processing clinical samples to complex matrices and different threat types.
- Pursued recombinant DNA technologies for immunodiagnostic reagent production.
- Initiated assessment of host response data in order to target the development of specialized gene sets as diagnostic targets.
- Identified an immunodiagnostic platform suitable for JBAIDS, Block II (toxin diagnostics) to the advanced developer.
- Contributed to the set-up of the IT infrastructure to integrate medical surveillance and laboratory test data using the Epidemic Outbreak Surveillance (EOS) model.

Diagnostic Technologies Defense Technology Objective Accomplishments:

Research Toward the Development of Methodology to Facilitate Development of Biological Warfare Threat Agent Detection and Medical Diagnostic Systems (DTO CB.56)
- Began to elevate previously transitioned nucleic acid assays to test and evaluation standards established during FY04 for assays selected for JBAIDS, Block I.
- Finalized standards for immunodiagnostics assays.
- Delivered four nucleic acid detection/diagnostic assays and/or supporting reagents to the advanced developer.
- Delivered four antigen detection assays and/or supporting reagents to the advanced developer.

DTO CB.56 Methodology to Facilitate Development of BW Threat Agent Detection and Medical Diagnostic Systems
Objectives. This DTO will identify, characterize, test, and evaluate nucleic acid and antigen detection assays and associated supporting reagents to enable development and fielding of biological agent diagnostic and detection systems.
Payoffs. A principal payoff of this research effort is reliable and timely fielding of medical diagnostic and agent detection assays capable of supporting joint service medical assets in theaters of operation. For medical diagnostic applications, this research will ensure that diagnostics assays receive appropriate testing and validation prior to deployment and fielding, thus enabling obtaining Food and Drug Administration (FDA) approval of these medical devices by the advanced developer. Additionally, this effort will include refinement of BW agent detection and medical diagnostic assays and reagents already transitioned to advanced development, resulting in better performance, sensitivity, and specificity of

DTO CB.56 Methodology to Facilitate Development of BW Threat Agent Detection and Medical Diagnostic Systems

fielded systems and facilitating a rapid response to changing operational needs and requirements.

Challenges. Key technical challenges include the development of reagent and protocol standards for comparison of similar diagnostic/detection assays and reagents, and the establishment of mutually acceptable technical data package formats for assay and reagent hand-off to the advanced developer.

Milestones/Metrics.

FY2006: Deliver additional four nucleic acid detection/diagnostic assays and/or supporting reagents to the advanced developer. Deliver four antigen detection assays and supporting reagents to the advanced developer. Continue to elevate previously transitioned assays up to test and evaluation standards established during the first year.

FY2007: Deliver additional four nucleic acid detection/diagnostic assays and supporting reagents to the advanced developer. Deliver four antigen detection assays and supporting reagents to the advanced developer. Continue to elevate previously transitioned assays up to test and evaluation standards established during the first year.

DTO CB.64 Rapid Detection, Threat Assessment and Attribution of Genetically Engineered Biothreat Organisms Using Microarray-Based Resequencing Technologies

Objectives. This DTO will provide for rapid, inexpensive, high-throughput, microarray-based DNA resequencing of biothreat agent genomes, whether naturally occurring, newly arising, or genetically engineered. Knowledge of a biothreat agent's genome sequence provides fundamental information for nucleic acid-based bio-defense detection and surveillance systems. Rapid, inexpensive genomic resequencing of biothreat agent genomes enables immediate, definitive identification of the organism, is informative for efforts to determine the attribution of an agent, and will identify genetic signatures characteristic of genetic engineering or naturally-occurring, newly arising strains. This project will provide validated targets for current biodetection systems, while enabling next-generation systems that will be based on rapid DNA sequence determination of genomes. We aim to develop the capability to perform lower-cost, whole-genome sequencing in single laboratories with minimal space and personnel requirements.

Payoffs. This effort will provide a rapid, low cost, high-throughput microarray-based resequencing technology, allowing the rapid identification, threat assessment and attribution of genetically engineered and newly arising biothreat agents. Genetic data generated will provide verified targets to speed assay development, and low-cost, rapid resequencing technologies will likely be the basis of next-generation bio-defense detection and surveillance platforms.

Challenges. Assembling large, diverse collections of biothreat agents and close relatives is a time-consuming process; while some collections exist, additional systematic sampling to encompass population diversity is necessary. Refining and increasing the throughput of existing microarray-based resequencing technologies is also a time- and labor-intensive effort. It will be important but challenging to create systems for automating data production and transfer to other sites, bioinformatics inference, analysis and decision-making. Considerable effort is needed to develop a deployable platform incorporating emerging sequencing technologies to further improve microarray systems.

Milestones/Metrics.

FY2006: Develop collection procedures and expand biothreat agent strain collection, focusing on *Bacillus anthracis* and *Yersinia pestis*. Sequence 6 *B. anthracis* group genomes; release data to other

DTO CB.64 Rapid Detection, Threat Assessment and Attribution of Genetically Engineered Biothreat Organisms Using Microarray-Based Resequencing Technologies
relevant DOD projects. Demonstrate/evaluate two high-density microarray systems, (Affymetrix, Inc. and Nimblegen Systems), as whole-genome resequencing platforms. Develop, implement data analysis pipeline.
FY2007: Demonstrate >3-fold scale up of high-throughput experimental protocols and systems for rapid high-throughput microarray-based resequencing. Resequence 10 *B. anthracis* and 10 *Y. pestis* group genomes; release data to other relevant DOD projects. Expand biothreat agent collection. Evaluate microarray feature size reduction/increased density on two platforms.
FY2008: Demonstrate 3-fold scale up of experimental protocols and systems. Resequence 30 *B. anthracis* and 30 *Y. pestis* group genomes, releasing data to other relevant DOD projects. Expand strain collection, focusing on agents most relevant to warfighters. Evaluate further microarray feature improvements on two microarray platforms.
FY2009: Demonstrate 3-fold scale up of experimental protocols and systems. Resequence 90 *B. anthracis* and 90 *Y. pestis* group genomes, or equivalent numbers of biothreat agent genomes, releasing data to other relevant DOD projects. Deliver high-throughput, microarray-based resequencing system for consideration of DOD procurement and development.

DARPA Biowarfare Defense Programs: *Pathogen Countermeasures Program*

The focus of the efforts completed in FY05 was the development of revolutionary, broad-spectrum medical countermeasures against pathogenic microorganisms and/or their toxinogenic products. The program addressed this focus by identifying those biochemical processes of biological threat agents that are essential for their ability to cause disease and then undermining such processes and/or mechanisms. The medical countermeasures under development will be versatile enough to eliminate biological threats, whether from natural sources or modified through bioengineering or other manipulations.

Critical Reagents Program (CRP)

The Critical Reagents Program is outlined below.

Rationale:

- Supports requirements of all Services, as well as biological detection programs of DOD first responders, other Federal Agency's, and NATO countries'.

Key Requirements:

- Provide Total Life Cycle Management for the critical reagents (antibodies, antigens, and gene probes and primers), Electrochemilluminescense Assays (ECLAs), Polymerase Chain Reaction Assays (PCRAs), Hand Held Assays (HHAs), and DOD Biological Sampling Kits necessary to the operation of all DOD biological detection systems.
- Ensure best quality reagents and immunoassays are available in time and in adequate quantities.
- Ensure adequate security and surge capability of critical reagents, ECLAs, HHAs and PCRAs.

- Produce HHAs and DOD Biological Sampling Kits that are critical to all DOD biological detection programs.

Description:

The CRP ensures the quality, availability, and security of BW reagents, ECLAs, PCRAs, HHAs, and DOD Biological Sampling Kits, which are critical to the successful development, test, and operation of DOD biological warfare detection systems and medical biological products. The program maintains an R&D effort to ensure the best possible reagents are available for use against both current and emerging threats and to include analysis of commercially available reagents and technologies. The CRP consolidates all DOD antibody, antigen, gene probe/primer, ECLA, PCRA, HHA, and DOD Biological Sampling Kit developments and requirements. The CRP has reagents and HHAs to detect 10 BW threat agents from the ITF-6A threat list. The CRP provides required reagents and HHAs to support fielded DOD BW detection systems (BIDS NDI and P3I, XM-99 Joint Portal Shield, and DOD Biological Sampling Kits) and developmental systems (JBPDS), as well as other Federal Agencies and NATO allies. The near future requires the development of environmental and diagnostic molecular reagents for the JBAIDS. Outlying years will focus on the development of reagents to identify new and emerging threats and the procurement of improved reagents to replace older stocks.

F.2.3 ADVANCED DEVELOPMENT ACCOMPLISHMENTS

The JPEO-CBD is a DOD agency chartered to provide intensive centralized management of medical and non-medical programs to expedite materiel solutions for validated biological defense capabilities. Vaccine products will be further developed by the Joint Vaccine Acquisition Program (JVAP), an ACAT II program under JPEO-CBD.

F.2.3.1 JVAP Prime Systems Contract

- DynPort Vaccine Company continued to expand their operations, finding appropriate commercial subcontractors to engage in the advanced development of BD vaccines (recombinant botulinum vaccine, recombinant plague vaccine, and Venezuelan equine encephalitis vaccine).

F.2.3.2 Contingency Stockpile of Biological Defense (BD) Vaccines

- Testing of potency and other characteristics, continues for legacy EEE, VEE, WEE, Tularemia and Q-Fever vaccines.

F.2.3.3 Advanced Development of the Tularemia Vaccine

- Program terminated due to removal of funding.
- NIAID will continue vaccine development through IND application submission.

F.2.3.4 Advanced Development of the Smallpox Vaccine

- DOD smallpox vaccine development terminated due to removal of funding
- Filed an annual report with the FDA under IND #9141 to insure continued availability of Vaccine Immune Globulin (VIG).
- DynPort Vaccine Company achieved licensure for the new VIG product for intravenous administration in February 2005. The current manufacturer (under subcontract to the PSC) has ceased all plasma-derived processing, and the PSC was unable to find a new

manufacturer to perform the technology transfer. An Interagency Agreement will be drafted to procure VIGIV from DHHS.

F.2.3.5 Advanced Development of the Plague Vaccine

- Granted Fast-Track designation by the FDA.
- Completed manufacture of cGMP final drug product for Phase 1 and 2 clinical trials of U.S. plague vaccine candidate.
- Finalized and submitted IND.
- Initiated and completed active immunization portion of Phase 1 clinical trial.
- Initiated manufacturing process development scale-up.

F.2.3.6 Advanced Development Venezuelan Equine Encephalitis Vaccine

- Continued assay development and qualification for VEE IA/B component.
- Continued stability and lot release testing on lot of V3526.
- Initiated Phase 1 clinical trial with immunization of cohort 1.
- Received Fast-Track designation by FDA.

F.2.3.7 Advanced Development Recombinant Botulinum Toxin Vaccine

- Finalized and submitted IND.
- Continued Phase 1 clinical trial. Vaccination of cohorts resulted in no serious adverse events.
- Finalized manufacturing scale-up and initiated process validation for serotypes A and B.
- Received Fast-Track designation by the FDA.

F.2.3.8 Anthrax Vaccine Adsorbed (AVA) (BioThrax™) [Procurement]

- Bioport has delivered over 8.4 million FDA-released doses of BioThrax™ to the DOD as of October 2005.

F.2.3.9 International Cooperative Research and Development

- The new Chemical Biological and Radiological Memorandum of Understanding (CBR MOU) between the U.S., the UK, and Canada (CANUKUS) was signed and implemented on 1 June 2000. The U.S. and Canada signed a bilateral Project Arrangement (PA) under the CBR MOU on 27 March 2003 to co-operatively develop a smallpox vaccine system with the U.S. as the lead nation. The PA objectives include development and licensure in both the U.S. and Canada of a smallpox vaccine and a Vaccinia Immune Globulin (VIG) to treat rare cases of adverse reactions. The smallpox vaccine portion of the PA is currently under review by both nations in light of the Department of Health and Human Services (DHHS) efforts to develop a smallpox vaccine. In April 2005, the Project Arrangement for development of the UK plague vaccine was signed by the U.S., UK, and Canada.

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Annex G

Homeland Security Programs

Table G-1 Homeland Security RDA Efforts

Category	Nomenclature	Status	USA	USAF	USMC	USN
CBRN Defense Homeland Security Programs	- National Guard Weapons of Mass Destruction Civil Support Teams (WMD-CSTs) - United States Army Reserve Domestic Response Decontamination and Reconnaissance Mission	RDTE/Prod Fielded*	*Rqmt*	*Interest*	*Interest*	*Interest*
Installation Protection	- Installation Protection Program	Prod/Fielded*	Joint	Joint	Joint	Joint

Rqmt = Product Requirement
Interest = Product Interest
Int-NIR = Product Interest, No Imminent Requirement
* = sub-Product(s) of a Consolidated Joint Service Project
Rqmt, Interest = Sub-Product Requirement or Interest
Defense Technology Objective (Science & Technology Base Program)

CBRN Defense Homeland Security Programs

National Guard Weapons of Mass Destruction Civil Support Teams (WMD-CSTs)

Rationale:

Army requirement. Congress has authorized 55 WMD-CSTs. The first 32 teams authorized through 2001 have achieved the certification required by law and in accordance with Department of Defense criterion. Twelve additional teams were authorized in 2003 and have been fielded and have achieved their certification. Eleven additional teams were authorized in 2005 are in the process of fielding, activation, and certification.

Key Requirements:

- The Analytical Laboratory System (ALS) (*shown*) capable of conducting presumptive analysis of unknown or potential agents (Chemical Warfare (CW) agents, Toxic Industrial Materials (TIM), Toxic Industrial Chemicals (TIC) and Biological Warfare (BW) agents) at an incident site and transmit that information electronically through the means of the Unified Command Suite (UCS).

- The UCS (*shown*) provides a full range of communications (both secure and non-secure data) necessary to support the CST mission. It is the primary means of reach back communications for the ALS for the WMD-CSTs, and acts as a command and control hub to provide a common operational picture for planning and executing an incident response.

- Chemical and Biological (CB) Support Equipment provides the National Guard Weapons of Mass Destruction- Civil Support Team (CSTs) and the United States Army Reserve Chemical Companies with Chemical Biological Radiological Nuclear (CBRN) life-support equipment (individual protection clothing, survey equipment, detection equipment, and response support equipment) that directly protects individuals from the effects of CBRN contamination.

Description:

The WMD-CST mission is to support civil authorities at a domestic CBRN incident site by identifying CBRN agents/substances, assessing current and projected consequences, advising on response measures, and assisting with appropriate requests for state support to facilitate additional resources. The WMD-CST is a high-priority response unit supporting civil authorities in responding to a weapon of mass destruction situation. The unit is made up of 22 full-time National Guard members. It consists of six sections: command, operations, communications, administration/logistics, medical, and survey, who have been specially trained and equipped to provide a technical reach-back capability to other experts. The team is formed specifically to provide advice to the Incident Commander to help make assessments of the requirements for follow-on forces.

United States Army Reserve Domestic Response Casualty Decontamination and Reconnaissance Mission

Rationale:

Army requirement. Defense Reform Initiative Directive Number 25, which created the WMD-CSTs also required the US Army Reserve to train and equip Decontamination and Reconnaissance Elements for Domestic Response.

Key Requirements:

- All 23 Decontamination Chemical Companies in the Army Reserve are authorized to train with three platoon sets of Domestic Response Casualty Decontamination Equipment.
- All four Chemical Reconnaissance Companies in the Army Reserve are authorized to and train with three platoon sets of Domestic Response Reconnaissance Equipment. One company, the 392d Chemical Company, Little Rock, AR, used their skills to great effect when deployed in Operation Iraqi Freedom (OIF).

Description:

Nuclear, Biological, and Chemical (NBC) area reconnaissance and casualty evacuation in NBC-contaminated environments in support of the Lead Federal Agency in domestic and foreign crisis and Consequence Management (CM) operations. Provide CBRN reconnaissance support operations to include contamination surveys, agent/material sampling, and assistance with casualty search and extraction. Perform dismounted NBC recon to support domestic response. This Hazardous Materials (HAZMAT) training enhances unit capabilities to detect and operate in-and-around industrial chemicals and non-standard chemical agents. Army Reserve smoke and decontamination companies conduct patient decontamination of NBC casualties in support of the Lead Federal Agency for domestic and foreign crisis and CM operations. Perform military and civilian personnel and casualty decon to support domestic response. The enhanced capabilities of

the USAR Chemical Decontamination and Reconnaissance elements mean improved support to Combatant Commanders.

Installation Protection

Installation Protection Program (IPP)

Key Requirements:

- Provides improved CBRN detection, identification, protection and response capability to critical military installations
- Capable of preventing disruption of critical missions, rapidly resuming essential operations, and minimizing personnel impact.

Description:

The JPEO-CBD Joint Project Manager (JPM) Guardian Installation Protection Program (IPP) constitutes the DOD's first effort to field a full spectrum of CBRN installation protection capabilities designed as a family-of-systems (FoS) to military installations and DOD-owned or leased facilities. The JPM Guardian plans to procure Government and Commercial-Off-The-Shelf (GOTS/COTS) systems designed to meet the operational requirements as identified in the Urgent Requirements Capabilities Document (URCD), October 14, 2003.

The IPP is designed to fill a critical gap in an installation's ability to react to a CBRN incident. This program provides DOD prioritized installations with an integrated CBRN detection, identification, warning, protection and response capability to reduce casualties, maintain critical missions, and effectively restore essential operations. JPM Guardian has an assigned mission to:

- Provide an effective CBRN detection, identification, warning, protection and response system for installation protection.
- Provide a CBRN capability that will allow for rapid restoration of critical missions.
- Protect DOD civilians, contractors, and other persons working or living on U.S. military installations and facilities from a WMD event.

The program is structured using a spiral acquisition strategy to expedite procurement and fielding. Technical risk will be reduced by focusing on mature GOTS/COTS technologies and products. This FoS package will be fielded as a single, integrated system designed to meet the specific needs of the installation. The design will stress flexibility and the capability for future technology insertion.

The Army Emergency First Responder Program (AEFRP) provides enhanced emergency response capability to select Army installations. This program provided upgraded first responder capability to 20 Army installations in FY05 and will provide additional capability to 14 installations in FY06. Capabilities include improved personnel protection, CBR detection and survey systems, individual decontamination as well as improved concept of operations and tactics, techniques and procedures. This program is executed in concert with the Installation Protection Program ensuring system interoperability and compatibility across Army installations.

Among the significant changes to the future strategic environment, proliferation of WMD is recognized as a principal asymmetric threat capable of providing an adversary military advantage to neutralize overwhelming conventional superiority. Having an effective CBRN defense is a necessary component of any defense strategy that seeks to demonstrate to the adversary that use of WMD will not gain the advantage sought. Modernizing the force while conducting a robust S&T effort is critical to preventing technological surprise from new CB agents or different employment means. Recapitalizing and maintaining the current force is necessary to enable transformation and mitigates risk by extending the useful life of current systems within fiscal constraints. This modernization plan assures a disciplined approach to meeting mission-based requirements and secures orderly change as we transition to the future force.

Annex H

CBRN Defense Logistics Readiness Data

H.1 BREAKOUT OF SERVICE WAR REQUIREMENTS, STOCKS ON-HAND, AND PLANNED ACQUISITIONS

Tables H-1 through ***H-5*** display CBRN defense equipment Total Service Requirements, 1-4-2-1 Requirements, FY05 stocks on-hand quantities (as of 30 September 2005), and FY06–07 planned procurements for each of the four Services and the Defense Logistics Agency (DLA). Total Service Requirements and 1-4-2-1 Requirements are based on the results of the Combating WMD Enhanced Planning Process (EPP) study for jointly funded end items and consumables, and on Service recommendations for legacy end items and other consumables bought with Service O&S funds. Requirements for jointly funded items that were specified by an individual Service are identified in the tables. The Services will develop new consumables requirements from the results of the *Joint Chemical and Biological Defense Expendable Equipment Combat Consumption* (E2C2) study to meet the operational needs of the 1-4-2-1 force planning construct. Until the E2C2 study is complete, requirements developed from previous models have become outdated and are not consistent with the 1-4-2-1 construct. While new consumable requirements are being modeled and validated, numerical requirements not specifically identified by the Services will not be listed in this annex.

In the tables, CBRN defense items listed under "**NOMENCLATURE**" are currently fielded in the Services. The "**STOCKS ON-HAND**" represents the total of all serviceable CBRN defense materiel available in each of the Services (stocks positioned with troops, stocks in the supply system and stocks stored in depots/facilities, both peacetime stores and war reserve) minus any medical consumable that has been issued to individual service members (this materiel is considered dispensed and is no longer visible in the supply system). This number represents only those items physically "on-hand". Quantities for which a Service or agency has submitted a funded requisition or purchase order in FY05, but has not received the requisitioned items are included in FY06. Finally, the quantities depicted as "**PROJECTED DUE-IN**" are quantities the Services plan to buy to replace consumption of CBRN defense assets (to include training use and shelf-life expiration), and to buy wartime sustainment stocks. These numbers are based on major command estimates of requirements. Actual procurements are contained within the On-Hand Column. "**TOTAL SERVICE REQUIREMENTS**" and "**1-4-2-1 REQUIREMENTS**" are based on the results of the Combating WMD EPP study unless otherwise specified by the Service.

Table H-1a. Army Logistics Readiness Data – Non-Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN					
					FY06	FY07	FY08	FY09	FY10	FY11
INDIVIDUAL PROTECTION COMMODITY AREA										
CB MASK										
MASK, CB, M40/M40A1	4240-01-258-0061-63 4240-01-370-3821/3/4	629,490		108,823 452,894	50,067					
MASK, M42A2, TANK	4240-01-413-4100-02			24,079						
MASK, M43, APACHE	4240-01-208-6966-69			108						
	4240-01-265-2679			37						
MASK, M45, AVIATOR	4240-01-414-4034-35/-4051-52			10,731	7,768	2,000	2,000	1,000	500	
MASK, M45, LAND WARRIOR	4240-01-447-6987-9, 8967			7,594	15,212	0	1,000	0	500	500
MASK, M48, APACHE	4240-01-386-0198/-4686/-0201/-0207			2,049						
MISC PROTECTION										
PATS, M41	4240-01-365-8241	10,841	8,412	4,951	181					
CONTAMINATION AVOIDANCE COMMODITY AREA										
NUCLEAR DETECTION EQUIPMENT										
AN/PDR-75	6665-01-211-4217	10,041	6,932	7,823		261	206	206	0	0
AN/PDR-77	6665-01-347-6100	2,037	622	1,443						
AN/UDR-13	6665-01-407-1237	71,152	50,568	48,202	652	2,251	1,731	1,721	0	0
AN/VDR-2	6665-01-222-1425	60,061	41,662	45,132	2,400	1,841	1,214	1,231	0	0
IM-9	6665-01-241-3844 6665-00-243-8199 6665-00-705-6068	3,611	3,239	1,918						
IM-93	6665-01-330-7520 6665-00-752-7759	36,725	35,492	32,132						
PP-1578	6665-00-542-1177	9,181	8,873	8,262						
BIOLOGICAL DETECTION EQUIPMENT										
BIDS, M31A1	6665-01-436-2309	930	777	77						
JBAIDS	NOT ASSIGNED	126	91	0	25	58				
JBPDS (MOBILE)	6665-01-452-8643	1,200	1,146	98						
CHEMICAL DETECTION EQUIPMENT										
ACADA, M22	6665-01-438-6963	46,527	33,103	30,485		1,841	1,214	1,231	0	0
ALARM, CAA, M8A1	6665-01-105-5623	19,166	16,023	13,970						
ALARM, M42										
CAM/ICAM	6665-01-357-8502	27,190	19,966	24,101		1,005	1,080	984	0	0
	6665-01-199-4153			3,041						
JWARN	NOT ASSIGNED	72,788	51,465							
MICAD	NOT ASSIGNED	352	111	111						
M21 RSCAAL	6665-01-324-6637			167						
NBCRS, M93A1	6665-01-372-1303			111						
STRYKER NBCRV	2320-01-481-8579	411	348	0	17	0	9	4		

Table H-1a. Army Logistics Readiness Data - Non-Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN					
					FY06	FY07	FY08	FY09	FY10	FY11
DECONTAMINATION COMMODITY AREA										
DECON APPAR, PDDA, M12A1	4230-00-926-9488	952		236						
A/E32U-8 SANATOR	4230-01-150-8660			24						
L/WT DEC SYS, M17A3	4230-01-346-3122	6,388	6,388	430						
COLLECTIVE PROTECTION COMMODITY AREA										
CHATH, AIR HANDLER	4240-01-423-0915									
CP DEPMEDS	5410-01-479-9727/9730	23	12	2	2					
SHELTER, CB PROTECT	5410-01-441-8054	1,259	1,035	26	20	6	20	39	38	39
SHELTER, CP, M20/M20A1	4240-01-166-2254/4240-01-330-7806	3,143		101	637	408	409	444	408	412
MEDICAL COMMODITY AREA										
LITTER, DECONTAMINABLE	6530-01-380-7309			10,205						

Table H-1b. Army Logistics Readiness Data – Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
INDIVIDUAL PROTECTION COMMODITY AREA						
OVERGARMENTS						
CHEM PROT UNDERGARMENT TOP	8415-01-363-8692-00			26,978	5,048	
CPU DRAWERS	8415-01-363-8683-91			24,848	9,535	
JSLIST OVERGARMENTS *		5,195,302	2,016,183			
Woodland Coat	SEE TABLE H-5			187,224	7,281	
Woodland Trousers	SEE TABLE H-5			257,481	6,431	
Desert Coat	SEE TABLE H-5			210,504	24,132	
Desert Trousers	SEE TABLE H-5			211,204	22,323	
SCALP (TAN)	8415-01-333-0987-89			6,944		
SCALP (GREEN)	8415-01-364-3320-22			3,554	30	
SUIT, CP CAMO (BDOs)	8415-01-137-1700-07			98,876	44	
OVERBOOTS/GLOVES						
JLIST MULO	8430-01-464-9453-84					
BLK/GRN VINYL O/BOOTS	8430-01-317-3374-85			393,230	45,045	
	8430-01-049-0878-87			16,353	36	
CP FOOT COVERS	8430-01-021-5978			3,543		
CP GLOVES 7 MIL	8415-01-138-2501-04			54,088	154	
CP GLOVES 14 MIL	8415-01-138-2497-00			101,755	1,941	
CP GLOVES 25 MIL	8415-01-033-3517-20			142,041	8,755	
	8415-01-144-1862			238,112		
MISC PROTECTION						
2D SKIN, M40 SERIES	4240-01-413-1540-43			329,086	82,292	70,000
BATTERY, BA-5800 (PRO MASK)	6135-01-440-7774			2,904		
CP HELMET COVER	8415-01-111-9028			527,273	5,834	
FILTER CAN, C2A1	4240-01-361-1319			1,108,696	1,886,402	563,000
HOOD, M40A1 (QUICK DOFF)	4240-01-376-3152	629,490		600,459	130,916	
CONTAMINATION AVOIDANCE COMMODITY AREA						
CHEMICAL DETECTION EQUIPMENT						
BATTERY, ACADA BA-5590	6135-01-036-3495			10,562	5,210	
BATTERY, BA-3517	6135-00-450-3528			745	5	
BATTERY, ICAM BA-5800	6665-99-760-9742			11,134	1,039	
DET KIT, M256A1 (Boxes of 10 tickets)	6665-01-133-4964			47,745	36,617	26,700
DET PAPER, M8 (Indiv. Books)	6665-00-050-8529			927,061	179,348	357,000
DET PAPER, M9 (Indiv. Rolls)	6665-01-226-5589			890,102	231,706	224,000
MAINT KIT, M312	5180-01-462-7469			2,300		
MAINT KIT, M293	5180-01-379-6409			309	110	
MAINT KIT, M273	5180-01-108-1729			795	1	
NBC MARK SET, M274	9905-12-124-5955			18,675	2,247	1,890
WATER TEST KIT, M272	6665-01-134-0885			7,490	1,745	1,711
BIOLOGICAL DETECTION EQUIPMENT						
HAND HELD ASSAY	6665-01-504-8534			9,565	24,080	

Table H-1b. Army Logistics Readiness Data - Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
DECONTAMINATION COMMODITY AREA						
DECON KIT, M291 (Box of 20)	6850-01-276-1905			115,114	36,820	41,000
DECON KIT, M295 (Box of 20)	6850-01-357-8456			175,177	1,065	
NITROGEN CYLINDERS	4230-00-775-7541			29,441		
SORBENT DECON SYSTEM	4230-01-466-9095			338,605	1,104	1,340
STB, 50 LB	6850-00-297-6653			10,174		
COLLECTIVE PROTECTION COMMODITY AREA						
FILTER, CP, M12A2 (M14 GPFU)	4240-01-365-0981			14,590		
FILTER, CP, M13 SERIES (M14 GPFU)	4240-00-368-6291			21,747	4	
FILTER, CP, M18A1 (M13 GPFU0	4240-01-365-0982			21,386	2,894	3,877
FILTER, CP, M18	4240-00-828-3952			426		
FILTER, CP, M19	4240-00-866-1825			25,065		
FILTER, GP, M48A1	4240-01-363-1311			13,710	3,432	3,493
M98 FILTER SET (M59, M56, SHIPBOARD)	4240-01-369-6533			225	7,814	5,440
M28 Liner, End Section	4240-01-330-8882			37	71	26
M28 Liner, End Section, Type II	4240-01-461-5983			3		
M28 Liner, Center Section	4240-01-330-8884			114	137	47
M28 Liner, Center Section, Type II	4240-01-460-9058			33		
M28 Liner, Vestibule	4240-01-330-8891			11	226	127
M28 Liner, Vestibule, Type II	4240-01-460-9059			12		
M28 Liner, ISO Adapter	4240-01-330-8890			27	42	33
M28 Liner, ISO Adapter, Type II	4240-01-460-9056					
MEDICAL COMMODITY AREA						
2-PAM CHLORIDE AUTOINJ	6505-01-125-3248			1,035,303	22,652	22,325
ANTID TREAT NERVE AGENT AUT	6505-01-362-7427			537,944	381,603	381,523
ATROPINE AUTOINJ	6505-00-926-9083			1,583,318	217,088	214,550
CANA AUTOINJ	6505-01-274-0951			1,248,389	80,759	80,610
DIAZEPAM INJECTOR	6505-01-505-3476			95,265		
NAAK, MKI	6505-01-174-9919			686,262		
PYRIDOSTIGMINE TAB	6505-01-178-7903			235,601	31,965	31,965
SODIUM NITRITE INJ (300 MG) KIT	6505-01-206-6009			1,409		
SODIUM THIOSULFATE INJ (12.5 G) KIT	6505-01-206-6010			1,242		
SODIUM THIOSULFATE INJ (50 ML AMPULE)	6505-01-334-8781			38		
ATROPINE 1MG/ML 1 ML VIAL, 25s	6505-00-957-8089			61		
ATROPINE 0.4MG/ML 20ML VIAL, 25s	6505-01-505-4077			175		
ATROPINE 2MG/ML 25ML VIAL	6505-00-299-9673					
POTASSIUM IODIDE TABS 14's BTL	6505-01-116-8198			5,621		
POTASSIUM IODIDE TABS 14's IS	6505-01-496-4916			298,235		
PATIENT WRAPS	6530-01-383-6260			356		

Table H-1b. Army Logistics Readiness Data – Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
SERPACWA	6505-01-483-7162			313,085		
ATROPINE SULFATE AEROSOL	6545-01-332-1281			6,147		
OTHER TREATMENTS **						
CIPROFLOXACIN (500 mg tabs 50s)	6505-01-272-2385			9,129		
(500 mg tabs 100 IS)	6505-01-273-8650			37,157	1,478	1,478
(500 mg tabs 100s)	6505-01-333-4154			1,393	222	209
(500 mg tabs 10 ISs)	6505-01-491-6143			36,816		
(500 mg tabs 30s)	6505-01-529-6640			11,832		
(500 mg tabs 30 IS)	6505-01-491-2834			25,540		
DOXYCYCLINE CAPS (100 mg tabs 500s)	6505-01-153-4335			40,373		
(100 mg tabs 30s)	6505-01-491-5506			444,888	62,889	62,889
(100 mg tabs 100s)	6505-01-505-0146			84,407		
ANTIDOTE TREATMENT KIT, CYANIDE	6505-01-143-4641			1,564		
	6505-01-457-8901			10,882	2,271	2,242
INDIVIDUAL GUIDE TO MBCDM	7610-01-492-7703			898,580		

* Requirements are for all protective overgarments
** The unit of measure on Ciprofloxacin and Doxycycline is “Bottles/Packages”

Table H-2a. Air Force Logistics Readiness Data - Non-Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN					
					FY06	FY07	FY08	FY09	FY10	FY11
INDIVIDUAL PROTECTION COMMODITY AREA										
CB MASK										
MASK, AERP	8475-01-339-9782(S)	13,288		12,757	929	183	101	91	88	86
MASK, M45, AVIATOR	4240-01-414-4034/5, -4051/2	187		0	176					
MASK, M45, LAND WARRIOR	4240-01-447-6988/6989									
MASK, MCU-2/P,	4240-01-415-4239-41 ‡	657,759		583,911	4,752	2	120	1	8	0
MASK, MCU-2A/P	4240-01-284-3615-17									
MASK, MCU-2A/P (WR) USAF	4240-01-327-3299-01	15								
MISC PROTECTION										
PATS, M41	4240-01-365-8241			471						
MASK COMM AMPLIFIER M7	5996-01-381-9012	160		135						
JSMLT	NOT ASSIGNED	1,312	741							
CONTAMINATION AVOIDANCE COMMODITY AREA										
NUCLEAR DETECTION EQUIPMENT										
ADM 300 - A KIT	6665-01-363-6213NW			122						
- B KIT	6665-01-342-7747NW			721						
- C KIT	6665-01-320-4712NW			698						
- E KIT	6665-01-426-5071NW			261						
BIOLOGICAL DETECTION EQUIPMENT										
JBAIDS	NOT ASSIGNED	332	46	0	59	32				
JBPDS (MOBILE)	6665-01-452-8643	734	360							
JBPDS (FIXED)	6665-01-453-5385	93	77							
CHEMICAL DETECTION EQUIPMENT										
ACADA, M22	6665-01-438-6963	3,521	1,914	3,521						
ALARM, CAA, M8A1	6665-01-105-5623			4						
CAM/ICAM	6665-01-357-8502	1,960	1,436	1,960						
	6665-01-199-4153									
JWARN	NOT ASSIGNED	1,232	1,073	1,232						
MICAD	NOT ASSIGNED									
M90 CHEM ALARM	6665-01-408-5108									
DECONTAMINATION COMMODITY AREA										
L/WT DEC SYS, M17A2	4230-01-349-1778	324								
L/WT DEC SYS, M17A3	4230-01-346-3122									
COLLECTIVE PROTECTION COMMODITY AREA										
CP EMEDS	NOT ASSIGNED	21	16							
MEDICAL COMMODITY AREA										
LITTER, DECONTAMINABLE	6530-01-380-7309			1,850						

‡ Total Service Requirement and FY05 On-Hand provided by JTAVRW, as of 17 October 2005

Table H-2b. Air Force Logistics Readiness Data – Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
INDIVIDUAL PROTECTION COMMODITY AREA						
OVERGARMENTS						
AIRCREWMAN CAPE	8415-01-040-9018	93,133		111,787	2,794	1,788
JSLIST OVERGARMENTS		1,444,001	1,444,001			
Woodland Coat	SEE TABLE H-5 ‡	946,832		637,520	77,858	99,584
Woodland Trousers	SEE TABLE H-5 ‡	966,259		633,897	81,732	105,310
Desert Coat	SEE TABLE H-5 ‡	838,134		407,441	6,790	78,291
Desert Trousers	SEE TABLE H-5 ‡	837,619		447,130	23,176	87,205
SUIT, AIRCREW, CWU-66/77P	8475-01-328-3434-57	52,239		50,171	7,997	966
SUIT, CP CAMO (BDO)	8415-01-137-1700-07 ‡	534,734		416,082	116,525	83,712
SUIT, CP CAMO-DESERT 3 clr	8415-00-327-5347-53 ‡	57,963		43,889	22,358	1,739
SUIT, CP CAMO-DESERT 6 clr	8415-01-324-3084-91 ‡	0		70	87	2
OVERBOOTS/GLOVES						
JLIST MULO	8430-01-464-9453-84			19,880		
BLK/GRN VINYL O/BOOTS BVO	8430-01-317-3374-85 ‡	1,926,342		1,050,436	108,607	91,988
	8430-01-450-0357-60 ‡	114,220		126,120	13,104	5,287
CP GLOVES 7 MIL	8415-01-138-2501-04 ‡	101,716		67,599	7,073	4,562
CP GLOVES 14 MIL	8415-01-138-2497-00 ‡	3,620,316		2,082,996	507,353	129,521
CP GLOVES 25 MIL	8415-01-033-3517-20 ‡	0		0		
DISP FOOTWEAR COVER	8430-00-580-1205-06	82,281		87,835	2,735	755
GLOVE INSERTS	8415-00-782-2809 (S)	51,126		68,266	871	571
MISC PROTECTION						
FILTER CAN, C2/C2A1	4240-01-119-2315 ‡	2,095,997		1,049,112	11,538	2,194
	4240-01-361-1319 ‡	1,664,833		1,636,491		
FILTER ELEMENT, M13A2	4240-00-165-5026	8,712		8,563	1,796	274
HOOD, MCU-2/P	4240-01-189-9423 ‡	1,725,929		2,233,778	8,590	19,432
HOOD, M45, LAND WARRIOR	4240-01-441-0553 ‡	0		0		
SECOND SKIN, MCU-2	NOT ASSIGNED	345,856	253,385	168,249	0	0
CONTAMINATION AVOIDANCE COMMODITY AREA						
CHEMICAL DETECTION EQUIPMENT						
DET KIT, M256A1	6665-01-133-4964 ‡	0		0	1,558	
DET PAPER, M8	6665-00-050-8529 ‡	1,012,051		1,779,248	1,647	85
DET PAPER, M9	6665-01-049-8982					
	6665-01-226-5589 ‡	598,176		705,273	50,999	128,637
DECONTAMINATION COMMODITY AREA						
DECON KIT, M291 (Box of 20)	6850-01-276-1905 ‡	1,123,857		852,021	102,079	73,897
DECON KIT, M295 (Box of 20)	6850-01-357-8456 ‡	1,112,076		1,097,939	413	170
SODIUM HYPOCHLORITE	6810-00-598-7316					
SORBENT DECON SYSTEM	4230-01-466-9095	14,065				
STB, 50 LB	6850-00-297-6653					

Table H-2b. Air Force Logistics Readiness Data - Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
MEDICAL COMMODITY AREA						
2-PAM CHLORIDE AUTOINJ	6505-01-125-3248			669,422		
ANTID TREAT NERVE AGENT AUT	6505-01-362-7427			68,081		
ATROPINE AUTOINJ	6505-00-926-9083			576,950		
CANA AUTOINJ	6505-01-274-0951			287,815		
NAAK, MKI	6505-01-174-9919			0		
PYRIDOSTIGMINE TAB	6505-01-178-7903			121,210		
ANTIDOTE TREATMENT KIT, CYANIDE	6505-01-143-4641			9		
ATROPINE 1MG/ML 1ML VIAL, 25s	6505-00-957-8089			25,633		
ATROPINE 2MG/ML 25ML VIAL	6505-00-299-9673			0		
POTASSIUM IODIDE TABS 14's BTL	6505-01-116-8198			100		
POTASSIUM IODIDE TABS 14's IS	6505-01-496-4916			0		
OTHER TREATMENTS *						
CIPROFLOXACIN 500 MG TAB 100s IS	6505-01-273-8650			191,466		
500 MG TAB 100s BTL	6505-01-333-4154			32,954		
DOXYCYCLINE, 100 MG CAPS,500s	6505-00-009-5063			23		
100 MG TABS, 500s	6505-01-153-4335			2,881		
100 MG TABS, 50s	6505-01-095-4175			84,892		
INDIVIDUAL GUIDE TO MBCDM	7610-01-492-7703					

‡ Total Service Requirement and FY05 On-Hand provided by JTAVRW, as of 17 October 2005
* The unit of measure on Ciprofloxacin and Doxycycline is "Bottles/Packages"

Table H-3a. Navy Logistics Readiness Data – Non-Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN					
					FY06	FY07	FY08	FY09	FY10	FY11
INDIVIDUAL PROTECTION COMMODITY AREA										
CB MASK										
MASK, A/P 22P-14(V)	NOT ASSIGNED			3,629						
MASK, CB, M40A1	4240-01-370-3821-23	26,400		13,397						
MASK, M45, LAND WARRIOR	4240-01-447-6987/89			2,562						
MASK, M45, AVIATOR	4240-01-414-4034-35/-4051-52			44						
MASK, MCU-2/P	4240-01-175-3443-45 4240-01-497-7467 (S) 4240-01-497-7783 (M) 4240-01-498-1189 (L)			47,179 2,611 5,656 2,130						
MASK, MCU-2A/P	4240-01-284-3615-17			11,791						
MASK, MCU-2A/P USN	4240-01-415-4239/41			52,825						
MISC PROTECTION										
TDA-99M	6665-01-450-3022	793	365	355						
JSMLT	NOT ASSIGNED	883	319							
CONTAMINATION AVOIDANCE COMMODITY AREA										
NUCLEAR DETECTION EQUIPMENT										
AN/PDR-65	6665-01-279-7516	564		900						
CP-95	6665-00-526-8645	1,164		1,336						
PP-4276	6665-00-489-3106	1,123		1,535						
IM-143	6665-00-764-6395	17,389		17,418						
DT-60	6665-00-978-9637	218,176		220,538						
AN/PDQ-1 MFR	6665-01-435-0127	2,865		4,600	476	337	884			
OA-9449/PDQ	6665-01-435-0131	2,865		4,474						
BIOLOGICAL DETECTION EQUIPMENT										
DRY FILTER UNIT	6665-01-523-3927			683						
JBAIDS	NOT ASSIGNED	71	26	0	5	45	14			
JBPDS (SHIP)	6665-01-452-9645	145	110	2	10	11	11	16	15	24
CHEMICAL DETECTION EQUIPMENT										
ACADA, M22	6665-01-438-6963	451	154	450						
ACADA, SHIPBOARD	6665-01-484-7823			0						
ALARM, CAA, M8A1	6665-01-105-5623			0						
CAPDS	6665-01-294-2556			7						
CAM/ICAM	6665-01-199-4153	1,009	364	1,252		10				
CWDD, AN/KAS-1A	5855-01-352-7033			725						
IMP POINT DETECTION SYSTEM	6665-LL-HAL-5532			229	25					
JCAD	NOT ASSIGNED	7494								386
DECONTAMINATION COMMODITY AREA										
L/WT DEC SYS M17A3 DIESEL	4230-01-346-3122	*412*		5						

Table H-3a. Navy Logistics Readiness Data - Non-Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN					
					FY06	FY07	FY08	FY09	FY10	FY11
COLLECTIVE PROTECTION COMMODITY AREA										
SHELTER, CP, M20/M20A1	4240-01-166-2254			16						
SHIP CPS BACKFIT	NOT ASSIGNED	51	40							
JOINT EXPEDITION-ARY CP SHELTER	4240-01-346-2564	2,952	1,065							
MEDICAL COMMODITY AREA										
LITTER, DECONTAMINABLE	6530-01-380-7309			36						

Table H-3b. Navy Logistics Readiness Data – Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
INDIVIDUAL PROTECTION COMMODITY AREA						
OVERGARMENTS						
APRON, TAP M-2	8415-00-281-7813-16			353		
JSLIST OVERGARMENTS *		1,139,000	477,375			
Woodland Coat	SEE TABLE H-5			211,409		
Woodland Trousers	SEE TABLE H-5			190,677		
Desert Coat	SEE TABLE H-5			346,157		
Desert Trousers	SEE TABLE H-5			324,108		
SUIT, CP, OG MK3	8415-01-214-8289-92			3,730		
SUIT, CP, SARATOGA	8415-01-333-7573-76			15,734		
SUIT, CP SARATOGA-DESERT	8415-01-333-7577-80			24		
UNDERGARMENTS						
CMU-34 UNDERSHIRTS	8415-01-490-1900/17			27,556		
CMU-35 DRAWERS	8415-01-490-4368/71/72/74/76-84			28,215		
OVERBOOTS/GLOVES						
JSLIST MULO	8430-01-464-9453-84					
AIRBOSS LTWEIGHT OVERBOOT	8430-99-869-0395/9			238,069		
BLK/GRN VINYL O/BOOTS BVO	8430-01-317-3374-85			78,213		
	8430-01-450-0357-60			0		
	8340-01-496-0668			0		
GVO	8430-01-049-0878-87			46		
CP FOOTWEAR COVERS	8430-01-118-8172			27,621		
	8430-01-021-5978			79,544		
CP GLOVES 7 MIL	8415-01-138-2501-04			1,793		
CP GLOVES 14 MIL	8415-01-138-2497-00			43,178		
CP GLOVES 25 MIL	8415-01-033-3517-20			239,878		
AIRBOSS GLOVE	8415-21-921-2167/72			21,034		
CP SOCKS	8415-01-040-3169			67,833		
DISP FOOTWEAR COVER	8430-00-580-1205-06			11,611		
	8430-00-591-1359			3,017		
GLOVE INSERTS	8415-00-782-2809			383,755		
CP GLOVE INSERTS	8415-01-138-2494-96			60,089		
MISC PROTECTION						
CP HELMET COVER	8415-01-111-9028					
FILTER CAN, C2/C2A1	4240-01-119-2315			149,816		
	4240-01-361-1319			476,747		
	4240-01-871-7842			2,772		
HOOD, MCU-2/P	4240-01-189-9423			772		
HOOD, M40/42 (ONE-PIECE)	4240-01-260-8723					
HOOD, M40A1 (QUICK DOFF)	4240-01-376-3152			541		
SECOND SKIN, MCU-2	NOT ASSIGNED	530,250	190,983	176,000		

Table H-3b. Navy Logistics Readiness Data - Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
CONTAMINATION AVOIDANCE COMMODITY AREA						
CHEMICAL DETECTION EQUIPMENT						
DET KIT, M256A1	6665-01-133-4964			7,036		
DET PAPER, M8	6665-00-050-8529			111,537		
DET PAPER, M9	6665-01-226-5589			43,389		
NBC MARK SET, M274	9905-12-124-5955			78		
TUBE PHOSGENE	6665-01-010-7965			636		
WATER TEST KIT, M272	6665-01-134-0885			149		
BIOLOGICAL DETECTION EQUIPMENT						
HAND HELD ASSAYS	6665-01-504-8534			12,000	12,000	
CARRIER BOX ASSEMBLY JBPDS HHA	6665-01-512-7010			110	100	760
LIQUID CONSUMABLE MISSION PACK JBPDS	6665-01-512-4430			110	114	946
DRY COLLECTION KIT JBPDS	6665-01-520-7072			50	37	110
DECONTAMINATION COMMODITY AREA						
CALCIUM HYPOCHLORITE (6 oz)	6810-00-255-0471					
CALCIUM HYPOCHLORITE (100 lb)	6810-12-132-2439			443		
DECON KIT, M291 (Box of 20)	6850-01-276-1905			181,069		
DECON KIT, M295 (Box of 20)	6850-01-357-8456			106,889		
SODIUM HYPOCHLORITE	6810-00-598-7316			202		
STB, 50 LB	6850-00-297-6653			821		
COLLECTIVE PROTECTION COMMODITY AREA						
FILTER, GP, M48A1	4240-01-363-1311			124	91	104
FILTER SET, SHIPBOARD (M98)	4240-01-369-6533			0	869	103
PRE-FILTER, SHIPBOARD CPE	4240-01-474-8855			27	4,648	4,648
PRE-FILTER, SHIPBOARD CPS	4130-01-474-8851			54	7,344	7,344
LP FILTER, 1000 CFM	4240-01-347-6190			0	430	294
MEDICAL COMMODITY AREA						
2-PAM CHLORIDE AUTOINJ	6505-01-125-3248			893,841		
ANTID TREAT NERVE AG AUTOINJ	6505-01-362-7427			136		
ATROPINE AUTOINJ	6505-00-926-9083			859,979		
CANA AUTOINJ	6505-01-274-0951			236,050		
NAAK, MKI	6505-01-174-9919			27,330		
PYRIDOSTIGMINE TAB	6505-01-178-7903			39,562		
ANTIDOTE TREATMENT KIT, CYANIDE	6505-01-143-4641			6,725		
SODIUM NITRITE INJ (300 MG) KIT	6505-01-206-6009			600		
SODIUM THIOSULFATE INJ (12.5 G) KIT	6505-01-206-6010			200		
ATROPINE 1MG/ML 1ML VIAL, 25s	6505-00-957-8089			85,994		

Table H-3b. Navy Logistics Readiness Data – Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
ATROPINE 0.4MG/ML 20ML VIAL, 25s	6505-01-505-4077			108		
ATROPINE 2MG/ML 25ML VIAL	6505-00-299-9673			12		
POTASSIUM IODIDE TABS 14's BTL	6505-01-116-8198			85,796		
POTASSIUM IODIDE TABS 14's IS	6505-01-496-4916			3,048		
PATIENT WRAPS	6530-01-383-6260			0		
FRANCISELLA TULARENSIS TARGET #1	6550-01-523-6620				60	
BACILLUS ANTHRACIS TARGET #1	6550-01-523-5948				60	
BACILLUS ANTHRACIS TARGET #2	6550-01-523-5949				30	
YERSINIA PESTIS TARGET #1	6550-01-523-5642				60	
YERSINIA PESTIS TARGET #2	6550-01-523-5936				30	
BRUCELLA MELINTENSIS SPP	6550-01-523-6621				30	
OTHER TREATMENTS **						
CIPROFLOXACIN 500 MG TAB 100s IS	6505-01-273-8650			27,430		
500 MG TAB 100s BTL	6505-01-333-4154			46,858		
DOXYCYCLINE CAPS, 500s	6505-00-009-5063			23,438		
TABS 500s	6505-01-153-4335			1,717		
INDIVIDUAL GUIDE TO MBCDM	7610-01-492-7703			0		

* Requirements are for all protective overgarments
****** The unit of measure on Ciprofloxacin and Doxycycline is “Bottles/Packages”

Table H-4a. Marine Corps Logistics Readiness Data - Non-Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN					
					FY06	FY07	FY08	FY09	FY10	FY11
INDIVIDUAL PROTECTION COMMODITY AREA										
CB MASK										
MASK, CB, M40/M40A1	4240-01-258-0061-63 4240-01-370-3821-23	159,285	N/A	163,803	61,121					
MASK, M42A2, TANK	4240-01-258-0064-66	2,422	N/A	139						
MASK, MCU-2/P, -2A/P	4240-01-284-3615-17	2,551	N/A	0						
JSGPM	NOT ASSIGNED	257,785	257,785	0	22,963	37,508	51,239	36,884	57,176	55,955
JSAM	NOT ASSIGNED	5,264	5,274	0	19	151	386	745	420	133
MISC PROTECTION										
MASK COMM AMPLIFIER M7	5996-01-381-9012	701	N/A	27,432						
PATS, M41	4240-01-365-8241	TBD	N/A	336	3					
JSMLT	NOT ASSIGNED	293	293	0	38	23	24	22	0	0
CONTAMINATION AVOIDANCE COMMODITY AREA										
NUCLEAR DETECTION EQUIPMENT										
AN/PDR-56	6665-00-086-8060	102	N/A	TBD						
AN/PDR-75	6665-01-211-4217	TBD	N/A	924	20					
AN/UDR-13	NOT ASSIGNED	16,500	16,500	0						
AN/VDR-2	6665-01-222-1425	92	N/A	1,841	190					
VEHICLE MOUNT AN/VDR-2	TBD	10	N/A	TBD						
PP-4276	6665-00-489-3106	28	N/A	TBD						
IM-143	6665-00-764-6395	345	N/A	5,529						
DT-236		152,864	N/A	TBD						
BIOLOGICAL DETECTION EQUIPMENT										
JBAIDS	NOT ASSIGNED	19	98	0	38					
DFU	NOT ASSIGNED	40	N/A	TBD						
CHEMICAL DETECTION EQUIPMENT										
ACADA, M22	6665-01-438-6963	622	N/A	746	72					
ACADA, M22 (TIM)	NOT ASSIGNED	783	622	0	15	19	22	22	22	
CAM 1.5	6665-01-359-9006	0	N/A	34						
CAM 2.0	6665-99-725-9996	2,407	N/A	2,683	95					
M21 RSCAAL	6665-01-382-1968	199	N/A	89	50					
NBC RECON SYS, M93	6665-01-372-1303	0	N/A	2						
NBC RECON SYS, M93A1	6665-01-372-2582	10	N/A	8						
JNBCRS (LAV)	NOT ASSIGNED	22	22	22	3	3	3	5	5	2
JCAD	NOT ASSIGNED	15,485	15,485	0	86	731	589	738	721	864
DECONTAMINATION COMMODITY AREA										
DECON APAR, M11	4230-00-720-1618	0	N/A	501						
L/WT DEC SYS, M17A1	4230-01-303-5225	0	NA/	34						
L/WT DEC SYS, M17A3	4230-01-346-3122	0	N/A	101						
HEAVY FUEL DECON	4230-01-492-1540	1,077	N/A	922	19					
JSTDS, SMALL	NOT ASSIGNED	730	730	0						

Table H-4a. Marine Corps Logistics Readiness Data – Non-Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN					
					FY06	FY07	FY08	FY09	FY10	FY11
JSSED	NOT ASSIGNED	106	106	0						
MODELING AND SIMULATION COMMODITY AREA										
JWARN	TBD	217	N/A	TBD						
JWARN IE	NOT ASSIGNED	217	217	0	0	19	146			
JEM	NOT ASSIGNED	149	149	0	105	107				
JOEF	NOT ASSIGNED	149	149	0						
COLLECTIVE PROTECTION COMMODITY AREA										
ICPS (MGPTS) CB Liner	8340-09-000-2480	322	N/A	TBD						
MEDICAL COMMODITY AREA										
LITTER, DECONTAMINABLE	6530-01-380-7309									

Table H-4b. Marine Corps Logistics Readiness Data - Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
INDIVIDUAL PROTECTION COMMODITY AREA						
OVERGARMENTS						
JSLIST OVERGARMENTS *		867,586	867,586		22,106	
Woodland Coat	SEE TABLE H-5			139,943		
Woodland Trousers	SEE TABLE H-5			99,692		
Desert Coat	SEE TABLE H-5			25,655		
Desert Trousers	SEE TABLE H-5			16,026		
M-2 APRON	8415-00-281-7813-16	4,263	N/A	4,985		
SUIT, CP, SARATOGA	8415-01-333-7573-76	0	N/A	256,306		
SUIT, CP SARATOGA-DESERT	8415-01-333-7577-80	0	N/A	8,914		
JPACE (AIR)	NOT ASSIGNED	25,950	25,950	0	5,935	
JPACE (CVC)	NOT ASSIGNED	28,284	28,284	0		
OVERBOOTS/GLOVES						
JLIST MULO	8430-01-464-9453-84	0	N/A	27,491		
BLK/GRN VINYL O/BOOTS BVO	8430-01-317-3374-85	0	N/A	220,970		
	8340-01-450-0357-60	0		0		
	8340-01-496-0668	0		0		
GVO	8430-01-049-0878-87	0	N/A	3,065		
CP FOOT COVERS	8430-01-021-5978	0	N/A	2,784		
AFS	NOT ASSIGNED	872,374	872,374	0		
CP GLOVES 25 MIL	8415-01-033-3517-20	0	N/A	306,399		
JB1GU	NOT ASSIGNED	TBD	TBD	328,121		
JB2GU	NOT ASSIGNED	854,051	854,051	0		
MISC PROTECTION						
2D SKIN, M40 SERIES	4240-01-413-1540-43	TBD	N/A	151,164		
FILTER CAN, C2/C2A1	4240-01-119-2315	0	N/A	61,439		
	4240-01-361-1319	TBD	N/A	789,120		
HOOD, M40	4240-01-376-3152	0	N/A	2,188		
WP BAG, M1A1	TBD	2,424	N/A	58,426		
CONTAMINATION AVOIDANCE COMMODITY AREA						
CHEMICAL DETECTION EQUIPMENT						
BATTERY, M8A1BA-3517	6135-00-450-3528	0	N/A	0		
BATTERY, ICAM BA-5800	6665-99-760-9742	TBD	N/A	3,546		
BATTERY, ACADA BA-5590	6135-01-036-3495	TBD	N/A	1,159		
BATTERY, ACADA BA-5590 B/U	6135-01-438-9450	TBD	N/A	53,139		
DET KIT, M256A1	6665-01-133-4964	6,562	N/A	5,524		
DET PAPER, M8	6665-00-050-8529	TBD	N/A	177,983		
DET PAPER, M9	6665-01-049-8982	0	N/A	713		
	6665-01-226-5589	15,158	N/A	116,563		
NBC MARK SET, M274	9905-12-346-4716	TBD		639		
WATER TEST KIT, M272	6665-01-134-0885	1,972	N/A	1,611		

Table H-4b. Marine Corps Logistics Readiness Data – Consumables

NOMENCLATURE	NSN	TOTAL SERVICE REQUIREMENT	1-4-2-1 REQUIREMENT	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN	
					FY06	FY07
BIOLOGICAL DETECTUIN EQUIPMENT						
HAND HELD ASSAY	NOT ASSIGNED	TBD	N/A	TBD		
DECONTAMINATION COMMODITY AREA						
DECON KIT, M291	6850-01-276-1905	208,744	N/A	24,049		
DECON KIT, M295	6850-01-357-8456	0	N/A	8		
SORBENT DECON SYSTEM	4230-01-466-9095	132,624	N/A	79,076		
JSPDS	NOT ASSIGNED	646,914	646,914	0	54,227	
JSPDS, TRAINING	NOT ASSIGNED	49,547	49,547	0		
STB, 50LB	6850-00-297-6653	0	N/A	1,501		
COLLECTIVE PROTECTION COMMODITY AREA						
FILTER, CP, M12A2 (M14 GPFU)	4240-01-365-0981	TBD	N/A	50		
FILTER, CP, M13 SERIES (M14 GPFU)	4240-00-368-6291	TBD	N/A	52		
FILTER, CP, M18A1	4240-01-365-0982	TBD	N/A	301		
FILTER, CP, M19	4240-00-866-1825	TBD	N/A	146		
FILTER, GP, M48A1	4240-01-363-1311	TBD	N/A	241		
CCCC **MEDICAL COMMODITY AREA**						
2-PAM CHLORIDE AUTOINJ	6505-01-125-3248	TBD		74,577		
ANTID TREAT NERVE AG AUT	6505-01-362-7427			0		
ATROPINE AUTOINJ	6505-00-926-9083	TBD		96,406		
CANA AUTOINJ	6505-01-274-0951	TBD		76,588		
NAAK, MKI	6505-01-174-9919			0		
PYRIDOSTIGMINE TAB	6505-01-178-7903	TBD		3,436		
ATROPINE 1 MG/ML, 1ML VIAL, 25s	6505-00-957-8089			0		
POTASSIUM IODIDE TABS 14S BTL	6505-01-116-8198	TBD		968		
OTHER TREATMENTS						
CIPROFLOXACIN 500 MG TAB 100s IS+	6505-01-273-8650	TBD		327		
500 MG TAB 100s BTL+	6505-01-333-4154	TBD		683		
DOXYCYCLINE CAPS, 500s +	6505-00-009-5063					
DOXYCYCLINE TABS, 100 MG, 500s +	6505-01-153-4335			0		
INDIVIDUAL GUIDE TO MBCDM	7610-01-492-7703					

* Requirements are for all protective overgarments
** Includes Joint Service stocks held for all Services prior to fielding
+ The unit of measure on Ciprofloxacin and Doxycycline is “BOTTLES”

Table H-5. Defense Logistics Agency Logistics Readiness Data - Consumables

NOMENCLATURE	NSN	FY05 STOCKS ON HAND (as of 30 Sept 05)	PROJECTED DUE IN FY06	PROJECTED DUE IN FY07
INDIVIDUAL PROTECTION COMMODITY AREA				
OVERGARMENTS				
CAPE, AIRCREWMAN	8415-01-040-9018	193,008	0	300,000
CHEM PROT UNDERGARMENT TOP	8415-01-363-8692-00	21,180	76,386	76,386
CPU DRAWERS	8415-01-363-8683-91	59,133	42,804	42,804
JSLIST OVERGARMENTS *				
Woodland Coat	8415-01-444-1163/-1169/-1200/38/49/65/70	25,218	506,880	40,000
Woodland Trousers	8415-01-444-1435/39/-1613-/2308/10/25/38	74,536	506,880	40,000
Desert Coat	8415-01-444-5902/05/13/26/-6116/31/38	20,748	1,029,120	60,000
Desert Trousers	8415-01-444-5417/5504/06/-5892/93/98/-5900	26,766	1,029,120	60,000
OVERBOOTS/GLOVES				
BLK/GRN VINYL O/BOOTS	8430-01-450-0357-60	35,945	960,000	960,000
CP GLOVES 7 MIL	8415-01-138-2501-04	119,257	33,307	33,307
CP GLOVES 14 MIL	8415-01-138-2497-00	268,847	271,899	271,899
CP GLOVES 25 MIL	8415-01-033-3517-20	460,155	90,600	90,600
CP GLOVE INSERTS	8415-01-138-2494-96	216,936	162,000	162,000
DISP FOOTWEAR COVER	8430-00-580-1205-06	25,762	25,224	25,224
MISC PROTECTION				
CP HELMET COVER	8415-01-111-9028	113,624	229,740	229,740
CONTAMINATION AVOIDANCE COMMODITY AREA				
CHEMICAL DETECTION EQUIPMENT				
BATTERY, ACADA BA5590	6135-01-438-9450	161,871	82,287	0
BATTERY, BA3517	6135-00-450-3528	21,639	0	0
MAINTENANCE KIT, M293	5180-01-379-6409	1,402	0	0
TUBE, DET, PHOSGENE GAS	6665-01-010-7965	57	97	0
DECONTAMINATION COMMODITY AREA				
CALCIUM HYPOCHLORITE (6 oz)	6810-00-255-0471	5,090	20,585	0
STB, 50 LB	6850-00-297-6653	7,687	39	0
MEDICAL COMMODITY AREA				
2-PAM CHLORIDE, AUTOINJ	6505-01-125-3248	140,000	550,000	550,000
ATROPINE AUTOINJ	6505-00-926-9083	298,000	700,000	700,000
CANA AUTOINJ	6505-01-274-0951	834,000	600,000	600,000
NAAK, MKI	6505-01-174-9919	796,000	800,000	800,000
PYRIDOSTIGMINE TABLETS	6505-01-178-7903	28,616	70,000	70,000
LITTER, DECONTAMINABLE	6530-01-380-7309	2,804	10,000	5,000
ANTIDOTE TREAT KIT, CYANIDE	6505-01-143-4641	0	63	63
	6505-01-457-8901	370	3,500	3,500
CIPROFLOXACIN 500 MG TAB 100s IS+	6505-01-273-8650	3,000	3,000	3,000
500 MG TAB 100s BTL+	6505-01-333-4154	19,727	19,727	19,727
DOXYCYCLINE CAPS, 500s +	6505-00-009-5063	15,520	15,520	15,520
DOXYCYCLINE TABS, 100 MG, 500s +	6505-01-153-4335	11,200	11,200	11,200

* DLA purchases JSLIST overgarments for the Services. Projected Service allocations are included in the individual Service totals.

\+ The unit of measure on Ciprofloxacin and Doxycycline is “Bottles/Packages”

H.2 FIELDED CBRN DEFENSE ITEMS - ISSUES AND CONCERNS

CBRN defense items are generally used in combination to form a system or subsystem for a particular function. Therefore, this report will address items used as a system. These systems are categorized into five functional areas: (1) Contamination Avoidance, (2) Individual Protection, (3) Collective Protection, (4) Decontamination, and (5) Medical.

H.2.1 Contamination Avoidance

Contamination avoidance programs generally include equipment that is used to conduct CBRN agent reconnaissance, detection, and identification. Due to recent type-classification of several programs that are intended to modernize contamination avoidance programs, this area has an unusually high number of developmental programs, as compared to other commodity areas. Many programs will complete their fielding beyond FY05. Thus several systems may appear to be initially low in inventory, but their quantities will improve with continued procurement in coming years.

The number of biological detection devices, to include the Biological Integrated Detection System (BIDS), Dry Filter Unit (DFU), and Joint Portal Shield has historically been low as measured against requirements. Automatic biological agent point detectors and stand-off detectors are currently in development, and will not be deployed in significant numbers prior to FY05. The USAF is fielding an off-the-shelf capability called the Ruggedized Advanced Pathogen Identification Device (RAPID). RAPID is a medical tool used for clinical identification of pathogenic agents within 25 minutes. It is capable of processing up to 32 samples simultaneously. Also, the USAF has limited quantities of the Joint Portal Shield biological networked Sensor Systems. The Marine Corps' current capability consists of a limited number of DFUs and HHAs that were fielded to support Operation Iraqi Freedom (OIF). The Navy is fielding the DFU, which is a commercially available system, thus lowering risks sometimes associated with defense industries. The DFU is an environmental air sampling system designed to be used with biological agent assays and confirmatory laboratories to provide a "Detect to Treat" capability for US Naval forces ashore and afloat. It may be employed for periodic environmental sampling to detect covert releases or may be used to collect air samples from a suspected incident scene. The DFU is a high volume air sampler whose purpose is to collect airborne particulate matter as it is drawn through a 1 micron filter. Used filters are removed from the unit and the residue rinsed into a buffer solution. The filters, solution and other items needed to collect particles and perform presumptive testing are packaged in a consumable DFU kit. The sample solution is analyzed via disposable hand held assays (HHAs) for the detection and identification of biological agents. Training and operational HHAs have a shelf life of one year stored at 70 degrees Fahrenheit, or 3 years if stored at 40 degrees Fahrenheit. Shipboard conditions may not be optimal, increasing risk of insufficient quantities being available. The operational and training HHAs received NSNs and the DFU kit has received an NICN. The Navy has begun bar-coding to better track items and to reduce risk of spoilage.

The Army and Navy are currently fielding JBPDS systems. This system is a point detector that automatically detects, identifies, warns, and collects liquid samples for further analysis. Like the DFU, JBPDS monitors the environment for agents of biological origin. The JBPDS however, automatically collects a liquid sample and inoculates the HHA (within a carrier box assembly) upon the detection of possible agents. The JBPDS automatically reads

the HHA and provides warning to the warfighter with the specific agent identified. Both DFU and JBPDS use liquid consumables and HHAs to process aerosol samples. The HHAs have a shelf life of approximately one year if stored at 70 degrees Fahrenheit, or three years if stored at 40 degrees Fahrenheit.

The combined total of chemical agent detection systems will improve slowly as the M22 Automatic Chemical Agent/Detector (ACADA) replaces the M8A1 Automatic Chemical Agent Alarm.

The M93A1 NBCRS is currently fielded according to schedule. This system adds improved mass spectrometer sampling system along with stand-off chemical vapor detection. Several units continue to use trained reconnaissance personnel in HMMWVs and APCs, thus adding a supplemental capability.

Traditional consumables in this commodity area (M8 and M9 detection paper, M256A1 kits and M272 water test kits) are usually available in sufficient quantities to meet wartime requirements. Some shortages may exist in individual Services, but overall there is little risk. Shelf life concerns may change this projection; this area remains under review.

The Army and Air Force RADIAC programs are expected to meet requirements. The Army National Guard still has a large number of older version RADIACs. These are being replaced by newer variants such as the VDR-2, UDR-13 and PDR-77. The Navy RADIAC Program meets requirements. Replacement of the AN/PDR-27 and AN/PDR-43 with the AN/PDQ-1 (Multi-Function RADIAC) and OA-9449/PDQ (Gamma Beta Probe) is complete. The Marine Corps has sufficient AN/VDR-2s, lacks an Alpha detection capability, and needs to replace its outdated IM-143 Pocket Dosimeters. The Marine Corps is also considering deleting the AN/PDR-75 and DT-236 from the inventory as not operationally suitable to its needs. Overall, RADIACs represent a moderate logistics risk, especially during contingencies.

H.2.2 Individual Protection

Individual protection equipment is designed to protect against CB warfare threat agents, Toxic Industrial Chemicals (TICs), and Toxic Industrial Materials (TIMs). Past Service-unique requirements led to Service-specific procurements and some duplication in capability resulting in the procurement of six different chemical protective overgarments and six different masks. This has caused difficulties in meeting current needs and exacerbated logistics planning.

The Joint Project Manager for Individual Protection (JPM-IP) has organized his Program Office into 5 teams: Surface Protection Ensembles, Aviation Protection Ensembles, Surface Respiratory Protection, Aviation Respiratory Protection and Universal “Common” Individual Protective Equipment (IPE). Fielding of Joint Individual Protection equipment through these teams has begun to resolve many of these former challenges.

H.2.2.1 Surface Protection Ensembles

Garments. The Services are continuing acquisition of the Joint Service Lightweight Integrated Suit Technology (JSLIST) overgarments as a replacement for the Battle Dress Overgarment (BDO) and other chemical protective overgarments. As such, the protective overgarments should be viewed as a system with the older overgarments providing readiness stocks until the end of their service life. The initial JSLIST contracts did not include surge option clauses. Defense Supply Center Philadelphia (DSCP), whose solicitations include the surge option as a requirement, took management of JSLIST in FY98. DLA/DSCP has surge

clauses in current contracts that would bring production up to about 120,000 overgarments per month. However, through bilateral agreement DLA/DSCP contractors began to produce more than 128,000 overgarments per month beginning in April 2003. By examining the year-by-year status of protective overgarments, a number of older overgarments still within service life were added to the number of JSLIST overgarments purchased by that year and matched the total against the requirements.

Combat Vehicle Crewmen (CVC) and aircrews require special protective ensembles to integrate with their weapon systems. To protect armor crewmen from gross liquid contamination when they exit their vehicles, the Services have developed the Suit Contamination Avoidance Liquid Protection (SCALP), which is available in sufficient quantities. The Joint Protective Aircrew Ensemble (JPACE) is scheduled to replace present protective ensembles for both CVC and aircrew personnel.

Gloves. DOD surveillance tests are validating the protective qualities of the existing butyl rubber glove stocks. The status of the Services on-hand inventories has allowed DLA to pursue an Industrial Base Maintenance Contract (IBMC) with both current manufacturers to sustain the industrial base with "War Stopper" funding. The purpose of the IBMC is to maintain the equipment only. The JSLIST Block 1 Glove Upgrade (JB1GU) candidates #508 and #513 are interim replacements for the current butyl rubber gloves and will reduce reliance on them.

Footwear. Chemical Protective Footwear Covers, also known as the "fishtail", have been out of production for several years. Their shortages are supplemented by the Black/Green Vinyl Overboot (BVO/GVO), which is the interim chemical protective footwear until the JSLIST MULO boots have been completely fielded. Because the GVO's primary purpose is not chemical protection, current contracts do not include surge option clauses. Again, one should view protective footwear as a system with older GVOs providing readiness stocks until the MULO or suitable boot is fielded in sufficient quantities. Currently, the total DOD inventory shows adequate quantities of protective footwear, resulting in low risk assessment. The Air Force has plans to continue use of current GVOs. The USMC and the Navy are the only services reporting a shortage of footwear, but DLA can fill the shortfall for shore units. The JRO-CBRN Defense has validated a U.S. Navy urgent requirement for chemical protective footwear with a reduced volume that meets shipboard storage constraints. Existing chemical protective footwear volume is too large for shipboard storage spaces and the Chemical Protective Footwear Cover is no longer in production. The Navy has identified a commercial lightweight overboot (Airboss Lightweight Overboot) and has authorized its use by ships requiring replacements for the fishtail, and for new construction ships pending fielding of the Alternative Footwear Solution (AFS). 175,000 pairs of the Airboss Lightweight Overboot will be fielded to the U.S. Navy during FY04 and FY05.

Other: The Chemical Protective Helmet Cover is intended to provide Chem/Bio protection for the standard helmet. It is a one-piece configuration made of butyl coated nylon cloth and gathered at the opening by elastic webbing enclosed in the hem.

H.2.2.2 Aviation Protection Ensembles

Services usually have sufficient numbers of aircrew overgarments to meet minimum requirements, given the smaller total requirements for aircrews (relative to ground troops). An exception is the Chemical Protective Undercoverall, which is now obsolete. For the USAF, it is

replaced by the CWU-66/77P Aircrew Chemical Protective Suit. The USN and USMC aircrew are now using the CMU-34/P undershirt and CMU-35/P drawers (formerly known as Navy modified Chemical Protective Undergarment) in conjunction with the flyer's Summer Coverall for adequate protection.

Disposable Footwear Covers are worn over the flyer's boots. They protect the aircrew member from contamination en route between the shelter and the aircraft. They must be removed before entering the aircraft. The footwear covers come in three sizes: medium, large, and extra large. The Aircrew Cape is a large, clear, disposable, 4-mil polyethylene bag worn over the body. The cape protects the aircrew member from liquid contamination en route between the shelter and the aircraft and must be removed before entering the aircraft. It is available in one size. The JPACE is scheduled to replace existing aircrew ensembles for both fixed and rotary wing aircrew personnel.

H.2.2.3 Surface Respiratory Protection

The Services continue modernizing their chemical protective mask inventories. Different versions of the protective mask were developed to meet the requirements of different military occupational specialties (*e.g.*, air crew, tank crew, *etc.*). For the Army, the M40 (for generic use) and M42 (for armor crew members) series masks replace the M17(s) and M25(s)-series masks, respectively. For the Marine Corps, the M40A1 mask has replaced the M42, M17(s), and M25-series masks. Some Navy shore activities and Navy Expeditionary Air squadrons are also using the M40 series masks.

In order to provide complete protection to our forces on the contaminated battlefield, particularly from liquid chemical agents, protective hoods and helmet covers are required as part of the individual protective ensemble. The protective hood for the M40 is usually rated as low risk. The MCU-2/P hood also typically has abundant inventory. Second skins for the MCU-2/P and MCU-2A/P are in development and were issued beginning in FY04. Protective hoods for the M17-series, M24, and M25A1 masks are also in good supply, and thus are not a readiness issue. These masks are leaving the inventory, however. Historically, the Chemical Protective Helmet Cover has also been available in sufficient quantities. The Joint Service General Purpose Mask (JSGPM) will replace the M40/M42 series and the MCU-2/P series of protective mask.

H.2.2.4 Aviation Respiratory Protection

The M43-Type I mask was designed to be used by Apache equipped units. It is being replaced by the M48 (Apache) series mask. The M45 will replace the M24 and the M43 Type II masks as the general aviation mask for Army aircrew (except Apache). This modernization effort is still ongoing; not all units have replaced their M43-series masks. All of these masks are seen as low risk, as the combined numbers of all aviator masks on hand usually exceeds the requirement. The USN & USMC aircrew are currently using the A/P22P-14(V1-4), also known as the NDI Respirator, which is a common man-mounted system with variants to address Naval aircraft oxygen connections. These masks provide increased protection, improved fit and comfort, and compatibility with most Services' weapons systems' optics and sights. The Joint Service Aircrew Mask (JSAM) is scheduled to replace all existing aircrew protective masks. The Aircrew Eye/Respiratory Protection (AERP) mask is specially designed to enable pilots of high performance aircraft to conduct missions in a contaminated environment.

Key Component Consumables for Respiratory Protection. Filters and canisters provide the active ingredients that absorb the chemical and biological agents and provide the essential protection required. The C2/C2A1 canister is used with the M40, M42, M43, M45, M48, A/P22P-14(V1-4), and MCU-2/P series masks. The M13A2 filter element will be leaving the inventory with the retirement of the M17-series mask. The M10A1 filter canister used on the M24/25 are also leaving the inventory and will not be a readiness problem.

The Mask Communicator Amplifier, M7 provides effective voice communication between masked personnel enhancing command and control on the NBC contaminated battlefield.

The Second Skin was a pre-planned product improvement that provides liquid agent protection for the M40 mask face piece material. It is a butyl rubber blend that is very durable. A Second Skin is also being fielded for the Navy's and Air Force's MCU-2A/P.

H.2.2.5 Universal "Common" IPE

During the issuing process for Protective Masks it is absolutely essential that the mask be properly fitted to the individual to ensure the highest protective value. The M41 Protection Assessment Test System (PATS) validates proper fit of a mask to the face of the individual. It tests all current military masks. The system provides a visual display of the fit achieved by the mask when worn by the individual and requires calibration every 18 to 24 months. It is currently in use by the Army, Air Force and Marines.

The Joint Service Mask Leakage Tester (JSMLT) supplements the M41 PATS in some cases and replaces it in other cases. The Army is to be the user of the M41 PATS and the Navy and Air Force are to use the JSMLT. However, the Air Force will continue to use the M41 PATS until the JSMLT becomes widely available. The Marine Corps will continue to use the M41 PATS to conduct fit testing; the JSMLT will be used primarily for checking mask serviceability.

The MQ1A mask tester also validates proper fit of a mask to the face of the individual. It tests currently fielded AF MBU-5/P and MBU-12/P aviator masks and the MBU-13/P and MBU-19/P aviator NBC protective masks. The system provides a visual display of the fit achieved by the mask when worn by the individual. It is currently in use by the Air Force at units supporting the MBU-5/P, MBU-12/P, MBU-13/P and MBU-19/P.

H.2.3 Collective Protection

There are two general categories of collective protection: stand-alone shelters and integrated systems. Integrated collective protection equipment is component equipment designed to provide protection against CB agents through the use of filtered air under positive pressure to a variety of facilities, vans, vehicles, aircraft and ships. Filters for these integrated collective protection systems (CPS) are usually in short supply due to low peacetime demand and low production quantities.

The Air Force has expressed interest in a greater collective protective shelter capability through their Collective Protection Small Shelter System. Combined with the Navy's increasing shipboard collective protection filter requirements due to a continually increasing number of ships with CPS, and the Army's integrated vehicular systems and tactical shelter requirements, the near-term requirements for large carbon-based filters have outpaced current inventories even aided by industrial surge capability. As a result, much of this sector may be

assessed as high risk, though the risk is primarily due to the level of funding rather than technical shortfalls. Most of the filter manufacturers retain the industrial capability to produce them.

Collective protection filters for integrated systems (such as armored vehicles, ships and planes) continue to suffer from low stocks. While the Services have been proactive in selecting more capable industrial sources, actual procurement and storage of these filters to meet requirements has not been initiated for all filters primarily due to insufficient funding but also since procurement of such filters is demand-driven. As a result, stocks of some filters remain at a low level. The filters associated with the Collective Protection Systems (M98) are being procured in sufficient quantities, although filters are backordered due to current manufacturing limitations. There were 4,709 M-98 filters on order DOD wide first quarter of FY06. Required lot testing of the filters, accomplished at Edgewood Chemical Biological Center in Edgewood, Maryland, has been backlogged for over a year and is expected to be backlogged in the foreseeable future. Advance planning and significant effort is involved in procurement and delivery of the filters. A Just-In-Time manufacturing and delivery method must be developed to ensure adequate filter quantities are available to the warfighter when required.

The M20/20A1 Simplified CPEs are used to provide a contamination-free, environmentally controlled workspace for Echelon I and II forward area medical treatment facilities. Current funding levels, however, only will meet Force Package I requirements. There are some Force Package II units designated for deployments into high threat regions that will not be equipped with M20 shelters. M20A1 SCPE procurement was initiated in FY03 and production is ongoing. The M20A1 SCPE is the only modern collective protection shelter outside of the medical community in the inventory.

H.2.4 Decontamination

The Joint Program is attempting to find environmentally safe decontaminants that are less labor intensive than previously employed decontaminants, yet are highly effective against all CB agents.

Basic soldier skills for decontamination of vehicle and crew-served weapons rely on the M100 Sorbent Decontamination System (SDS), as well as pressurized water dissemination systems like the M17 Lightweight Decontamination System (LDS) to eliminate gross contamination. Hot soapy water delivered via M17(s) is used for aircraft decontamination by both the Army and the Air Force. The SDS replaces the M11 Decontamination Apparatus, Portable (DAP) and the M13 DAP, which are being eliminated from all inventories within the U.S. Army and Marine Corps. The M100 began fielding in 2002 and is anticipated to continue beyond 2005. Army Working Capital funded quantities were available for purchase beginning in 2003.

The M17A3 Lightweight Decontamination System (LDS) is used to provide operational equipment decontamination in many battalion-level units and dual-purpose (smoke/ decontamination) chemical companies. The Marine Corps is upgrading all of their LDS to the diesel engine. The Air Force employs the M17A3 at the squadron level for operational equipment decontamination. The Air Force is deleting stocks of A/E32-U systems by attrition and procuring additional M17A3s to satisfy shortages. The M17 is assessed as having some risk, due in part to a delay in rebuilding several hundred systems caused by a lack of funding since 1990. The M17 is no longer in production. M17 program risk is being mitigated though

the purchase of commercial off the shelf systems in the near term, and through the development of the Joint Service Transportable Decontamination System – Small Scale (JSTDS-SS).

In the Army, the M12A1 Power-Driven Decontamination Apparatus (PDDA) and the M17A3 LDS are the primary pieces of equipment used to decontaminate vehicles, crew-served equipment and large areas of terrain. The Army M12A1 has gone thru a modernization upgrade with a conversion to diesel fuel and improvements of the controls. It is now at a low risk. The use of commercial off-the-shelf technologies will help lessen the risk of shortages. The Marine Corps is replacing their M12A1 PDDAs with the M17A3 LDS.

The projected stockage of STB has been considered a high-risk category in the past. Slight shortages in calcium hypochlorite and sodium hypochlorite ("household bleach" at 5%-6% concentration) can be made up by the industrial base, using commercially available alternatives. These increased requirements come as a result of increased attention to the need for decontamination capabilities in the 1-4-2-1 construct scenario, and will be further refined. Continued monitoring is recommended.

The M291 Skin Decontaminating Kit is the only personal decontamination kit approved for use on skin in the U.S. military inventory. Projected buys are expected to meet service requirements as Pine Bluff Arsenal has increased production. Rohm & Haas Co. was the sole supplier of the resin and made over 150,000 boxes in 1990–91 then sold their automated manufacturing line to the U.S. government. Rohm & Haas no longer supplies one of the XE-555 resin components. Since October 1996, Pine Bluff Arsenal, Arkansas, has been the sole producer of the M291 Decontaminating Kit. Over 60,000 pounds of this proprietary resin was purchased by the item manager and is now being provided to Truetech, Inc. for production of XE-555. When the 60,000 pounds are gone, XE-555 can no longer be procured. Block I of the Joint Service Family of Decon Systems (JSFDS) program will field a new skin decon kit to replace the M291 in 2007. The replacement is a Canadian product, Reactive Skin Decon Lotion (RSDL), which will be fielded as the Joint Service Personnel/Skin Decontamination System (JSPDS).

The projected stockage of the M295 Individual Equipment Decontamination Kit typically puts it in a low risk category. The M295 Decontamination Kit used to contain the same resin mix as the M291 Decontaminating Kit, but since January 2000, it contains an alumina-silica sorbent. The sorbent is much cheaper than XE-555 and readily available. Truetech, Inc. is the main producer of this item, with Pine Bluff Arsenal available for surge capability. Increased funding for its procurement would maintain the low risk.

H.2.5 Medical

Medical CB defense items are used to counteract the effects of exposure to chemical, biological, or nuclear agents through pre-treatment, vaccines, or post-treatment. Current projections for medical chemical defense material indicate that sufficient quantities should be on hand through the far-term. Quantities of Nerve Agent Antidote Kits (NAAK), and Atropine and 2-PAM Chloride Autoinjectors may fall short of requirements. Convulsant Antidote Nerve Agent (CANA), and Soman Nerve Agent Pyridostigmine Pretreatment (SNAPP) Tablets (also known as PB Tablets) will probably remain at low risk because of continued purchases. This report includes medical treatments for biological warfare agents and cyanide exposure along with the addition of new chemical treatments.

The FDA has approved SNAPP for the Military, in Jan 2003, for the use as a nerve agent pre-treatment for Soman, with a 10-year shelf life. This new material will require periodic testing after it reaches 5 years, but may not be extended beyond its original 10-year shelf life. The use of SNAPP will still require a complete audit trail, all the way to the user. Defense Supply Center – Philadelphia (DSCP) is working with ICN Pharmaceuticals to establish a requirements contract for the manufacture of SNAPP.

The sole supplier to DOD for NAAK, atropine autoinjectors, pralidoxime autoinjectors and CANA is Meridian Medical Technologies, St Louis, Missouri. The medical chemical defense production line is being maintained with an IBMC. Meridian is a U.S. company but it obtains its atropine for the autoinjectors from a German supplier. Currently there is no domestic source for this drug. Pralidoxime and diazepam (CANA) for the autoinjectors is available from U.S. sources. The replacement for NAAK is the Antidote Treatment, Nerve Agent, Auto-injector (ATNAA), which is a multi-chambered injector that began procurement in FY03. ATNAA will replace 2-PAM Chloride Autoinjectors and NAAK over the next 5-7 years. The Atropine Autoinjectors will still be required, but in a smaller quantity.

Patient Chemical Wraps, which are used to transport a patient, who is unable to wear a mask or suit due to their injuries, through an area that may still have a vapor hazard, have not been procured since 1991. The Wraps are made of a special five –layer material that provides protection from a chemical agent, but still allows the required carbon dioxide-oxygen exchange so no additional breathing apparatus is required. The material is no longer produced. The Office of the Surgeon General and the U.S. Army Medical Materiel Agency (USAMMA) with the Natick Soldier Center are currently assessing new material for the patient wrap before initiating new procurement of this item. The current stock of wraps has been tested for extended use and their use has been modified to a maximum of 3 hours. There is a very large stockpile of canvas litters that may be used once in an NBC environment and then destroyed. As the canvas litters are depleted, they will be replaced with the new nylon decontaminable litter.

The Office of the Surgeon General of the Army has centrally programmed and funded the Army's Medical Chemical Defense Materiel since 1994. USAMMA has procured, stored and maintained this materiel for the Army in strategic locations for early deployers and forward deployed forces Deployable Force Packages (DFP), which will support various sized groups of personnel, based on location and mission. The Marine Corps has consolidated its medical defense materiel into five centralized locations. The materiel is issued from one of the centralized locations whenever a Marine Corps element deploys, and is returned to the centralized program upon redeployment. The Air Force and Navy maintain their medical CB materiel in decentralized unit locations. Visibility of on-hand assets has been improved with the release of the Joint Medical Asset Repository, which is the Class VIII (medical) portion of JTAV.

Currently, the U.S. total force (active and reserve forces) is being vaccinated against anthrax, which is considered the primary high-threat BW agent. The anthrax vaccination program is a three-phase program, starting with the troops serving in—or identified to deploy to—the two high-threat areas where hostile anthrax-use poses the greatest potential danger. The status and schedule of the anthrax vaccination program is provided in Chapter 3 of this report.

In the area of medical therapeutics, the Department is maintaining a stockpile of antibiotics (*e.g.*, ciprofloxacin, doxycycline) sufficient to address the treatment needs of potential BW exposures, where such treatment is medically indicated.

The Office of the Assistant Secretary of Defense Health Affairs and the Military Medical Departments in response to Congressional concern over the conservation of military medical resources developed the DOD/FDA Shelf Life Program. The program's focus is to save replacement cost of date sensitive medical materiel especially medical materiel in War Reserve Stocks, Medical Biological Defense Materiel Programs and Medical Chemical Defense Materiel Programs. The Joint Readiness Clinical Advisory Board (JRCAB) manages the shelf-life extension program for the Services and interfaces with the FDA. The FDA requests samples from the JRCAB and the Services. The samples have an initial potency test performed, followed by a 90-day stress test, and then a final potency test. The potency results are compared against a degradation curve, and a new potency period is assigned. The FDA sends the information to the JRCAB and Services who disseminate instructions to extend and re-mark or destroy the materiel to activities and units worldwide. The same lots are subjected to yearly retest and subsequent extensions until the materiel fails or is removed for lack of sufficient on-hand quantities required for testing. The Army maintains its extended materiel at Meridian Medical Technologies for use by Force Package 3 and 4 units. The Air Force maintains its materiel at its local medical logistics activities that re-mark the materiel and maintains it for the deploying units. The Navy re-marks the materiel and maintains it with the unit. The Marines re-mark the materiel at its centralized storage locations. The FDA no longer allows changes to expiration dates to be pen and ink changes. All extended materiel must have a new label, of the same color, font, and points as the original. The complete label may be replaced, or only the Lot with the new expiration date. The DOD/FDA Shelf Life Program has saved an average of $75.00 of medical chemical defense materiel from having to be destroyed and repurchased for every $1.00 it has cost the Services to get materiel tested and extended by the FDA.

JBAIDS is an acquisition category III program under the Office of the Secretary of Defense Chemical and Biological Defense Program and is on the Director, Operational Test and Evaluation (DOT&E) oversight list. FDA approved, the JBAIDS development is using an evolving block approach to incorporate rapidly developing technologies in the diagnostic capabilities arena. JBAIDS will include a clinical instrument based upon Commercial Off The Shelf/Non Developmental Item (COTS/NDI) technology that requires limited modification to meet operational requirements. JBAIDS will be used both fixed and field military medical facilities, system components will require limited modification to meet current logistics requirements and ensure that the system will be deployable with other field laboratory equipment. The JBAIDS system is intended to be a reusable, portable, modifiable, biological agent identification and diagnostic system capable of simultaneous reliable identification of multiple biological agents of operational concern and other pathogens of clinical significance. It will augment and integrate with existing medical biological identification systems (such as those in use at gold standard commercial laboratories or emerging systems like the Joint Biological Point Detection System) to provide a comprehensive identification and diagnostic capability.

Annex I

DOD Joint Service Chemical and Biological Defense Program Funding Summary

In accordance with 50 USC 1522, *Department of Defense Chemical and Biological Defense Program*, research, development, test and evaluation (RDT&E) and procurement for all DOD chemical and biological defense programs (with the exception of those biological warfare defense RDT&E programs conducted by the Defense Advanced Research Projects Agency, DARPA) are consolidated into defense-wide program element (PE) funding lines. Fiscal year 1996 was the first year in which all Service and Defense Agency CB defense programs were consolidated into defense-wide funding lines. Prior to FY1996, funding was included in several separate Service and Defense Agency funding lines.

The detailed funding information in this annex is provided annually to Congress in the DOD Joint Service Chemical and Biological Defense Program (CBDP), President's Budget Submission, Research, RDT&E, Defense-Wide and Procurement, Defense-Wide budget exhibits, and in the Department of Defense Extract found in the Budget of the United States. These budget submissions provide a detailed account of prior year accomplishments and planned activities for the budget request period. ***Table I-1*** (and ***Figure I-1***) provides a summary of appropriated and requested funding from FY2004–FY2011. Detailed funding request for FY 2004–2011 are provided separately in the President's FY2006 Budget Submission.

Table I-2 (and ***Figure I-2***) provides a summary of expenditures by the DOD CBDP. Expenditures represent the amount of checks issued or other payments made (including advances to others), net of refunds and reimbursements. The term is frequently used interchangeably with the term "outlays," which are the measure of government spending (*i.e.*, payments to liquidate obligations (other than the repayment of debt), net of refunds and offsetting collections.) It is important to note that funds appropriated for a given year may be expended incrementally over a period of years. Thus, expenditures shown in ***Table I-2*** will be updated in following years to show total expenditures of appropriated funds.

Table I-1 CB Defense Program Appropriations Summary

Program Element (PE) ($ in millions)	FY04‡	FY05‡	FY06‡	FY07*	FY08*	FY09*	FY10*	FY11*
0601384BP – Basic Research	46.946	51.998	94.366	99.182	79.149	64.565	56.330	56.314
0602384BP – Applied Research	149.668	172.119	246.953	280.422	214.036	191.991	173.790	166.261
0603384BP – Advanced Tech. Dev.	148.274	175.181	234.039	207.114	259.667	320.350	342.905	237.652
Science & Technology Base Subtotal	**344.888**	**399.298**	**575.358**	**586.718**	**552.852**	**576.906**	**573.025**	**460.227**
0603884BP – Advanced Component Development and Prototypes	121.351	125.420	122.274	73.111	139.990	149.679	176.770	205.721
0604384BP – System Development and Demonstration (SDD)	185.666	138.278	260.279	212.072	287.074	238.203	188.868	237.579
0605384BP – Management Support	44.612	43.785	81.494	80.134	80.335	83.958	78.156	79.784
0605502BP- Small Business Innovative Research (SBIR)	11.447	5.860	0.000	0.000	0.000	0.000	0.000	0.000
0607384BP – Operational Systems Development	0.000	2.070	9.949	7.035	9.928	19.059	16.120	20.903
Reimbursable Program Reimbursable Activity	0.123	1.165	0.000	0.000	0.000	0.000	0.000	0.000
RDT&E Subtotal	**708.087**	**715.876**	**1049.354**	**959.070**	**1070.179**	**1067.805**	**1032.939**	**1004.214**
0208384BP – Procurement Subtotal	**545.755**	**716.296**	**655.033**	**506.423**	**535.060**	**561.190**	**613.540**	**620.641**
CB Defense Program Total	**1253.842**	**1432.172**	**1704.387**	**1465.493**	**1605.239**	**1628.995**	**1646.479**	**1624.855**

‡ Total Obligation Authority (TOA) * Estimated [from FY2007 President's Budget Request]

Table I-2 CB Defense Program Expenditures Summary†

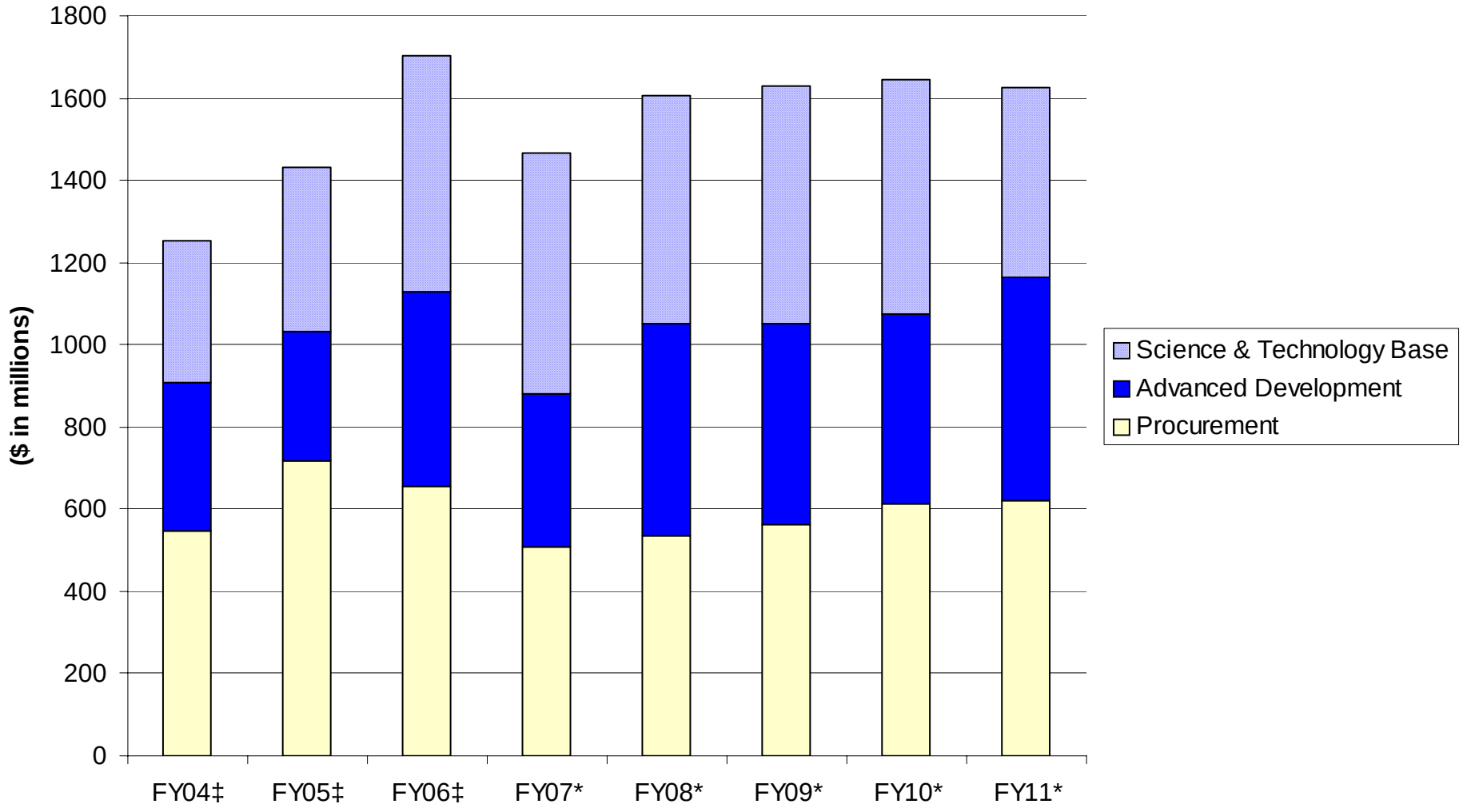
Program Element (PE) ($ millions)	FY99	FY00	FY01	FY02	FY03	FY04	FY05
RDT&E, Defense-Wide	338.683	385.622	396.389	580.686	603.993	548.546	234.680
Procurement, Defense-Wide	300.473	364.388	467.800	510.137	579.468	369.204	168.092
CB Defense Program Total	**639.156**	**750.010**	**864.189**	**1090.823**	**1183.461**	**917.750**	**402.772**

† Expenditures as of September 30, 2005

Table I-3 DARPA Biological Warfare Defense Program Appropriations Summary

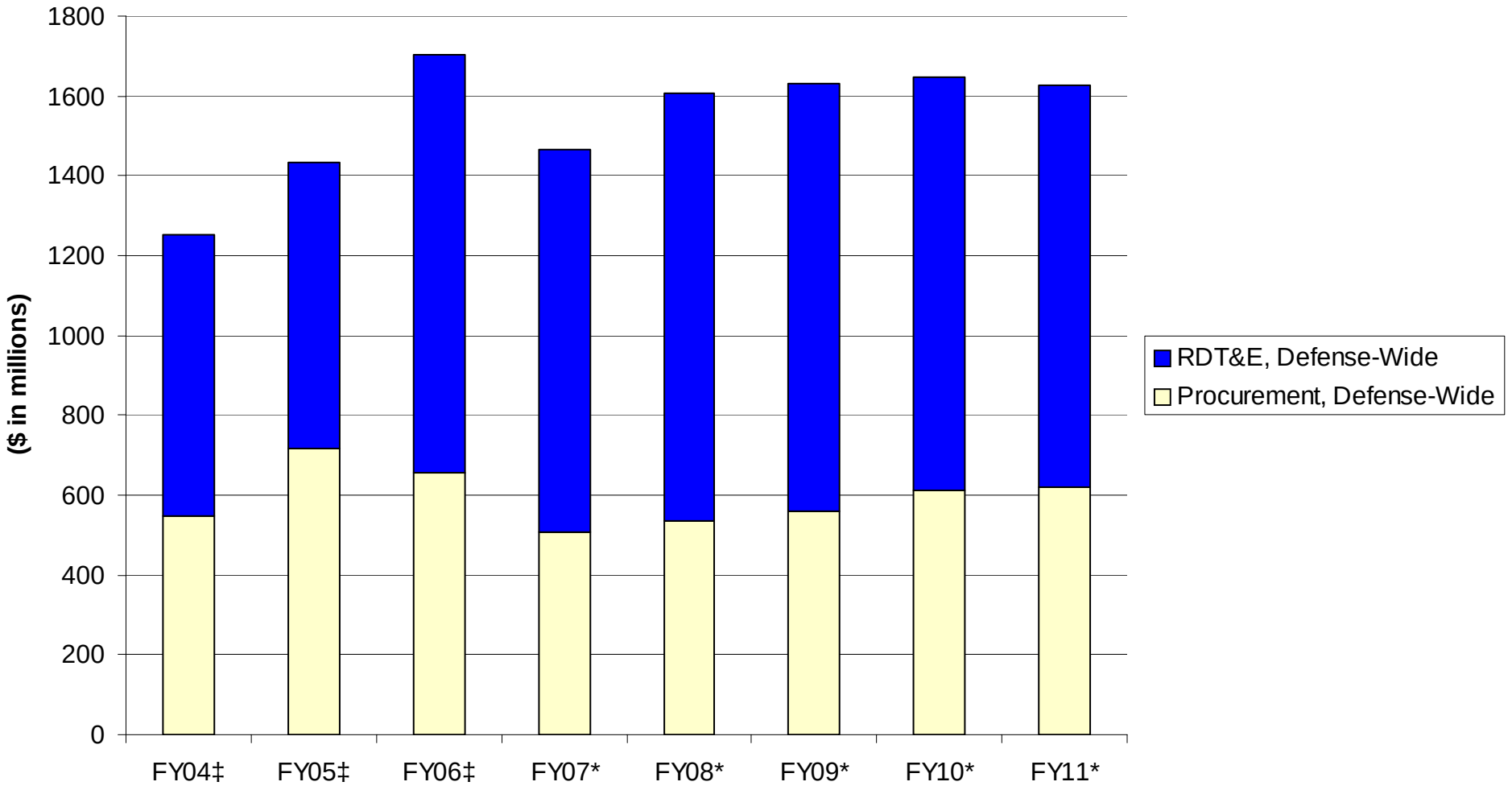
Program Element PE ($ in millions)	FY04‡	FY05‡	FY06*	FY07*	FY08*	FY09*	FY10*	FY11*
PE 0602383E – (BW-01) - Applied Research	141.921	155.360	148.108	112.242	110.695	110.618	110.914	110.414

‡ Total Obligation Authority (TOA) * Estimated [from FY2007 President's Budget Request]



FY04-FY06 = Total Obligational Authority FY07-11 = President's Budget Request
Science and Technology Base includes Basic Research, Applied Research, and Advanced Technology Development
Advanced Development includes Advanced Component Development and Prototypes, SDD, Management Support, SBIR, and Operational Systems Development

Figure I-1 CB Defense Program Appropriations Summary



†as of September 30, 2005 (includes reimbursable expenditures)

Figure I-2 CB Defense Program Expenditures Summary

Annex J

Statement Regarding Chemical and Biological Defense Programs Involving Human Subjects

The reporting requirement (50 USC 1523) for the annual report to Congress on the DOD Chemical and Biological Defense Program was modified by Section 1086 of the FY98 National Defense Authorization Act. The amendment requires the following information:

> A description of any program involving the testing of biological or chemical agents on human subjects that was carried out by the Department of Defense during the period covered by the report, together with a detailed justification for the testing, a detailed explanation of the purposes of the testing, the chemical or biological agents tested, and the Secretary's certification that informed consent to the testing was obtained from each human subject in advance of the testing on that subject.

While DOD conducted tests involving the tests of human subjects to chemical and biological agents in the past, all such tests and programs have been halted and disbanded. The United States formally renounced the "use of lethal biological agents and weapons, and all other methods of biological warfare" in National Security Decision 35, November 25, 1969. Human testing with lethal biological warfare agents was never done and testing with incapacitating biological warfare agents was ceased in 1969. The last human testing of chemical warfare agents occurred on July 25, 1975. Acting Secretary of Army Norman Augustine suspended testing of chemical compounds on human volunteers on July 28, 1975.

Tests involving the exposure of human subjects to chemical agents began in the 1940s and continued following World War II through the Cold War until the early 1970s. Such testing has been document and reported to Congress. See for example, Department of Army, Inspector General Report, DAIG-IN 21-75, *Use of Volunteers in Chemical Agent Research*, March 1976. In addition, there was extensive congressional testimony on this subject during 1975 and 1976. DOD has not conducted any experimentation since that time involving the exposure of human subjects to chemical warfare agents.

Table J-1 provides a summary of prior and planned tests conducted by the Department of Defense, both directly and under contract, which involve the use of human subjects for the testing of chemical or biological agents. In summary, there has been no such testing since 1969 with biological agents, since 1975 for chemical agents, and no testing is planned.

The Department is in full compliance with the requirements of all laws regarding the use of human subjects involving chemical or biological agents. DOD is involved in no experimentation or any other efforts that involve the exposure of unprotected human subjects to chemical or biological agents. All individuals involved in training or RDT&E activities involving live chemical or biological agents are fully protected and carefully monitored.

Table J-1 Summary of Experiments and Studies with Human Subjects Involving the Use of Chemical or Biological Agents

November 25, 1969	–	Human biological agent testing ended
July 28, 1975	–	Human chemical agent testing ended
Since 1969/1975	–	No activities with human subjects involving exposure to biological agents nor chemical agents have occurred since testing ended

As part of the DOD Chemical and Biological Defense Program (CBDP), DOD requires the use of small quantities of chemical and biological agents in the research, development, test and evaluation of detection, protection, and decontamination equipment and systems. Chemical and biological agents are also used in small quantities in training U.S. forces to operate in protective equipment and to operate detection and decontamination systems in a chemical or biological environment. However, no research, development, test or evaluation involves the exposure of unprotected human subjects to chemical or biological agents.

Medical chemical and biological defense programs involve the use of human subjects in controlled clinical trials to test and evaluate the safety, immunogenicity, and other effects of medical products (drugs, vaccines, therapies, *etc.*) to protect against chemical and biological agents. The use of human subjects in these trials involves volunteers who have provided informed consent. All use of human subjects in these trials is in full compliance with the "Common Rule," Federal Policy for the Protection of Human Subjects, Food and Drug Administration (FDA) regulations, Federal Acquisition Regulations (FAR), DOD Directives and Instructions, and *all* other applicable laws, regulations, issuances, and requirements. The FDA has a proposed rule "New Drug and Biological Drug Products; Evidence needed to Demonstrate Efficacy of New Drugs for Use Against Lethal or Permanently Disabling Toxic Substances When Efficacy Studies in Human Ethically Cannot be Conducted" October 5, 1999. No medical chemical or biological defense programs involving human subjects involves the exposure of these subjects to chemical or biological agents.

As part of some training and RDT&E activities sponsored by the DOD CBDP and by the Military Departments, simulants are sometimes used to enhance the realism of operations in a chemical or biological contaminated environment. Simulants are not chemical or biological agents, but may simulate some of their properties (e.g., particle size, surface absorption). For all personnel involved in testing with simulants, (a) all personnel are informed of any hazards, if any, associated with the simulant, (b) all personnel are provided with appropriate protective equipment, and (c) all names are carefully recorded, and if at some point in the future it is determined that a simulant used in testing presents a potential health hazard, the Department notifies the personnel of potential risks to their health.

Annex K

Status of DOD Efforts to Implement the Chemical Weapons Convention

INTRODUCTION

The Chemical Weapons Convention (CWC) was opened for signature on January 13, 1993. The Convention entered into force on April 29, 1997. As of January 1, 2006 there are 175 States Parties to the CWC, including the United States. In 2005, eight countries ratified or acceded to the CWC. The tenth session of the Conference of the States Parties, the highest policy making organ of the Organization for the Prohibition of Chemical Weapons (OPCW), convened in The Hague from 7 to 11 November 2005. Delegates from the 175 member states, seven non-member states, at least six international organizations, and over 14 non-governmental organizations and chemical industry associations were in attendance. A number of decisions were made by this conference to ensure the continued, effective implementation of the CWC.

DEPARTMENT OF DEFENSE IMPLEMENTATION OF THE CWC

In 2005, DOD hosted 118 inspections and visits at chemical weapons (CW) storage, former production, and destruction facilities. The Army (the Service most directly affected by CWC implementation activities) and DOD's Defense Threat Reduction Agency (DTRA) continue to host and escort inspectors from the OPCW Technical Secretariat (TS). The OPCW is charged with overseeing worldwide implementation of the CWC. TS inspectors conduct both continuous and non-continuous monitoring at DOD CW destruction facilities and systematic inspections at DOD CW storage, former production and Schedule 1 facilities. DTRA provides CWC Orientation Training and associated Mission-Support Training (Treaty Escort Training, Hazardous Materials (HAZMAT), and Hazardous Waste Operations and Emergency Response (HAZWOPER)) to United States Government (USG) National Escorts and other treaty compliance personnel. DTRA insures all escorts are trained and ready to receive OPCW TS Inspection Teams.

In addition to supporting inspections at DOD facilities, DTRA assists the Department of Commerce (DOC) with CWC inspections at U.S. chemical industry sites pursuant to a Memorandum of Agreement. The DOC is the lead agency for chemical industry inspections. DTRA supports DOC with training, escort, and logistic support on a non-interference, cost reimbursable basis. U.S. chemical industry inspections began in May 2000. The OPCW conducted 11 chemical industry inspections in 2005.

DOD conducts a Chemical Weapons Agreements Implementation Working Group (CWIWG), chaired by the Office of the Secretary of Defense (OSD) Treaty Manager, the Deputy Assistant to the Secretary of Defense (Chemical Demilitarization and Threat Reduction), to implement the CWC. Through regularly recurring meetings, representatives of OSD, the Joint Staff, the Military Departments, the Military Services, and DOD agencies and activities coordinate planning efforts to ensure proper implementation of the CWC. Formal meetings of the CWIWG are scheduled approximately quarterly and small group meetings are

held as needed to address specific requirements in support of the CWIWG. A Compliance Review Group (CRG), also chaired by the Treaty Manager, was established within DOD to address, as needed, CWC compliance concerns. OSD, the Joint Staff, the Military Services, and DTRA provide technical experts to support activity at the U.S. Delegation to the OPCW in The Hague, The Netherlands.

The Army is the executive agent for the Chemical Demilitarization Program which has the mission to destroy all U.S. chemical warfare material while ensuring maximum protection of the public, personnel involved in the destruction effort, and the environment. The Army works through OSD to ensure this program is compliant with CWC provisions.

SAFETY ORIENTATION FOR INSPECTORS

All OPCW inspectors who conduct continuous monitoring at U.S. chemical weapons demilitarization facilities are required to attend a 32-hour safety orientation, which is broken down into two sections and is presented by the Army. One section is a 24-hour health and safety orientation (HSO) course, which is a USG requirement of all personnel who must be present on a more than short-term basis at U.S. chemical demilitarization facilities. The second section is an 8-hour Ammunition Safety Course. A 48-hour demilitarization protective ensemble (DPE) procedures course is required only for those inspectors designated by the OPCW TS, whose responsibilities would include the use of such protective equipment. Approximately 182 currently assigned OPCW TS inspectors attended HSO training and 15 inspectors attended the 48-hour DPE class in 2005. The orientations are conducted at the Chemical Demilitarization Training Facility in Edgewood, Maryland or in The Hague. Annual 8-hour HSO refresher courses are also required and are being accomplished by the Army in The Hague. DTRA provides USG national escorts for OPCW inspectors while attending required training at U.S. facilities. DTRA ensures that all inspectors receive required training.

PREPARATION OF DEFENSE INSTALLATIONS

The Military Services and DTRA have developed individual implementation and compliance plans to provide guidance for their commands and activities under the CWC. The Military Services have individually established implementation support offices, which participate actively at the DOD CWIWG, provide Service policy direction, and conduct ongoing liaison with their major commands to ensure that all military elements are fully prepared for inspections under the CWC.

The Military Services continue to coordinate actively with OSD and DTRA to prepare DOD installations for inspections under the CWC. All defense installations which are subject to declarations under the requirements of the CWC, and many which are subject to challenge inspections even though not declarable, have been visited by Military Service representatives and DTRA technical experts. DTRA will continue to support site assistance visits and Army treaty implementation and compliance meetings.

All of the Military Services have held exercises to test their preparedness for short-notice CWC challenge inspections. Such exercises involve the active participation of Service, OSD, DTRA, and other DOD representatives in the roles they would assume during a challenge inspection. DOD and the Services have exercised written DOD guidance and procedures to test the operational readiness of personnel and facilities. Commonly, the lead Service responsible for developing an exercise also produces a comprehensive Lessons Learned report to ensure

DOD readiness for possible challenge inspections. The Services have initiated efforts to ensure that in the case of a challenge inspection, affected commands take timely and appropriate measures, based on lessons learned, to demonstrate compliance while protecting security concerns.

In coordination with the Army, DOD sponsored a seven day mock challenge inspection exercise in 2005, using Fort Leonard Wood, Missouri as the challenged site. DOD's overall objective was to practice using existing and revised CWC compliance guidance and improve the processes by which the DOD would demonstrate compliance with the Chemical Weapons Convention.

DEFENSE TREATY INSPECTION READINESS PROGRAM

The Defense Treaty Inspection Readiness Program (DTIRP), for which DTRA is the executive agent, has implemented an extensive outreach program to provide information about the CWC, security countermeasures, and facility preparation to both government and government contractors. In 2005, DTIRP distributed arms control and security educational products (electronic and print media). The program also provided the Army's Chemical Material Agency with tailored training to its chemical depots. The DTIRP has provided, and will continue to provide, arms control vulnerability assessment teams in support of any requirement to assess risks to critical national security assets, United States industry and research institutions. Program personnel also participated and presented at arms control and security conferences.

TECHNICAL EQUIPMENT INSPECTION PROGRAM

The Technical Equipment Inspection (TEI) Program ensures OPCW TS verification equipment meets U.S. safety, environmental and security requirements through a familiarization process authorized by OPCW Conference of States Parties. Familiarization results are documented in the U.S. "Certification Report of Chemical Weapons Convention Organization for the Prohibition of Chemical Weapons Technical Secretariat Equipment." In addition, TEI verifies and confirms OPCW equipment entering and exiting the United States and performs chemical agent monitoring of inbound OPCW equipment for all OPCW inspection teams at the Point of Entry. The chemical agent monitoring is conducted to protect both U.S. and OPCW personnel and to prevent inaccurate findings as a result of pre-existing contaminants on the OPCW verification equipment.

ARTICLE X ASSISTANCE AND OTHER ASSISTANCE

Under Article X of the CWC, a State Party to the treaty may make an appeal for assistance through the Director-General of the TS. In accordance with a condition established in the U.S. Senate's Advise and Consent to the Ratification of the CWC, the United States will provide "no assistance…other than medical antidotes and treatment," which the USG deems are necessary, to those CWC States Parties that have requested assistance under Article X of the CWC.

Under the CWC, DOD has not provided any chemical weapons detection equipment or assistance in the safe transportation, storage, and destruction of chemical weapons to other States Parties. Such assistance, however, is being provided to Russia and Albania under DOD's Cooperative Threat Reduction (CTR) program.

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Annex L

Congressional Reporting Requirement: 50 USC 1523

Text of Public Law Mandating Report on
The Department of Defense Chemical and Biological Defense Program

Title 50 of the U.S. Code, Sec. 1523. Annual report on chemical and biological warfare defense
Implemented by Public Law 103-160, The FY94 National Defense Authorization Act

(a) Report required

The Secretary of Defense shall include in the annual report of the Secretary under section 113(c) of title 10, a report on chemical and biological warfare defense. The report shall assess--

(1) the overall readiness of the Armed Forces to fight in a chemical-biological warfare environment and shall describe steps taken and planned to be taken to improve such readiness; and

(2) requirements for the chemical and biological warfare defense program, including requirements for training, detection, and protective equipment, for medical prophylaxis, and for treatment of casualties resulting from use of chemical or biological weapons.

(b) Matters to be included

The report shall include information on the following:

(1) The quantities, characteristics, and capabilities of fielded chemical and biological defense equipment to meet wartime and peacetime requirements for support of the Armed Forces, including individual protective items.

(2) The status of research and development programs, and acquisition programs, for required improvements in chemical and biological defense equipment and medical treatment, including an assessment of the ability of the Department of Defense and the industrial base to meet those requirements.

(3) Measures taken to ensure the integration of requirements for chemical and biological defense equipment and material among the Armed Forces.

(4) The status of nuclear, biological, and chemical (NBC) warfare defense training and readiness among the Armed Forces and measures being taken to include realistic nuclear, biological, and chemical warfare simulations in war games, battle simulations, and training exercises.

(5) Measures taken to improve overall management and coordination of the chemical and biological defense program.

(6) Problems encountered in the chemical and biological warfare defense program during the past year and recommended solutions to those problems for which additional resources or actions by the Congress are required.

(7) A description of the chemical warfare defense preparations that have been and are being undertaken by the Department of Defense to address needs which may arise under article X of the Chemical Weapons Convention.

(8) A summary of other preparations undertaken by the Department of Defense and the On-Site Inspection Agency to prepare for and to assist in the implementation of the convention, including activities such as training for inspectors, preparation of defense installations for inspections under the convention using the Defense Treaty Inspection Readiness Program, provision of chemical weapons detection equipment, and

assistance in the safe transportation, storage, and destruction of chemical weapons in other signatory nations to the convention.

(9) A description of any program involving the testing of biological or chemical agents on human subjects that was carried out by the Department of Defense during the period covered by the report, together with a detailed justification for the testing, a detailed explanation of the purposes of the testing, the chemical or biological agents tested, and the Secretary's certification that informed consent to the testing was obtained from each human subject in advance of the testing on that subject.

Annex M

Acronyms and Abbreviations

Note: The acronyms and abbreviations in this annex reflect an extensive, though not exhaustive, list of terms related to the various and diverse CB defense activities. The acronyms might have different meanings in other contexts.

–A–

AAALAC – Association for Assessment and Accreditation of Laboratory Animal Care
AAAV – Advanced Amphibious Assault Vehicle
AAE – Army Acquisition Executive
AAR – after action review
AB – Air Base
ABDU – Aviation Battle Dress Utilities
ABV – Assault Breacher Vehicle
AC – Active Component
ACAA – Automatic Chemical Agent Alarm
ACADA – Automatic Chemical Agent Detector Alarm
ACAT – Acquisition Category
ACD&P – Advanced Component Development & Prototypes
ACPLA – agent containing particle per liter of air
ACPM – Aircrew Protective Mask
ACTD – Advanced Concept Technology Demonstration
ADC – Agile Development Center
AEL – Allowance Equipage List
AEPS – Army Electronic Product Support
AERP – Aircrew Eye/Respiratory Protection
AFB – Air Force Base
AFCESA – Air Force Civil Engineer Support Agency
AFI – Air Force Instruction
AFIP – Armed Forces Institute of Pathology
AFMAN – Air Force Manual
AFOTEC – Air Force Operational Test & Evaluation Center
AFRL – Air Force Research Laboratory
AFRRI – Armed Forces Radiobiology Research Institute
AFS – Alternative Footwear Solution
AFTH – Air Force Theater Hospital
AFTTP – Air Force Tactics, Techniques and Procedures
AIDET – Aircraft Interior Detector
AIT – Aeromedical Isolation Team or Advanced Individual Training
ALN – artificial lymph node
ALS - Analytical Laboratory System
AMAD – Automatic Mustard Agent Detector
AMC – U.S. Army Materiel Command
AMD – Average Monthly Demand
AMEDD – Army Medical Department
AMEDDC&S – Army Medical Department Center & School
AMSAA – Army Materiel Systems Analysis Activity
AMSNY – Associated Medical Schools of NY
ANBACIS – Automated Nuclear Biological and Chemical Information System
ANCOC – Advanced NCO Course
ANG – Air National Guard
AN/UDR-13 – Compact, digital whole body radiation meter
AN/VDR-2 – Portable dose-rate gamma/beta radiation meter
APC – Armored Personnel Carrier
APOD – Aerial Port of Debarkation
ARNG – Army National Guard
ASA(ALT) – Assistant Secretary of the Army for Acquisition, Logistics, & Technology
ASAP – Advanced Situational Awareness Program
ASBREM – Armed Services Biomedical Research Evaluation and Management
ASD(HA) – Assistant Secretary of Defense for Health Affairs
ASD(HD) – Assistant Secretary of Defense for Homeland Defense
ASD(SO/LIC) – Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict
ASF – Active Standoff Facility
ATD – Advanced Technology Demonstration
ATG – Afloat Training Group
ATH – Air Transportable Hospital
ATNAA – Antidote Treatment Nerve Agent Autoinjector
ATRRS – Army Training Requirements & Resources System
ATRv6 – Atmosphere Transport of Radiation Version 6
ATS – Automatic Transfer Switch
ATSD(NCB) – Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs

ATSO – Ability to Survive and Operate
aTSP – active Topical Skin Protectant
AU – Air University
AVA – Anthrax Vaccine Adsorbed
AV/DP – Amalgam Virgo/Determined Promise
AVIP – Anthrax Vaccine Immunization Program

–B–

B. anthracis – Bacillus anthracis (anthrax)
B. mallei– Burkholderia mallei (glanders)
BAT – Biodosimetry Assessment Tool
BCA – Baseline Capability Assessment
BCTP – Battle Command Training Center, or an emulsion made from water, soybean oil, Triton X 100 detergent, and the solvent trin-butyl phosphate
BD – biological detector (*also,* biological defense)
BDO – Battledress Overgarment
BDRD – Biological Detection Research Department
BDTF – Biological Defense Task Force
BDU – Battledress Uniform
BECC – Basic Engineering Core Course
BES – Budget Estimate Submission
BGAD – Blue Grass Army Depot
BIDS – Biological Integrated Detection System
BIODET – biological detection
Bio-OPT – Biological Operational Planning Team
BL – Biosafety Level
BLA – Biologics Licensing Application
BNCOC – Basic Non-Commissioned Officer Course
BOI – basis of issue
BoNT – Botulinum Neurotoxin
BoNT/A – Botulinum Neurotoxin A
BRMs – biological response modifiers
BSM – Business System Modernization
BTN – below the neck
BuChE – butyrylcholinesterase
BVO/GVO – black vinyl overboot/green vinyl overboot
BW – biological warfare
BWD – Biological Warfare Defense
BWDC – Biological Warfare Detection Course

–C–

C2 – Command and Control
C2PC – Command and Control Personal Computer
C3 – Command, Control, & Communications
C4I – command, control, communication, computer, and intelligence
C4ISR – command, control, communication, computer, intelligence, surveillance, and reconnaissance
CA – Commodity Area
CAA – Chemical Agent Alarm
CA/D – Chemical Activity/Depot
CADTS – Contamination Avoidance Detector Test Suite
CaE – carboxylesterase
CAM – Chemical Agent Monitor (*also,* Commodity Area Manager)
CANA – Convulsant Antidote Nerve Agent autoinjector
CAPDS – Chemical Agent Point Detection System
CASPOD – Contamination Avoidance at Sea Ports of Debarkation
CatOx – catalytic oxidation
CB – chemical and biological (*also,* C/B)
CBAT – Chemical Biological Advisory Team
CBAWM – Chemical Biological Agent Water Monitor
CBCS – Chemical and Biological Contamination Survivability
CBD – chemical and biological defense
CBDE – CB defense equipment
CBDP – Chemical/Biological Defense Program
CBIAC – Chemical and Biological Information Analysis Center
CBIRF – Chemical Biological Incident Response Force
CBMS – hemical biological mass spectrometer
CBMS – Chemical Biological Medical Systems
CBNP – Chemical Biological Nonproliferation Program
CBPR – Chemical and Biological Portable Radar
CBPS – Chemical Biological Protective Shelter or Chemical Biological Protected Shelter
CBR – Chemical, Biological, and Radiological
CBR-D – Chemical, Biological, and Radiological Defense
CBRD TAVMS – CBRD Total Asset Visibility Management System
CBRMOU – Chemical, Biological, and Radiological Memorandum of Understanding
CBRN – Chemical, Biological, Radiological, and Nuclear
CBRNC – Chemical, Biological, Radiological, and Nuclear Countermeasures
CBRND – Chemical, Biological, Radiological, and Nuclear Defense
CBRNDP – Chemical, Biological, Radiological, and Nuclear Defense Program
CBRNE – Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives
C/B-RRT – Chemical/Biological Rapid Response Team
CbtWMD – Combating Weapons of Mass Destruction

CBU – Chemical and Biological Umbrella
CBW – chemical and biological warfare or counter biological warfare
CBWA – chemical and biological warfare agent
CBW-CFX – CB Warfare Computational Fluid Effects
CCA – Contamination Control Area
C-CBRNE – Counter Chemical, Biological, Radiological, Nuclear, and High-Yield Explosive
CcrM – cell-cycle regulated methyltransferase
C-CW – Counter Chemical Warfare
CDC – Centers for Disease Control and Prevention
cDNA – Complementary Deoxyribonucleic Acid
CD-ROM – Compact Disk - Read Only Memory
CDTF – Chemical Defense Training Facility (at the U.S. Army Chemical School)
CE – Civil Engineer
CEES – half mustard (2-chloroethyl ethylsulfide)
CENTCOM – Central Command
CESM – Chemical Environment Survivability Mask
C-EW – Counter High-Yield Explosive
CFD – Computational Fluid Dynamic(s)
CFM – cubic feet per minute
CFR – Code of Federal Regulations
CFS – Consolidated Storage Facilities
CFX – computational fluid effects
cGLP – current Good Laboratory Practices
cGMP – current Good Manufacturing Practices
cGy – cent-Gray
CHAMP – Chemically/biologically Hardened Air Management Plant
CHATH – Chemically/Biologically Hardened Air Transportable Hospital
ChE – Cholinesterase
CHEMRAT – Chemical Hazard Estimation Method Risk Assessment Tool
CIA – Central Intelligence Agency
CIL – Critical Item List
CJCS – Chairman of the Joint Chief of Staff
CM –Consequence Management, crisis management, or countermeasures
CNS – Central Nervous System
C-NW – Counter Nuclear Warfare
COC – Combat Operations Center
COCOM – Combatant Commander
COLPRO – Collective Protection
CoM – Consequence Management
CONOPS – Concept of Operations
CONUS – continental United States
COTS – Commercial Off-the-Shelf
CP – chemical protective (*also*, collective protection, command post, *or* counterproliferation)
CPDEPMEDS – Chemically Protected Deployable Medical System
CPE – Collective Protection Equipment
CPEMEDS – Collective Protection for Expeditionary Medical Support
CPO – Chemical Protective Overgarment
CPRC – Counterproliferation Review Council
CPS – Collective Protection System
CP-SSS – Collective Protection for Small Shelter System
CPU – Chemical Protective Undergarment
CPX – Command Post Exercise
CREST – Casualty and Requirements Estimation Tool
CRG – Compliance Review Group
CRP – Critical Reagents Program
C-RW – Counter Radiological Warfare
CSF – Consolidated Storage Facilities
CSSC – Civil Support Skills Course
CTEIP – Central Test and Evaluation Investment Program
CTR – Cooperative Threat Reduction
CUGR - CBRN Unmanned Ground Reconnaissance
CUGV – CBRN Unmanned Ground Vehicle
CVC – Combat Vehicle Crewmen
CW – Chemical Warfare
CWA – Chemical Warfare Agent
CWC – Chemical Weapons Convention
CWDD – Chemical Warfare Directional Detector (AN/KAS-1A)
CWIWG – Chemical Weapons Agreements Implementation Working Group
CWNAVSIM – Chemical Warfare Naval Simulation
CY – Calendar Year

–D–

D2PC – Dynamic Two Phase Commitment
DAB – Defense Acquisition Board
DAE – Defense Acquisition Executive
DAIG – Department of the Army Inspector General
DAP – Decontaminating Apparatus Portable
DARPA – Defense Advanced Research Projects Agency
DASD/FHP&R – Deputy Assistant Secretary of Defense (Force Health Protection and Readiness)
DASG-HCF – Department of the Army Surgeon General-Directorate of Health Care Operations
DATSD(CBD) – Deputy Assistant to the Secretary of Defense for Chemical/Biological Defense
DAWN – Deposition and Weathering of a Chemical Attack on a Vessel
DC – Dentists

DCA – Damage Control Assistant
DC CD – Deputy Commandant for Combat Development
DC-OSIMS – Damage Control-Operating Space Items Management System
DCTE – Defensive Chemical Testing Equipment
DDC – Defense Distribution Center
DDG – Guided Missile Destroyer
DEA – Data Exchange Agreement
DED – Diesel Engine Driven
DEPMEDS – Deployable Medical Systems
DepSecDef – Deputy Secretary of Defense
DERF – Defense Emergency Response Fund
DFP – Deployable Force Packages
DFU – Dry Filter Unit
DHS – Department of Homeland Security
DHHS – Department of Health and Human Services
DLA – Defense Logistics Agency
DMRTI – Defense Medical Readiness Training Institute
DMSMS – Diminishing Manufacturing Sources and Material Shortages
DMSS- Defense Medical Surveillance System
DNA – Deoxyribonucleic Acid
DNWS – Defense Nuclear Weapons School
DOC – Department of Commerce
DOD – Department of Defense
DODI – Department of Defense Instruction
DODIG – Department of Defense Inspector General
DOE – Department of Energy
DON – Department of Navy
DoS – Department of State
DOT&E – Director, Operational Test and Evaluation
DOTMLPF – Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities
D(PA&E) – Director, Program Assessment and Evaluation
DPE – Demilitarization Protective Ensemble
DPG – Defense Planning Guidance (*also,* Dugway Proving Grounds)
DRES – Defense Research Establishment
DRF – dose reduction factor
DRI – Defense Reform Initiative
DRID – Defense Reform Initiative Directive
DRMO – Defense Reutilization and Marketing Office
DRMS – Defense Reutilization and Marketing Service
DS – Diplomatic Security
DS2 – Decontamination Solution 2
DS/ATA – Diplomatic Security/Antiterrorism Assistance
DSCA – Defense Support to Civilian Authorities
DSCP – Defense Supply Center, Philadelphia
DSP – digital signal processing
DsRNA – double standard RNA
DT – Dental Techs
DTAP – Defense Technology Area Plan
DTIRP – Defense Treaty Inspection Readiness Program
DTO – Defense Technology Objective
DT/OT – developmental/operational testing
DTRA – Defense Threat Reduction Agency
DTRA(CB) – Defense Threat Reduction Agency's Chemical and Biological Defense Directorate
DTT – Doctrine and Tactics Training
DU – depleted uranium
DUSA(OR) – Deputy Under Secretary of the Army for Operations Research
DVC – Dynport Vaccine Company

–E–

E^2C^2 – Expendable Equipment Combat Consumption
EAU – Equipment Assessment Units
EBO – Ebola virus
ECBC – Edgewood Chemical & Biological Center
ECLA – electrochemilluminescense assay
ECTA – Embedded Common Technical Architecture
ECU – Environmental Control Unit
ECV – Expanded Capacity Vehicle
ED – ethyl dichlorarsine
EEE – Eastern Equine Encephalomyelitis
EFV – Expeditionary Fighting Vehicle
EMAT – Emergency Management Team
EMPRC – Emergency Medical Preparedness/Response Web-based Course
EMT – Emergency Medical Technician
EMW – Expeditionary Maneuver Warfare
EOC – Emergency Operation Center
EOD – Explosive Ordnance Disposal
EPA – Environmental Protection Agency
EPP – Enhanced Planning Process
ESLI – end of service life indicator
ETE – Education, Training, and Exercise
EUCOM – European Command
EZ – Exchange Zone

–F–

F1 – Fraction 1
F1-V – Fraction 1 - "V" Antigen
FAA – Federal Aviation Administration
FAR – Federal Acquisition Regulations
FBI – Federal Bureau of Investigations

FCBC – Field Management of Chemical and Biological Casualties Course
FCS – Future Combat Systems
FCT – Foreign Comparative Testing
FDA – Food and Drug Administration
FDTE – Force Development Testing and Experimentation
FEST – Foreign Emergency Response Team
FHPC – Force Health Protection Council
FLEETEX – Fleet Exercise(s)
FM – Field Manual
FNA – Functional Needs Analysis
FORCEM – Force Evaluation Model
FORSCOM – Forces Command
FoS – family of systems
FP1 – Force Package 1
FPA – focal plane array
FR – flame resistance
FRAT – First responder Radiological Assessment Triage
FSA – Functional Solutions Analysis
FSTR – Full Spectrum Threat Response
FTX – Field Training Exercise
FUE – First Unit Equipped
FY – fiscal year
FY99 – Fiscal Year 1999
FYDP – Future Years' Defense Plan

–G–

G8 – Army Deputy Chief of Staff for Programs
GA – tabun, a nerve agent
GAO – General Accounting Office
GB – sarin, a nerve agent
GD – soman, a nerve agent
GF – cyclosarin, a nerve agent
GIDEP – Government Industry Data Exchange Program
GLOC – G-force induced loss of consciousness
GLP – Good Laboratory Practices
GMP – Good Manufacturing Practice
GOTS – Government Off The Shelf
GOCO – Government-Owned/Contractor-Operated
GP – glycoprotein
GPFU – Gas Particulate Filter Unit
GPRA – Government Performance and Results Act
GUARDIAN – DOD-JPEO Readiness Installation Protection Program
GVO/BVO – Green Vinyl Overboots/Black Vinyl Overboots
GWOT – Global War on Terror

–H–

HAZMAT – Hazardous Material
HAZWOPER – Hazardous Waste Operations and Emergency Response
HD – sulfur mustard, a blister agent, or homeland defense
HEK – human epidermal keratinocytes
HEPA – high efficiency particulate
HHA – Hand Held Immunochromatographic Assay
HLA – high level architecture
HM – Hospital Corpsman
HMMWV – High Mobility Multipurpose Wheeled Vehicle
HN – Host Nation
HP – heteropolymer
HPAC – Hazard Prediction Assessment Capability
HQ – headquarters
HSA – Health Service Area
HSACDR – Health Service Area Commander
HSC/YA – Human Systems Program Office
HSO – Heath and Safety Orientation (Course)
HTA – high threat area
HTH – High Test Hypochlorite
HVAC – heating, ventilation, and air conditioning

–I–

IAB – Interagency Board
IAV – Interim Armored Vehicle
IAW – In Accordance With
IBAD – Interim Biological Agent Detector
IBMC – Industrial Base Maintenance Contract
ICAM – Improved Chemical Agent Monitor
ID – intradermal
IDC – Independent Duty Corpsmen
IDE – integrated digital environment or Investigational Device Exemption
IDLH – Immediate Danger to Life and Health
IET – Initial Entry Training
IFS – Integrated Footwear System
IIDP – Industry Initiated Demonstration Products
ILS – Integrated Logistics Support
IM – intramuscular
IMP – Industrial Preparedness Measure(s)
IMS – Ion Mobility Spectroscopy
IND – Investigational New Drug
IOC – Initial Operational Capability
IOT&E – Initial Operational Testing & Evaluation
IP – intraperitoneal or Individual Protection
IPDS – Improved (chemical) Point Detection System
IPE – Individual Protective Equipment
IPM – Industrial Preparedness Measures
IPP – Installation Protection Program
IPR – In-Process Review
IPT – Integrated Product Team
IR - Infrared
IR&D – Independent Research & Development
ISD – Individual Soldier Detector
ISO – International Standards Organization

ISS – Individual Survival Standards
ITAP – Improved Toxicological Agent Protective Ensemble
IV – intravenous

–J–

J-8 – Force Structure, Resources, and Assessment Directorate, the Joint Staff
JABT – Joint Ambient Breeze Tunnel
JASQ – JSLIST Alternative Source Qualification
JB1GU – JSLIST Block 1 Glove Upgrade
JB2GU – JSLIST Block 2 Glove Uprgrade
JBAIDS – Joint Biological Agent Identification and Diagnostic System
JBPDS – Joint Biological Point Detection System
JBSDS – Joint Biological Standoff Detection System
JBTDS – Joint Biological Tactical Detection System
JCAD – Joint Chemical Agent Detector
JCBAWM – Joint Chemical Biological Agent Water Monitor
JCBRAWM – Joint Chemical Biological Radiological Agent Water Monitor
JCBRN – Joint CBRN
JCBRN CIIT – Joint CBRN Defense Capabilities Improvement Initiative Team
JCBRNFC – Joint Chemical, Biological, Radiological, and Nuclear Familiarization Course
JCD – Joint Combat Developer
JCE – Joint Chemical Ensemble
JCHEMRATES – Joint Chemical Defense Equipment Consumption Rates
JCID – JWARN Component Interface Device
JCPE – Joint Collective Protection Equipment
JCS – Joint Chiefs of Staff
JEAP – Joint Equipment Assessment Program
JEAU – Joint Equipment Assessment Unit
JECP – Joint Expeditionary Collective Protection
JEM – Joint Effects Model
JEWC – Joint Electronic Warfare Center
JFCOM – Joint Forces Command
JFIRE – Joint Firefighter Integrated Response Ensemble
JFOC – Joint Future Operational Capabilities
JFSC – Joint Forces Staff College
JLAS – Joint Land, Aerospace, and Sea Simulation
JLSP – Joint Logistics Support Plan
JMAR – Joint Medical Asset Repository
JMCBDRP – Joint Medical Chemical and Biological Defense Research Program
JMCBDS – Joint Modular Chemical and Biological Detection System
JMCDRP – Joint Medical Chemical Defense Research Program
JMET – Joint Mission Essential Task
JMNBCDST – Joint Medical NBC Decision Support Tool
JMPAB – Joint Materiel Prioritization Allocation Board
JOEF – Joint Operational Effects Federation
JORD – Joint Operational Requirements Document
JPACE – Joint Protective Aircrew Ensemble
JPDS – Joint Portable Decontamination System
JPEO – Joint Program Executive Office
JPEO-CBD – Joint Program Executive Office for Chemical and Biological Defense
JPID – Joint Platform Interior Decontamination System
JPM – Joint Program Manager
JPM-CBMS – Joint Program Manager for Chemical and Biological Medical System
JPM IP – Joint Program Manager for Individual Protection
JPM IS – Joint Program Manager for Information Systems
JPMO – Joint Project Management Office
JPO – Joint Program Office
JPS – Joint Portal Shield
JRCAB – Joint Readiness Clinical Advisory Board
JRO – Joint Requirements Office
JROC – Joint Requirements Oversight Council
JRO-CBRN – Joint Requirements Office for Chemical, Biological, Radiological, and Nuclear Defense
JSAM – Joint Service Aircrew Mask
JSCESM – Joint Service Chemical Environment Survivability Mask
JSFDS – Joint Service Family of Decontamination Systems
JSGPM – Joint Service General Purpose Mask
JSIPETWG – Joint Service Individual Protective Equipment Technical Working Group
JSIPP – Joint Service Installation Pilot Project (*or,* Joint Service Installation Protection Program)
JSLC – Joint Senior Leaders Course
JSLIST – Joint Service Lightweight Integrated Suit Technology (individual protection)
JSLNBCRS – Joint Service Light NBC Reconnaissance System
JSLSCAD – Joint Service Lightweight Stand-off Chemical Agent Detector
JSMLT – Joint Service Mask Leakage Tester
JSNBCDEAP – Joint Service NBCD Equipment Assessment Program
JSNBCRS – Joint Service NBC Reconnaissance System

JSPDS – Joint Service Personnel/Skin Decontamination System
JSSDS – Joint Service Stationary Decontamination System
JSSED – Joint Service Sensitive Equipment Decontamination
JSTDS – Joint Service Transportable Decontamination System
JSTO – Joint Science & Technology Office
JSTO-CBD – Joint Science & Technology Office for Chemical/Biological Defense
JTAV – Joint Total Asset Visibility
JTAV-RW – Joint Total Asset Visibility Reporting Warehouse
JTF – Joint Task Force
JTS – Joint Training System
JVAP – Joint Vaccine Acquisition Program
JWARN – Joint Warning and Reporting Network
JWSTP – Joint Warfighting S and T Plan

–K–

KFE – Kunsan Focused Effort
KPP – Key Performance Parameter

–L–

L – lewisite, a vesicant agent
LAV – Light Armored Vehicle
LDS – Lightweight Decontamination System
LFADD – Large Frame Aircraft Decontamination Demonstration
LHA – general purpose amphibious assault ship
LHD – general purpose amphibious assault ship (with internal dock)
LIDAR – LIght Detection And Ranging
LIPT – Logistics Integrated Product Team
LL – Lincoln Laboratories
LLCWG – Low Level Chemical Warfare Agent Working Group
LMS – Lightweight Multipurpose Shelter
LNBCRS – Light NBC Reconnaissance System
LSCAD – Lightweight Stand-off Chemical Agent Detector
LSD – landing ship, dock
LSP – Logistics Support Plan
LTA – Low Threat Areas

–M–

M&S – Modeling & Simulation
Mabs – monoclonal antibodies
MACOM – Major Command
MAGTF – Marine Air Ground Task Force
MAJCOM – Major Command
MANAA – Medical Aerosolized Nerve Agent Antidote
MARFORPAC – Marine Force Pacific
MAT – Medical Analysis Tool
MBDRP – Medical Biological Defense Research Program
MBGV – *marburg* virus
MC - Physicians
MCBAT – Medical Chem-Bio Advisory Team
MCBC – Management of Chemical and Biological Casualties Course
MCBDRP – Medical Chemical and Biological Defense Research Program
MCCDC – Marine Corps Combat Development Command
MCHF (LDS) – Marine Corps Heavy Fuel LDS
MCLB – Marine Corps Logistics Base
MCO – Marine Corps Order
MCPE – Modular Collective Protection System
MCPU – Modified Chemical Protective Undergarment
MCS – Maneuver Control System or Mobility Capability Study
MCTTP – Marine Corps Tactics, Techniques and Procedures
MCU-2A/P – a chemical protective mask
MCWP – Marine Corps Warfighting Publication
MDA – Milestone Decision Authority
MDAP – Major Defense Acquisition Programs
MDS – Modular Decontamination System
MED – Medical
MEDCOM – Medical Command
MED/NBC WG – NATO Medical NBC Working Group
MEF – Marine Expeditionary Force
MEFEX – Marine Expeditionary Force Exercise
MEI – Major End Item
MEIR – Medical Effects of Ionizing Radiation
MES – Medical Equipment Set
MESO – Multi-community Environmental Storm Observatory
MEU – Marine Expeditionary Unit
MFR – Multi-Function Radiac Set (*or,* Multi-Function Radiation Detector)
MHS – Military Health System
MICAD – Multipurpose Integrated Chemical Agent Detector
MICAS – Mobility Inventory Control and Accounting System
MIDAS-AT – Meteorological Information and Dispersion Assessment System Anti-Terrorism
MIL STD – Military Standard
MITS – Medical Identification and Treatment Systems
MLRS – Multiple Launch Rocket System
MMS – Multimission Sensor (Program)
MNBCDM – Medical Nuclear Biological Chemical Defense Materiel

MNDRP – Medical Nuclear Defense Research Program
MOA – Memorandum of Agreement
MOPP – Mission Oriented Protective Posture
MOT&E – Multi-Service Operational Test & Evaluation
MOU – Memorandum of Understanding
MPDS – Multi-Purpose Decontamination System
MPF – Maritime Prepositioning Forces
MPH – miles per hour
MPS – Mission Performance Standard (*also,* Multipurpose Protective Sock)
MRMC – Medical Research and Materiel Command
MRTFB – Major Range and Test Facility Base
MS – Mass Spectrometry (*or*, milestone)
MSC – Military Sealift Command or Mesenchymal Stem Cells or Medical Service Corps Officers or Major Subordinate Command
MSCA – Military Support to Civil Authorities
MSR – Minimum Sustaining Rates
MSTP – MEFEX/MAGTF Staff Training Program
MTA – Medium Threat Area
MTF – Medical Treatment Facility, or Material Test Facility
MTO&E – Modified Table of Organization & Equipment
MTT – Mobile Training Team
MTTP – Multiservice Tactics, Techniques, and Procedures
MTW – Major Theater War(s)
MULO – Multi-purpose Overboot
mCPU – Modified Chemical Protective Undergarment

–N–

NAAK – Nerve Agent Antidote Kit
NAPP – Nerve Agent Pyridostigmine Pretreatment
NATO – North Atlantic Treaty Organization
NATOPS – Naval Air Training and Operating Procedures Standardization
NAVMED – Naval Medical
NAVSEA – Naval Sea Systems Command
NBC – Nuclear, Biological, and Chemical
NBCC – Nuclear, Biological, Chemical and Conventional
NBCCS – NBC Contamination Survivability
NBCD – NBC Defense
NBCDT – NBC Defense Training

NBCRS – NBC Reconnaissance System (Fox Vehicle)
NBCRV – (Stryker) NBC Reconnaissance Vehicle
NC – Nurses
NCBR – Nuclear, Chemical, Biological, and Radiological
NCO – Non-Commissioned Officer
NDAA – National Defense Authorization Act
NDC – National Drug Company
NDI – Non-Developmental Item
NDU – National Defense University
NEC – Navy Enlisted Code
NET – New Equipment Training
NFPA – National Fire Protection Association
NGAV – Next Generation Anthrax Vaccine
NGB – National Guard Bureau
NGS – Next Generation Sensor
NHP – non-human primates
NIAID – National Institute of Allergies and Infectious Diseases
NICP – National Inventory Control Points
NIH – National Institute of Health
NIOSH – National Institute for Occupational Safety and Health
NIST – National Institute of Standards & Technology
NMR – New Material Release
NMRC – Navy Medical Research Center
NO – nitric oxide
NORAD – North American Aerospace Defense Command
NORTHCOM – Northern Command
NP – Nurse Practitioner
NRC – National Research Council
NRL – Naval Research Laboratory
NRP – National Response Plan
NRSW – Navy Region South West
NSC – National Security Council
NSN – National Stock Number
NSTM – Naval Ships Technical Manual
NSWC – Naval Surface Warfare Center
NTA – Novel Threat Agent or Non-Traditional Agent or Non-Traditional Chemical Agent
NTTP – Naval Tactics, Techniques, and Procedures
NURA – Naval Unit Resiliency Analysis
NYSADC – New York State Academic Dental Centers
NWP – Naval Warfare Publication

–O–

O49 – Joint Contact Point and Test Project
O&M – Operations & Maintenance
O&S – Operations & Sustainment
OAG – Operational Advisory Group
OCONUS – Outside the continental United States
OEA – Operational Effectiveness Assistance
OFW – Objective Force Warrior (Program)
OG – Overgarment
OIF – Operation Iraqi Freedom

OIF/OEF – Operation Iraqi Freedom/Operation Enduring Freedom
OIPT – Overarching Integrated Product Team or Overarching Integrated Process TeamOMFTS – Operational Maneuver From the Sea
OOTW – Operations Other Than War
OPCW – Organization for the Prohibition of Chemical Weapons (in The Hague)
OPLAN – Operational Plan
OPNAV – Office of the Chief of Naval Operations
ORD – Operational Requirements Document
ORM – Operational Risk Management
OSD – Office of the Secretary of Defense
OSHA – Occupational Safety and Health Administration
OSUT – One Station Unit Training
OT – Operational Testing
OTA – Operational Test Agency
OTSG – Office of the Surgeon General

–P–

2-PAM - pralidoxime
P3I – Pre-Planned Product Improvement
PA – protective antigen, or physician assistant
PACAF – Pacific Air Forces
PACOM – Pacific Command
PAIO – Program Analysis and Integration Office
PAM – Preventative and Aerospace Medicine
PATS – Protective Assessment Test System
PB – President's Budget or pyridostigmine bromide
PBA – Pine Bluff Arsenal
pBuChE – plasma-derived human butylcholinesterase enzyme
PCC – Premature Chromosome Condensation
PCPS – Portable Collective Protection System
PCR – polymerase chain reaction
PCRA - polymerase chain reaction assay
PD – phenyl dichlorarsine
PDDA – Power Driven Decontamination Apparatus
PDM – Program Decision Memorandum
PE – Program Element
PEGEM – Post Engagement Ground Effects Module
PEO-CBD – Program Executive Office for Chemical and Biological Defense
PICS – Personal Ice Cooling System
PIP – Product Improvement Program
PK – pharamacokinetic
P.L. 103-160 – Public Law 103-160, *The National Defense Authorization Act of FY94*
PM – Program Manager
PMCS – Preventative Maintenance Checks and Services
PME – Professional Military Education
PMO – Product Management Office
POI – Program of Instruction
POL – petroleum, oil, and lubricant
POM – Program Objective(s) Memorandum
PPBES - Planning, Programming, Budgeting, and Execution System
PQS – Personnel Qualification Standard
PSA – Pressure Swing Adsorption

–Q–

QDR – Quadrennial Review
QEF – Quality Evaluation Facility
QMS – Quality Management System
QNFT – Quantitative fit testing
QPL – Qualified Products List

–R–

R&D – Research and Development
R&T – Research and Technology
RADIAC – Radiation
RAMAN – Regional Atmospheric Measurement and Analysis Network
RAPID – Ruggedized Advanced Pathogen Identification Device
RC – Reserve Component
RD – Radiation Decontamination
RDA – Research, Development, and Acquisition
RDD – Radiological Dispersal Device
RDECOM – Research Development and Engineering Command
RDTE (Also, RDT&E) – Research, Development, Test (&) Evaluation
RestOps – Restoration of Operations
RIP – Readiness Improvement Program
RMC – Regional Medical Commands
RNA – Ribonucleic Acid
ROM – Rough Order of Magnitude
ROTA – Release Other Than Attack
rPA – recombinant protective antigen
RRL – Redox Regulating Liposome
RSCAAL – Remote Sensing Chemical Agent Alarm
RSDL – Reactive Skin Decontaminating Lotion
RSEB – recombinant staphylococcal enterotoxin B
RSOI – Reception, Staging, Onward Movement and Integration
RTI – Research Triangle Institute
RW – radiological/nuclear warfare

–S–

S&T – Science & Technology Base
SA(CBD&CDP) – Special Assistant (Chemical Biological Defense and Chemical Demilitarization Programs)
SACPS – Selected Area Collective Protection System

SAG – Study Advisory Group
Saratoga – a CB protective overgarment
SASC – Senate Armed Services Committee
SBA – Simulation Based Acquisition
SBCCOM – Solider, Biological and Chemical Command (U.S. Army)
SBIR – Small Business Innovative Research
SCALP – Suit Contamination Avoidance Liquid Protection
SCPE – Ship Collective Protective Equipment
SD – Stand-off Detector
SDD – System Development and Demonstration
SDK – Skin Decontamination Kit
SDS – Sorbent Decon System
SE – *staphylococcal enterotoxins* or status ellepticus
SEA – Staphylococcal Enterotoxin A
SEABEE – Construction Battalion
SEB – Staphylococcal Enterotoxin B
SecDef – Secretary of Defense
SERPACWA – skin exposure reduction paste against chemical warfare agents
SERT – Smallpox Epidemic Response Team
SLAM – Strategic Logistics Asset Management
SLS – Senior Level Seminar
SMART-AIT – Special Medical Augmentation Response Team-Aeromedical Isolation
SMART-B – Special Medical Augmentation Response Team-Burn
SMART-EMR – Special Medical Augmentation Response Team-Emergency Medical Response
SMART-HS – Special Medical Augmentation Response Team-Health Systems Assessment and Assistance
SMART-LOG – Special Medical Augmentation Response Team-Logistics
SMART-MC3T – Special Medical Augmentation Response Team-Medical Command, Control, Communications, Tele-medicine
SMART-NBC – Special Medical Augmentation Response Team-Nuclear/Biological/Chemical
SMART-PC – Special Medical Augmentation Response Team-Pastoral Care (clinical)
SMART-PM – Special Medical Augmentation Response Team-Preventative Medicine
SMART-SM – Special Medical Augmentation Response Team-Stress Management
SMART-V – Special Medical Augmentation Response Team-Veterinary
SMAT – small molecule anti-genomic therapeutics
SME – Subject Matter Expert
SN – Strategic National
SNAPP – Soman Nerve Agent Pretreatment Pyridostigmine
SOF – Special Operations Forces
SO/LIC – Special Operations and Low Intensity Conflict
SOPS – Standing Operating Procedures
SORTS – Status of Resources and Training System
SORTS-C – Status of Resources and Training System-Chemical
SPG – Strategic Planning Guidance
SPOD – Seaport of Debarkation
SSBA – Spectral Sensing of Biological Aerosols
SSE – Sensitive Site Exploitation
STAFFS – Simulation Training and Analysis for Fixed Sites
STANAG – standardization agreement
STB – Super Tropical Bleach
STEPO – Self-Contained Toxic Environment Protective Outfit
STIMAL – Signal Transduction Methodology Antioxidant Liposomes
STOM – (Sea Basing) Ship to Objective Maneuver
SVP – Smallpox Vaccination Program
SWA – Southwest Asia

–T–

T&D – Transport & Diffusion
T&E – Test & Evaluation
TABMS – Total Asset Visibility Management System
TACOM ILSC – Tank-Automotive Armaments Command Integrated Logistics Support Center
TAP – Toxicological Agent Protective boots and gloves
TARA – Technology Area Review and Assessment
TARDEC – Tank and Automotive Research, Development and Engineering Center
TAV – Total Asset Visibility
TB – Technical Bulletin
TBM – Transportation of Biomedical Materials or Tactical Ballistic Missiles or Theater Ballistic Missiles
TBMCS – Theater Battle Management Core Systems
TCPS – Transportable Collective Protection Systems
TDA – table of distribution and allowances
TE – Technical Escort
TED – Troop Equivalent Dose
TEI – Technical Equipment Inspection
TEMP – Test and Evaluation Master Plan
TEMPER – Tent Extendable Modular Personnel
TES – Tactical Engagement Simulation
TEU – Technical Escort Unit
TIC – Toxic Industrial Chemical
TIM – toxic industrial material
TLR – toll like receptors

TOF – Time of Flight
TOPs – Test Operating Procedures
TRADOC – Training and Doctrine Command
TRANSCOM – Transportation Command
TRL – Technology Readiness Level
TS – Technical Secretariat
TSC – Training Simulation Capability
TSG – The Surgeon General
TSI – The Salk Institute
TSP – Topical Skin Protectant
TSWG – Technical Support Working Group
TTP – Tactics, Techniques, and Procedures

–U–

UCS – Unified Command Suite
UFL – Ulchi Focus Lens
UGVS – Unmanned Ground Vehicle System
UID – Unique Item Identifiers
UJTL – Universal Joint Task List
UNWD – Unconventional Nuclear Warfare Defense
URC – Urgent Requirements Capabilities Document
USA – United States Army
USACHPPM – United States Army Center for Health Promotion and Preventive Medicine
USACMLS – US Army Chemical School
USAF – United States Air Force
USAFSAM/311th HSW – U.S. Air Force School of Aerospace Medicine 311th Human Systems Wing
USAF/XO – United States Air Force, Director of Operations
USAMEDCOM – U.S. Army Medical Command
USAMEDDC&S – U.S. Army Medical Department Center & School
USAMMA – U.S. Army Medical Materiel Agency
USAMRICD – U.S. Army Medical Research Institute of Chemical Defense
USAMRIID – U.S. Army Medical Research Institute of Infectious Diseases
USAMRMC – U.S. Army Medical Research and Materiel Command
USAR – US Army Reserve
USC – United States Code or University of Southern California
USCG – United States Coast Guard
USCENTCOM – US Central Command
USD(AT&L) – Undersecretary of Defense (Acquisition Technology & Logistics)
USD(Policy) – Under Secretary of Defense for Policy
USEUCOM – US European Command
USFK – U. S. Forces, Korea
USG – United States Government
USJFCOM – US Joint Forces Command
USMC – United States Marines Corps
USN – United States Navy
USPACOM – US Pacific Command
USS – United States Ship
USSOCOM – United States Special Operations Command
USTRANSCOM – United States Transportation Command
UTC – Unit Type Code
UV – ultra-violet

–V–

VCA – Voice Communication Adapter
VEE – Venezuelan Equine Encephalomyelitis
VENM – Ventilation Model
VERTS – Virtual Emergency Response Training System
VIG – Vaccinia Immune Globulin
VLP – virus-like particles
VLSTRACK – Vapor, Liquid, and Solid Tracking Model
VPS – Virtual Prototyping System
VTC – Video Teleconference
VTT – Video Teletraining
VX – a nerve agent

–W–

W&R – Warning & Reporting
WAARS – Wide Area Aerial Reconnaissance System
WCF – Working Capital Fund
WDTC – West Desert Test Center
WDTIC – West Desert Technical Information Center
WEE – Western Equine Encephalomyelitis
WG – Working Group
WIPT – Working Integrated Process Team
WMD – weapons of mass destruction
WMD-CST – Weapons of Mass Destruction Civil Support Teams
WRAIR – Walter Reed Army Institute of Research
WRM – war reserve materiel
WRSI – War Reserves Secondary Items
WSLAT – Whole System Live Agent Testing

–X–

XBLAST- External Blast

–Y–

Y. pestis – *Yersinia pestis* (Plague)

Intentionally blank